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# Death of a Cannabis Abuser due to Combined effects of Gagging & Chocking by Garbage Materials: a Case Report

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## ABSTRACT

Gagging & chocking, both are types of violent asphyxial death. Gagging is mostly homicidal & majority of the victims are infants. Suicidal gagging is also reported many times from different parts of the world. Accidental gagging is relatively rare event. On the other hand, chocking is almost always accidental. Here, an accidental case of combination of gagging & chocking in a cannabis abuser has been reported.

**Keywords:** Gagging, Chocking, Cannabis, Asphyxia, Autoeroticism

## INTRODUCTION

Gagging is a type of mechanical asphyxia, where a pad or gag is fixed over the face or sometimes a gag is thrust into the mouth. The foreign material blocks the orifices<sup>[1]</sup>. Death usually occurs due to asphyxia, less commonly sudden death may occur due to reflex vagal inhibition<sup>[2]</sup>. Chocking refers to blockage of internal airways, usually between pharynx & the bifurcation of trachea. In chocking, death may occur due to pure hypoxia following a period of struggle for breath or due to neurogenic cardiac arrest<sup>[1]</sup>.

Gagging is almost always homicidal & infants are the main victims. In some homicidal gagging cases, death is not intended; in these cases, gagging is used for preventing the victim from shouting for help & death occurs accidentally<sup>[2]</sup>. Suicidal gagging is also

not uncommon. A case was reported in USA, that a 30 years old male subject was found hanging with a sock gag in his mouth. From the site of occurrence a book was found, containing detailed description of fantasized hanging. A series of suicide notes were also recovered from the place<sup>[3]</sup>. A series of cases has been reported in Germany about cases of gagging in fatal autoeroticism & suicide<sup>[4]</sup>. Another case of gagging has been reported in India. The case was gagging with papers containing religious rhymes written on them. The manner of death of the subject remained unclear<sup>[5]</sup>. Accidental gagging is relatively rare; usually occur due to accidental slipping of artificial denture, sudden sucking in of plastic sheet etc<sup>[6]</sup>. Chocking is almost exclusively accidental in nature<sup>[7]</sup>.

## CASE HISTORY

On June 2014, in the mortuary of Nilratan Sirkar Medical College, Kolkata, autopsy was performed on a 35 years old male subject, known to be a cannabis abuser. He was found inside a heap of garbage materials with head directed towards ground, at Dhapa, the dumping ground for Kolkata metropolitan. He was brought out from the heap without any visible sign of life. There was no visible external injury & the

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body was in decomposed condition. One small packet of "Ganja" was recovered from his shirt pocket. The body was sent to mortuary for autopsy examination.

### **Autopsy examination findings**

The body was in advanced decomposition stage, with partial protrusion of tongue, degloving & partially fallen off scalp hair. The body and the wearing apparels were covered with sand particles, dirt & garbage materials. There was no visible external injury.

On internal examination; mouth cavity, nasal cavity, oesophagus & tracheal lumen even beyond its bifurcation were found to be occluded by dirt & sand mixed with garbage materials. The stomach was containing partially digested food particles mixed with dirt, sand & garbage materials. Petechials haemorrhagic spots were found on the pleural surface.

All the findings are suggestive of death due to pure asphyxia.

### **DISCUSSION**

In this case, the respiratory tract & upper elementary tract of the subject was filled with mixture of dirt, sand & garbage materials. The possibility of homicidal manner of death can be ruled out as there was no external or internal injuries found on the body. Internal findings suggest the mode of death to be purely asphyxial.

### **CONCLUSION**

The person was a known cannabis abuser. Under the influence of cannabis intoxication, he fell asleep in the dumping ground & was buried alive in the heap garbage materials. Due to intoxicated condition & suppressed gag reflex, the subject faced his death due to accidental gagging.

Accidental deaths in the garbage dumping area are not very uncommon. In most occasions these accidents occur due to careless attitude of drivers of garbage carrying vehicles, they should have more responsibility to reduce these types of accidents.

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# Study of Fingerprint Pattern in Type II Diabetes Mellitus

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## ABSTRACT

There are several screening test for recognizing high risk groups for Type-II diabetes mellitus, which are mostly invasive and costly. But from many days research on fingerprint pattern are going on to prove it relationship with type-II diabetes mellitus. Our study aiming to find out the association of fingerprint pattern with type-II diabetes mellitus. Fingerprint pattern of 100 diagnosed type II diabetes mellitus patients (72 male and 28 female) were studied and compared with 100 normal individual (76 male and 24 female) not suffering from diabetes mellitus. Cases and controls were taken from medicine OPD of North Bengal Medical College in the period of 1st November 2013 to 12th December 2013.

There is significant difference between fingerprint pattern of diabetics and non diabetics. In diabetic patient there is significant increase in whorl pattern in both in diabetic male and female than the controls. Whereas significant reduction in loop pattern is seen in diabetics than controls, in both sexes.

**Keywords:** Fingerprint, Diabetes Mellitus, Loop, Whorl

## INTRODUCTION

Diabetes mellitus is a major public health problem in new era of civilization. It is one of the leading cause of morbidity and mortality in developing countries. WHO projects that diabetes will be the 7th leading cause of death in 2030 (WHO, 2011). Diabetes mellitus refers to a group of common metabolic disorder that share the phenotype of hyperglycemia. It is caused by a complex interaction of genetics and environmental factors. There are mainly two distinct type of diabetes mellitus:

- Type-I diabetes-result of complete or near complete deficiency of insulin due to
  - immune mediated
  - ideopathic
- Type-II diabetes-result of variable degree of insulin resistance, impaired insulin secretion, and increased glucose production. Other than above two type there is some specific types of diabetes mellitus, but among the all type-II diabetes is most common.

## Risk Factors For Type-II Diabetes Mellitus

- Family history of diabetes mellitus
- Habitual physical inactivity
- Food habit
- Race/ethnicity e.g. African American, Latino, Asian American.
- Previously identified impaired glucose tolerance
- Hypertension
- HDL cholesterol level <35 mg/dl
- History of vascular disease

## Genetic Predisposition

Type-II diabetes mellitus has a strong genetic component. Multiple gene defect is associated with familial predisposition of type-II diabetes mellitus, along with some acquired cause like sedentary life style, food habit etc. The concordance of type –II DM in identical twins is between 70 to 90%<sup>[1]</sup>.

Dermatoglyphics is the study of epidermal ridges in fingertips, palms and soles. Dermatoglyphics has proved to be an useful tool in diagnosing many gene-linked abnormalities and diseases, like Turner’s syndrome, Klinefelter’s syndrome, Chromosome 5p deletion, Beta- thalassemia, Rheumatoid arthritis. So for screening hereditary disorders, use of dermatoglyphics is increasing day to day. In these circumstances the present study was done to evaluate correlation between fingerprint pattern and type-II diabetes mellitus. If there is any positive correlation between these two, then it may be used as a risk factor for diabetes mellitus.

**MATERIALS AND METHOD**

Study Area- Medicine OPD of North Bengal Medical College.

Study period-1<sup>st</sup> November 2013 to 12<sup>th</sup> December 2013.

Study population- 100 diagnosed type-II diabetes mellitus patient attending at Medicine OPD Of North Bengal Medical College, Darjeeling in the study period were taken as case.

Controls taken from the patient attending Medicine OPD who was not diabetic.

**Criteria for Cases**

- 1) Glycosylated haemoglobin or Hb A1C level in blood >6%.
- 2) Controlled blood glucose level with use of anti-diabetic medication.
- 3) Absence of any other endocrinal disorder not

related with diabetes mellitus and other genetic disorders.

Controls taken from the patient attending Medicine OPD who was not diabetic.

**Criteria for controls**

- 1) Blood glucose level never exceed the normal values.
- 2) No positive family history for diabetes mellitus.
- 3) Age above 35 years.

Study Technique- Fingerprint pattern of 100 diagnosed type-II diabetes mellitus patient and 100 normal individual were studied. Among the case population 72 male and 28 were female, and among the controls 24 were female and 76 were male. For taking of fingerprint hands were washed, cleaned and dried fast, then it recorded on a unglazed white paper using printer’s ink. Both plain and rolled print was taken. Ethical clearance had taken from the college ethical committee.

The fingertip pattern of both cases and controls were studied by use of magnifying glass, and results were analyzed by Chi-Square test in SPSS software.

**RESULT**

In the present study there is significant increase in whorl pattern both in diabetic male and female than the controls. Whereas significant reduction in loop pattern is seen in diabetics than controls, in both sexes.

Frequencies are shown in Table-1 and Table-2 below.

**Table 1: Frequency Distribution of Various Pattern of Finger Print Pattern in Male**

	PATTERN	WHORL	ARCH	LOOP
	GROUP			
RIGHT HAND	CASE	59.7%	2.7%	37.6%
	CONTROLS	31.5%	7.9%	60.6%
LEFT HAND	CASE	56.9%	2.7%	40.4%
	CONTROLS	32.9%	6.5%	60.6%

**Table 2: Frequency Distribution of Various Pattern of Finger Print Pattern in Female**

	PATTERN	WHORL	ARCH	LOOP
	GROUP			
RIGHT HAND	CASE	53.6%	7.14%	39.3%
	CONTROLS	25%	12.5%	63.5%
LEFT HAND	CASE	66.7%	7.14%	26.2%
	CONTROLS	16.7%	16.7%	66.6%

## DISCUSSION

Dermatoglyphics now used widely as diagnostic aid in various hereditary disease. Cummins<sup>[2]</sup> study proved that many patient with chromosomal abnormality have abnormal ridge pattern.

Uchida, Miller, Soltan<sup>[3]</sup> study shows marked variation in dermal ridges in Klinefelter's syndrome patients. In the present study, Whorl pattern is significantly increased in both male and female diabetic patient, and reduction in loop patterns than the controls. This finding is similar with the findings of Sant et al<sup>[4]</sup>.

But Sant et al<sup>[4]</sup> reported increased frequency of arches in both male and female diabetics, but it contradicts findings of present study. The findings are also similar with Knussmann et al<sup>[5]</sup> and Hirsch<sup>[6]</sup>. Sarthak Sengupta et al<sup>[7]</sup> also reported increased frequency of whorl pattern in male type II diabetic patients.

## CONCLUSION

This study may be useful to prove the utilization of fingerprinting for screening the population for Type-II diabetes mellitus. This findings will definitely encouraging for more studies, which will prove its use as a screening tool for diabetes mellitus, and thus it can improve early diagnosis and treatment of diabetes mellitus from very childhood.

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**Conflict of Interest:** our primary interest of the study is to know the association of type –II diabetes mellitus and fingerprint pattern, and secondary interest is to use this data for the improvement of our professional research work.

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# Clinical Assessment of Agenesis of Palmaris Longus and Flexor Digitorum Superficialis in Indian Population

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## ABSTRACT

Palmaris longus (PL) is a slender, long and fusiform muscle of the forearm and suggested to be a phylogenetically degenerate muscle with weak action. Prevalence of agenesis of PL varies between 6-25%. Flexor digitorum superficialis (FDS) is the largest superficial flexor muscle of the forearm. Variations exist in the tendon of FDS to the little finger and this may influence clinical examination in injuries of the hand. The study was conducted in Adichunchanagiri Institute of Medical Sciences. In total 266 medical students (143 females and 123 males) aged between 17-20 years were evaluated in this cross sectional study. The overall prevalence of absence of PL was 27.44% (table 1). Unilateral absence was noted in 16.19 % and was more predominant than bilateral absence which was noted in 10.52% of the individuals. None of the subjects showed agenesis of FDS to the little finger. However in 14 (5.2 %) function FDS tendon to little finger was dependent on FDS to the ring finger. Even though prevalence of agenesis of PL in Indian population is quite high agenesis of FDS to little finger is a rare phenomenon.

**Keywords:** *Palmaris longus, Flexor Digitorum Superficialis, Variations, Hand Surgeries*

## INTRODUCTION

Palmaris longus (PL) is a slender, long and fusiform muscle of the forearm which lies medial to the flexor carpi radialis. Palmaris longus is often absent on one or both sides. PL is suggested to be a phylogenetically degenerate muscle with weak action. It is a metacarpophalangeal joint flexor. Clinically the presence of PL can be tested by flexing the wrist against resistance; the taut tendon of palmaris longus will be visible in the midline of the flexor wrist crease as the tendon passes superficial to the flexor retinaculum. When testing palmaris longus, opposing the thumb to the middle fingertip while the wrist is flexed accentuates the contraction of PL.<sup>1</sup> Congenital absence

of PL is seldom associated with significant physical or functional limitations as demonstrated by multiple studies. However, PL may add to the strength of thumb abduction, thus providing an advantage in sports and professions that make use of hand grip.<sup>2</sup> Agenesis of PL muscle is affected by various factors like race, genetic, hereditary and environment. Prevalence of agenesis of PL varies between 6-25%.<sup>3</sup> Owing to the paucity of data regarding the prevalence of PL in Indian population the present study was undertaken.

Flexor digitorum superficialis (FDS) is the largest superficial flexor muscle of the forearm and arises by two heads. Humero-ulnar head arises from the medial epicondyle of humerus, ulnar collateral ligament, intermuscular septa and medial side of coronoid process. The radial head arises from the anterior border of the radius extending from the radial tuberosity to the insertion of pronator teres<sup>1</sup>. FDS acts as a flexor of proximal interphalangeal (PIP), metacarpophalangeal and wrist joint. Independent action of FDS to a finger is tested by flexing that finger keeping other three fingers in full extension.<sup>1</sup> Variations exist in the tendon

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of FDS to the little finger and this may influence clinical examination in injuries of the hand. <sup>4,5</sup> Hence an attempt was made to assess the prevalence of agenesis of FDS tendon to little finger and to determine correlation between absence of PL and agenesis of FDS.

### MATERIALS AND METHOD

The study was conducted in Adichunchanagiri Institute of Medical Sciences, Karnataka. Approval for conducting the study was granted by the institutional ethical board prior to conducting the study. Written informed consent was taken from each participant before conducting the study. In total 266 medical students (143 females and 123 males) aged between 17-20 years were evaluated in this cross sectional study. Participants with history of injury, any surgery or any disease of the upper limbs were excluded from the study. Each subject was asked to fill an information sheet to collect the demographic data such as age and sex. After recording the handedness, the presence or absence of Palmaris longus muscle and flexor digitorum superficialis tendon to the little finger was identified by clinical examination and the findings were recorded.

Presence or absence of Palmaris longus muscle was identified by using the Schaeffer's test, where in the each participant was asked to oppose the thumb to the little finger and then to flex the wrist. Failure to visualize or palpate the prominence produced by the tendon of PL just below the wrist was taken as absent PL.

#### Frequency of absence of palmaris longus

Absence of Palmaris longus	Right upper limb	Left upper limb	Bilateral	Total
Males (n=123)	11 (8.94%)	05(4.06%)	11(8.94%)	27 (21.95%)
Females (n=143)	14(9.7%)	15 (10.48%)	17(11.88%)	46 (32.16%)
Total	25 (9.39%)	20 (7.51%)	28 (10.52%)	73 (27.44%)

Out of 266 subjects examined only 3(1.1%) were left handed. Out of 73 subjects with absent Palmaris longus only 1 was left handed and the rest were right handed.

Out of 266 subjects none of the subjects showed agenesis of FDS to the little finger. However in 14 (5.2 %) function FDS tendon to little finger was dependent on FDS to the ring finger. Prevalence of unilateral dependent function was 2.4% and bilateral dependent function was 2.8%. In males the overall prevalence of the dependent function was 4.06 % with unilateral dependent function being 1.62% on right side and 2.44% on left side. In females the overall prevalence

The function of tendon of FDS tendon to the little finger was tested by asking the participant to keep the wrist in full supination and all fingers in extension and then flex little finger. Flexion of only the proximal interphalangeal joint (PIP) was considered as positive for independent function of the tendon of FDS for little finger. In case of flexion of both PIP and distal interphalangeal joint (DIP) of little finger a modified test was used. Here the participant was asked to flex little and ring finger keeping the other fingers extended. Flexion of PIP of little finger with PIP of ring finger was taken as dependent function of FDS tendon to little finger. Failure to flex PIP of little finger even along with the ring finger was taken as absent tendon of FDS to the little finger.

### RESULTS

The overall prevalence of absence of PL was 27.44% (table 1). Unilateral absence was noted in 16.19 % and was more predominant than bilateral absence which was noted in 10.52% of the individuals. PL was absent in 21.95% of males and 32.16% of females and the difference was statistically significant (p<0.05). Bilateral absence was more common in females (11.88%) compared to males (8.94). Even unilateral absence was more common in females (20.27 %) than males (13%). In male subjects with unilateral absence, prevalence was 8.94 % in right upper limb and 4.06 % in left. In female subjects with unilateral absence, prevalence was 9.7% in right upper limb and 10.48 % in left.

was 6.29% with unilateral dependent function being 2.1% on right side and 4.19 on left. There was no correlation between absence of PL and absence of FDS tendon to little finger

### DISCUSSION

Numerous studies have been done till date in different geographical regions of the world to elicit the prevalence of absence of PL. In the present study prevalence of PL along with agenesis of FDS to the little finger was determined. Quoted by many authors as dispensable muscle with no active function in the

hand movements, PL serves as the sought after choice for tendon grafts and reconstructive procedures in plastic surgery.<sup>3</sup> In the present study the overall prevalence of PL agenesis was 27.44% which is in agreement with studies done by Devishankar et al<sup>6</sup> and Saxena S<sup>7</sup>. The lowest reported prevalence of PL is in North Korea (0.6%), followed by Uganda(1.02%), Africa (1.5%).<sup>8,9,10</sup> Highest reported prevalence is in Nigeria (30%).<sup>11</sup> Hence PL agenesis is definitely varies with ethnicity. Since PL forms one of the foremost tendon used in graft surgeries awareness of these variations is very essential to the operating surgeon.

Prevalence of agenesis of FDS tendon to little finger is reported to be 15-21% in Caucasian population.<sup>5</sup> However in our study we did not find a single case of agenesis of FDS tendon to the little finger. But in 5.2 % of the study group, function of FDS tendon to little finger was dependent on FDS tendon to the ring finger. There was no concomitant absence of PL and FDS to little finger. Aggenesis of FDS to little finger has no correlation with agenesis of PL.

### CONCLUSION

We conclude that the prevalence of agenesis of PL in Indian population is quite high. Since PL is one of the preferred tendon in graft surgery, Plastic surgeons should be well aware of variations of PL and the same should be confirmed by ultrasound examination before planning for surgeries using PL. Compared to agenesis of PL, agenesis FDS to the little finger is a rare phenomenon in Indian population and has no correlation with agenesis of PL.

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# Bite Marks in Criminal Investigation

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## ABSTRACT

A bite mark is defined as a pattern produced by human or animal dentition and its associated structures in any substance capable of being marked by the same, which serve as important as well as controversial aspects of forensic odontology. Although there is a continuing dispute over its authenticity, there are numerous cases wherein bite mark evidence has proven to be critical in the conviction of criminal defendants. This review article explores the cases in which bite marks have provided major evidence in homicide, rape and child abuse investigations.

**Keywords:** Bite Marks, Investigation, Criminal, Conviction

## INTRODUCTION

The compelling use of bite mark analysis in criminal investigation is in rise in the present scenario and the use in forensic sciences dates to the mid nineteenth century. Bite marks are unique to each person even in identical twins and the basic principle of bite lies in the concept no two dentitions are alike. The characteristics of a bite mark may be affected by the type, individual tooth movement, number and peculiarities of the teeth, muscle function, dynamics of occlusion, and temporomandibular joint dysfunction in the perpetrator. They usually indicate abuse in any form and establish the presence of a potential suspect in the scene of crime. Perpetrators of violent injury can be detected from bite marks from the victim or on that of the perpetrator, or on a food item taken from the scene of crime. They also yield significant physical evidence about the nature and circumstances of a crime. Some scientists elaborated the psychological aspects of bite marks and classified them into three basic categories<sup>1</sup>.

Due to a pattern of psychologically expressed ritualism, the perpetrator often inadvertently leaves

important psychological clues at the crime scene. The components like the attack style, characteristics of the victim and mode of death reveal the information on the type of psychological needs that the perpetrator is trying to satisfy. In the cases of bite marks associated with violent crime, it becomes crucial to an "investigator" what type of personality characteristics are welded together to form this kind of need complex. There are three major groups of perpetrators. The first group is motivated out of an anger track, the second group is motivated out of sadistic biting, and the third is out of the more traditional cannibal complex<sup>1</sup>.

Forensic dentistry comprises the application of dental knowledge to those criminal and civil laws that are enforced by the police agencies in a criminal justice. Human bite marks are one of the most violent crimes tried in the criminal courts and have been found in cases of homicide, sexual assault, attempted suicide and child abuse.<sup>2,3</sup>

## METHOD OF BITE MARK ANALYSIS

There involves a series of protocols for the bite marks to be analysed. The pattern of the bite mark is noted, followed by a detailed record of the size, color, number and anatomical position. A digital camera was used for photography, and photos were then transferred to a computer for printing and analysis. Photography was done vertically so that the chances of distortion were reduced to minimum. A scale with certified accuracy was placed along the length and

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width of the bite mark, serving a dual purpose namely obtaining relative size and allowing accurate enlargement. Dental Impressions of both arches of the suspect is taken, the jaw structure examined, followed by the biting dynamics of the muscles and tongue<sup>4</sup>.

There were two methods that were commonly employed in bite mark analysis, namely the direct and indirect method. In the past, the direct method compared a model of the suspect's teeth to a life-size photograph of the actual bite mark. Indirect methods involve the use of transparent overlays to record a suspect's biting edges. Transparent overlays are made by free-hand tracing the occlusal surfaces of a dental model onto an acetate sheet. The use of transparent overlays is considered subjective and irreproducible because the tracing can be easily manipulated. On the other hand, photocopier-generated overlays where no tracing is used is considered to be the best method in matching the correct bite mark to the correct set of models without the use of computer imaging<sup>5</sup>.

While the photocopier-generated technique is sensitive, reliable, and inexpensive, new methods involving digital overlays have proven to be more accurate. Two recent technological developments include the 2D polyline method and the painting method. Both methods use Adobe Photoshop. Use of the 2D polyline method entails drawing straight lines between two fixed points in the arch and between incisal edges to indicate the tooth width. Use of the painting method entails coating the incisal edges of a dental model with red paint and then photographing the model. Adobe Photoshop is then used to make measurements on the image. A total of 13 variables are used in analysis. Identification for both methods are based on canine-to-canine distance (1 variable), incisor width (4 variables), and rotational angles of the incisors (8 variables). The 2D polyline method relies heavily on accurate measurements, while the painting method depends on precise overlaying of the images. Although both methods were reliable, the 2D polyline method gave efficient and more objective results<sup>5,6</sup>.

### **CASES WHICH MADE LEGAL HISTORY**

The most famous bite mark case ever known to legal history was that of serial killer, Ted Bundy. On Jan 15, 1978, Bundy broke into the Florida State University Campus, where he assaulted and killed three women. No fingerprints were found at the crime scene, sperm and blood samples proved inconclusive, the attacker was consistent in maintaining caution,

taking the murder weapon as well leaving no hard evidence for conviction. However, there was a piece of evidence which was to later become the centerpiece of the trial; a bite mark left by Bundy on the buttocks of Lisa Levi whom he raped and killed. The unique indentation mark, size of the teeth, sharpness factors of the bicuspids, laterals and incisors turned out to be a perfect match to the dental impression of Bundy. It was this bite mark that was primarily responsible for his conviction. He was executed in Florida's electric chair on Jan 24, 1989 shortly before which he confessed to thirty other murders<sup>7</sup>.

Another case was that of an American serial killer John Joubert who was convicted for the murders of three young boys which rocked the Omaha, Nebraska area. The autopsy report of one of the young victims brutally murdered by him-Ricky Stenson showed that he had died from strangulation, resulting in asphyxia. He had also been stabbed in the chest with bite marks on him clearly made by human teeth, and were slashed as if to obliterate them. But the bruise from the bite showed that the killer had distinct set of teeth, which render the possibility of an accurate comparison would should a suspect he found. It took nearly five years to narrow down the list of suspects, and find a perfect match but, John Joubert was finally convicted in the late 1990's and was put to death in an electric chair in 1996<sup>8</sup>.

The third case discussed here dates back to 1967, when the strangled and heavily bruised body of Linda Peacock was discovered in a local cemetery by locals soon after she was reported missing. Forensic odontologist Dr. Warren Harvey was brought into the case upon the discovery of an unusual bruise, they suspected to be on the right breast of the fifteen year old victim. As the odontological examination continued to progress, officials gathered witnesses to the horrific incident. Meanwhile, a detailed examination of the bite mark revealed a very unique unevenness in the perpetrators dentition. With this newfound information combined by that given by the witness, a systematic search for the murder ensued. Dental impressions of numerous inmates and potential suspects were taken for comparison. At this point pathologist Keith Simpson Joined the team, and together these men studied all the impressions and came up with a suspect, seventeen year old Gordon Hay. Hay's dental impression showed that one of his teeth was pitted in two places by a disorder known as hypocalcification. This matched the unique impression on the patient's breast; the defining piece of physical

evidence was then taken to court, enabling the conviction of Gordon Hay in 1968<sup>9</sup>.

### CONCLUSION

As science continues to evolve, with more precise and demonstrative methods of performing investigations, alongside the surreal development in the field of research on the individuality of human dentition, will lead to a dramatically rapid rise in the uses of bite mark analysis in legal systems. A quality bite mark injury pattern when executed properly using validated scientific methodologies can assist society greatly in applying laws fairly.

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# An Analysis of Deaths due to Hanging

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## ABSTRACT

Suicide by hanging is known since ancient times and all over the world with varied incidence. The rapid nature of death in case of hanging makes it one of the popular methods used in suicide. A total of 107 cases of hanging on which autopsy were conducted in the mortuary of Government General Hospital, Gulbarga during the study period from September 2007 to August 2012. The maximum numbers of hanging cases were between age group of 21-30 Years i.e. 34(31.78%) and the male to female ratio being 2.6:1. On postmortem examination asphyxial signs and congestion of organs as an external and internal finding were present in almost all the cases of hanging. The ligature mark was oblique (100%), above the thyroid cartilage (99%) and rope as a ligature material (57%) were the ligature findings in these hanging deaths.

**Keywords:** Hanging, Postmortem Findings, Ligature Findings

## INTRODUCTION

Violent asphyxial deaths are among the most confounding of all entities that commonly confront a Forensic Expert. A major proportion of all unnatural deaths resulting from asphyxia are due to fatal neck compression.

Hanging is that form of asphyxia which is caused by suspension of the body by a ligature, which encircles the neck, constricting force being weight of the body.

Hanging as a method of ending one's life or as a form of execution has its root in antiquity and finds mention in historical records dating back to the Biblical times. Hanging is one of the most preferred methods of committing suicide. In hanging, death is usually painless, rapid and can occur even with partial

suspension due to asphyxia, cardiac inhibition and obstruction of cerebral arterial flow or venous drainage or less commonly in cases of body drop, by spinal cord injury.

In hanging, varied presentation may cause confusion if not properly seen. On the basis of position of the knot, hanging may be typical or atypical and according to the degree of suspension i.e. whether the body is fully suspended or not, hanging may be complete or total and incomplete or partial. Medicolegally alleged death due to hanging must be differentiated from strangulation.

The present study is undertaken to study hanging cases in terms of age and sex distribution and to study the cases of hanging in terms of postmortem findings and ligature findings.

## METHODOLOGY

The study was carried out from September 2007 to August 2012 (A Five year study). The study was conducted for 3 years retrospectively and 2 years prospectively. The study comprises 107 cases of hanging on which autopsy were conducted in the mortuary of Government General Hospital, Gulbarga during the study period. The details about the victim

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of hanging cases regarding age, sex, occupation, manner of death and information about the scene of crime were obtained from the documents received from police officer.

### RESULTS

Total 107 cases of hanging brought to the mortuary for postmortem examination were studied during the period of September 2007 to August 2012.

Out of 107 hanging cases, the maximum numbers of hanging cases were between age group of 21-30 Years i.e. 34(31.78%) (Table 1) and there were 77(71.96%) male and 30(28.04%) female, the male to female ratio being 2.6:1(Table 2).

**Table 1: Age wise distribution**

Age (Years)	Number	Percentage
Below 20	27	25.23
21-30	34	31.78
31-40	28	26.17
41-50	11	10.28
Above 50	7	6.54
Total	107	100

**Table 2: Sex wise distribution**

Sex	Number	Percentage
Male	77	71.96
Female	30	28.04
Total	107	100

**Table 3: Postmortem findings in deaths of study population:**

Postmortem	Number	Percentage
<b>External findings</b>		
Rigor mortis	78	72.90
PM Staining	28	26.17
Blood in natural orifices	10	9.35
Protrusion of tongue	21	19.63
Struggle marks	0	0
Salivary stains	24	22.43
Asphyxial signs	107	100
<b>Internal findings</b>		
Thyroid cartilage fracture	19	17.76
Cricoid cartilage fracture	0	0
Hyoid bone fracture	3	2.80
Congestion of organs	107	100

Table 3 shows on external postmortem findings, asphyxial signs were present in almost all the cases of hanging. Among internal findings, congestion of organs was observed in all cases of hanging but

hyoid bone fractures were observed in 2.8% of hanging cases.

**Table 4: Ligature findings**

Ligature mark	Number	Percentage
<b>Location</b>		
Above thyroid cartilage	106	99.07
At the level of thyroid cartilage	1	0.93
Below thyroid cartilage	0	0
<b>Material</b>		
Dhoti	13	12.15
Saree	14	13.08
Wire	16	14.95
Ropes	61	57.01
Others	3	2.80
<b>Direction</b>		
Oblique	107	100
Transverse	0	0
<b>Extent</b>		
Incomplete	84	78.50
Complete	23	21.50
<b>No of turns</b>		
1	94	87.85
2	11	10.28
More than 2	2	1.87
<b>Colour/ nature</b>		
Pale	13	12.15
Reddish brown	94	87.85
Parchmentisation	66	61.68
<b>Width</b>		
0-2 cms	55	51.40
2.1-4 cms	44	41.12
4.1-6 cms	8	7.48

According to the ligature findings (Table 4) in majority of cases of hanging, the ligature mark was oblique (100%), above the thyroid cartilage (99%), incompletely encircling the neck (79%), single turn (88%), with the width of 0-2 cms (51%) and rope as a ligature material (57%).

### DISCUSSION

It is observed that out of 107 cases of hanging studied, 87(83.18%) cases were aged less than 40 years and 20 (16.82%) were aged above 40 years. This finding is comparable with that of Sengupta <sup>1</sup> and Khoklov <sup>2</sup>. The lowest age recorded was 13 years (female) and highest age was 85 years (male). Individuals aged between 21 to 30 years constituted the largest group 31.78% in this study and similar were the findings of Reddy <sup>3</sup>, Morlid <sup>4</sup>, Sengupta <sup>1</sup> and Luke <sup>5</sup>.

This can be explained by the fact that this particular age group is more vulnerable for various forms of stress like dowry, financial debts, failure in studies, unemployment and marital problems.

In the present study males (71.96%) outnumbered females in total number of deaths due to hanging which is consistent with the Sengupta <sup>1</sup>, Gargi <sup>6</sup> and Momenchand et al <sup>7</sup>.

Protrusion of tongue was seen in 20% of cases. Sarangi <sup>8</sup> mentioned that the tongue was protruded in 8.66% of cases. The probable reason for this phenomenon could be that the constricting force of the ligature causes upward pressure on the neck structure causing elevation of the tongue. Saliva is often found dribbling from the angle of the mouth down the chin. This is supposed to be sure sign of antemortem hanging as secretion of saliva being a vital function, cannot occur after death. Salivary stain was present in 22.4% of hanging cases.

Hyoid bone was fractured in 3 cases (2.8%) of hanging and this similar finding is reported by studies conducted by Reddy <sup>3</sup> 6% of cases and Khoklov <sup>2</sup> 5% of cases. In the present study a larger portion of the victims are young i.e., age below 40 years. It is generally considered that frequency of fracture of hyoid bone increases when it is ossified and hence it becomes liable for fracture. There was higher incidence of thyroid cartilage fracture (17.76%) when compared to hyoid bone. Dixit et al <sup>9</sup> and Polson et al <sup>10</sup> also reported similar findings.

A note on the position of the ligature mark in relation to the thyroid cartilage is made and it is observed that in 106 (99.07%) cases it is situated above the thyroid cartilage and in one case (0.93%) ligature mark is noted over the thyroid cartilage. Sen Gupta <sup>1</sup>, Polson et al <sup>10</sup> and Reddy <sup>3</sup> also reported findings were in most of the cases ligature marks was above the thyroid cartilage. The ligature material preferred was ropes in 57.01% of cases. Luke <sup>5</sup> and Reddy <sup>3</sup> had similar observations regarding the ligature material used. Any substance that is available at the impulse of committing suicide by hanging will be used as a ligature material.

The ligature mark was obliquely situated in all the cases of hanging and in 87.85% of cases the ligature mark turn was single. In the majority of cases the ligature mark was reddish brown (87.85%) and in few cases it was pale or parchmentised. Momenchand <sup>7</sup> in his study also reported obliquely situated ligature

mark and a single turn of ligature mark in majority of his cases with most of the cases having reddish brown colour. Gargi <sup>6</sup> also observed reddish brown colour of the ligature mark in majority of the cases. The colour of the ligature mark depends largely on the duration of suspension of the body and nature of the ligature materials used and also the time elapsed between death and autopsy.

## CONCLUSION

The incidence of highest number hanging cases was found in 21-30 years. Economic problem, unemployment, failure in love, failure in examination, emotional instability were the alleged reasons for committing suicide in this age group. Hanging is one of the preferred method of suicide by males than females.

Asphyxial signs and the congestion of the organs are very important external and internal postmortem findings of hanging deaths respectively and are present in almost all the cases of hanging. Ligature forms a valuable finding in deaths due to hanging and here ropes are the most commonly used ligature material as it is easily available, in most of the cases it is above the thyroid cartilage and directed obliquely giving an idea about the constricting force being the weight of the body.

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# Post Mortem Interpretation of Blood Alcohol Concentration

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## ABSTRACT

A person's blood-alcohol concentration (BAC) and state of inebriation at the time of death is not always easy to establish owing to various postmortem artifacts, individual variations and circumstances. This article analyses how to interpret the given blood alcohol concentration value that is given by the Forensic science laboratory.

*Keywords: Forensic science Lab, Blood Alcohol Concentration, Urine Alcohol Concentration, Vitreous Humour, Potassium or Sodium Fluoride*

## INTRODUCTION

Over-consumption of alcoholic beverages and drunkenness have always played a major role in fatal accidents, trauma deaths, drowning, suicide, and many crimes of violence as evidenced by police reports and accident and emergency department records.

Alcohol tops the list of psychoactive substances encountered in postmortem toxicology and the analysis and interpretation of blood-alcohol concentration (BAC) in autopsy specimens represents a large part of the workload at forensic medicine and toxicology laboratories.

In general, the concentration of ethanol measured in postmortem blood needs to be interpreted in relation to whether the person had consumed alcohol and might have been drunk at the time of death or if the concentration exceeded some threshold limit<sup>(1,2)</sup>. Such conclusions are often contentious and caution is needed owing to various postmortem artifacts.

The diagnosis of alcohol influence has deep-rooted social medical ramifications owing to the existence of punishable BAC limits for driving in most countries, such as 0.20 mg/g in Sweden, 0.50 mg/g or 0.50 mg/mL in most European nations and 0.80 mg/mL (0.08 g% or 80 mg/100 mL) in UK, USA and Canada<sup>(3)</sup> and in India 0.3 mg/100 ml of blood. Accident and insurance claims might be null and void if the person involved in a fatal crash was declared above the legal limit for driving.

The qualitative and quantitative determination of ethanol in postmortem specimens has become a relatively simple analytical procedure and accurate, precise, and specific results are possible<sup>(4,5)</sup>. However, interpreting postmortem BAC results and drawing correct conclusions about antemortem levels and the person's state of inebriation and degree of behavioral impairment at the time of death is fraught with difficulties<sup>(6)</sup>. The condition of the body, the time between death and autopsy, the environmental conditions (temperature and humidity), and the nature of the specimen collected for analysis are important factors to consider. Under some circumstances alcohol might be produced after death by microbial activity and fermentation of glucose, which is a real problem if the corpse has undergone decomposition. Postmortem diffusion of alcohol from the stomach to central blood sampling sites is another complicating factor if a person died shortly after a period of heavy drinking<sup>(7)</sup>.

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### **Sampling of body fluids for determination of ethanol**

Several sets of guidelines have been published for collecting the most appropriate specimens for toxicological analysis<sup>(8-10)</sup>. In the case of ethanol, the blood samples should be taken from a femoral vein and whenever possible additional specimens, such as urine and vitreous humor (VH), should also be obtained and sent for analysis<sup>(8-10)</sup>. Sodium or potassium fluoride can be used as preservative<sup>(11, 12)</sup>.

The containers should be made airtight with tamperproof seals and if possible transported to the laboratory refrigerated (4°C). In forensic casework the chain of- custody of specimens is important to document and this helps to guarantee the integrity of the results in case these are called into question in later court proceedings.

Some forensic practitioners consider that blood from the intact heart chambers is suitable for toxicological analysis of ethanol<sup>(13)</sup> whereas others recommend using a peripheral venous sampling site preferably a femoral vein after visualization and cross-clamping proximally. The worst possible specimen is a blind-stick into the chest or blood scooped from the chest cavity on opening the body<sup>(14, 15)</sup>.

In postmortem toxicology, a BAC less than 10 mg/100 mL (0.1 mg/mL) should be reported as negative. And less than 40 mg/100mL should be regarded as doubtful.

### **Autopsy blood samples: Blood-ethanol in acute alcohol poisoning**

The BAC necessary to cause death is often an open question and much depends on the person's age, drinking experience and degree of tolerance development<sup>(16)</sup>. The speed of drinking plays a role in alcohol toxicity as does the kind of beverage consumed, whether beer (5% v/v) or neat liquor (40% v/v). Many drunk drivers have been apprehended with a blood-ethanol concentration over 400 mg/100 mL and a few have exceeded 500 mg/100 mL.

Drunkenness and hypothermia represent a dangerous combination and deaths tend to occur at a lower BAC when people are exposed to cold, such as, when an alcoholic sleeps outdoors in the winter months. Drinking large amounts of alcohol to produce stupor and unconsciousness combined with positional asphyxia or inhalation of vomit are common causes of death in intoxicated individuals who die of suffocation.

The toxicity of ethanol is often considerably enhanced by the concomitant use of other drugs with their site of action in the brain, especially opiates, propoxyphene, antidepressants and some sedative hypnotics<sup>(17)</sup>.

Two recent studies looked at the frequency distributions of BACs in deaths attributed to acute alcohol poisoning and similar mean and median concentrations were found, namely 360 mg/100 mL (0.36 g%)<sup>(17)</sup>.

It seems reasonable to assume that the BAC at autopsy will almost always be lower than the maximum BAC reached during a drinking binge, owing to metabolism of ethanol taking place up until the moment of death. During the time after discontinuation of drinking until death, the BAC might decrease appreciably depending on the speed of alcohol elimination from blood, which in heavy drinkers could exceed 20 or 30 mg/100 mL per h (0.02 or 0.03 g% per h)<sup>(18)</sup>.

### **Analysis of subdural or epidural hematomas**

Obtaining a blood specimen from a subdural or epidural hematoma is a useful strategy in deaths caused by a blow on the head<sup>(19)</sup>. A victim often survives for several hours after a fall or blunt trauma to the head with circulation remaining intact until the time of death. Owing to the reduced circulation in the damaged region of the brain, alcohol in the blood clot is not metabolized to the same extent as blood circulating through the liver. Accordingly, the blood clot will contain a higher concentration of alcohol compared with a specimen of peripheral venous blood obtained at autopsy.

### **Alcohol in blood and urine obtained at autopsy**

The two fluids most commonly submitted for analysis of ethanol after completing an autopsy are blood and urine and a wealth of information is available about the urine/blood alcohol relationship in living and dead. Urine should be sampled directly from the intact bladder by penetrating the organ with a sterile syringe and needle and transfer to a container with a fluoride preservative present (1–2%) before shipment for analysis of ethanol<sup>(20)</sup>.

Finding a ratio less than or close to unity suggests incomplete absorption of alcohol in all body fluids at time of death, which indicates fairly recent drinking and some of the ingested alcohol probably remains

unabsorbed in the stomach, whereas finding a ratio of 1.25 or more suggests that absorption and distribution of ethanol was complete by the time of death. If the question of recent drinking has legal significance, then a sample of the stomach contents should be obtained and submitted for determination of ethanol.

Urine is a useful specimen for analysis of ethanol because it is mainly water and the risk of microbes or yeasts invading the urinary bladder after death appears to be less compared with the risk of blood specimens being contaminated. Moreover, the urine produced by healthy individuals does not contain any significant amounts of glucose although this is a major limitation if the deceased suffered from diabetes and glycosuria. Glucose is the ubiquitous substrate for postmortem synthesis of ethanol in both blood and urine. Finding an elevated UAC in a specimen from a diabetic and a negative concentration in blood usually means that ethanol was produced in the urine after death, e.g. by yeast fermentation of glucose. The determination of glucose in VH, if available, is helpful to support the notion of concomitant glycosuria. Whether or not a person suffered from diabetes (Types I or II) is therefore important to know about when the postmortem alcohol concentrations are interpreted. There is also a possibility that alcohol was produced in blood and urine before the autopsy was performed so adding fluoride to the specimen sent for analysis does not exclude that ethanol was produced prior to the postmortem examination. A long time period between end of drinking and time of death might be associated with a zero BAC owing to on-going hepatic metabolism but a high UAC is found. The total volume of urine in the bladder also provides useful information and larger volumes tend to be associated with higher UAC/BAC ratios. Metabolism of ethanol does not occur in the urinary bladder and diffusion back into the blood is seemingly a slow and insignificant process<sup>(21)</sup>.

### **Analysis of vitreous humor**

Vitreous means glassy and humor means fluid so the watery fluid from within the eye is a useful specimen for postmortem ethanol determination. VH is useful not only for analysis of alcohol, but also for other drugs as well as endogenous biochemical constituents of the body. For example, the concentrations of lactate and glucose in VH have been utilized as an indicator of antemortem hyperglycemia. The main advantage of VH over blood, besides its watery nature, is that anatomically it is

remote from the gut and therefore less prone to contamination by spread of bacteria. This is important if the corpse has undergone decomposition or has been subjected to severe trauma<sup>(22)</sup>

### **Microbial contamination and decomposition**

Low concentrations of ethanol (<30 mg/100 mL) are more likely to be formed postmortem than high concentrations. Extensive trauma to a body likewise increases the potential for spread of bacteria and heightens the risk of ethanol production after death.

Blood-ethanol concentrations as high as 190 mg/100 mL have been reported in postmortem blood after particularly traumatic events such as explosions and when no evidence existed to support ingestion of ethanol before the disaster<sup>(23)</sup>.

### **Biochemical markers of postmortem synthesis**

In forensic and legal medical practice the need to distinguish between antemortem ingestion and postmortem synthesis of ethanol still persists.

To help resolve this problem, investigators have tried to develop a practical and useful biochemical indicator and in this connection, various non-oxidative metabolites of ethanol have been used. Much attention has been given to ethyl glucuronide (EtG), a minor metabolite of ethanol, because if measurable amounts are present in body fluids this means that ethanol must have undergone metabolism during life<sup>(24)</sup>.

### **Metabolites of serotonin**

The urinary metabolites of serotonin, namely 5-hydroxytryptophol (5HTOL) and 5-hydroxyindoleacetic acid (5HIAA) have also been used to resolve whether a positive BAC stems from antemortem ingestion of ethanol or postmortem synthesis. Finding an elevated urinary ratio of 5HTOL/5HIAA (>15) indicates that ethanol has undergone metabolism, which points to antemortem ingestion.

### **Low molecular weight volatiles**

During the microbial synthesis of ethanol from various endogenous substrates, other low-molecular volatiles are generated in blood and tissues and these include higher aliphatic alcohols (isoamyl alcohol, n-propanol, isopropanol, nbutanol), acetaldehyde, propionic acid as well as other organic acids. Of these n-butanol and isobutyric acid are considered reliable

indicators of putrefaction and if present in blood mean that the concentration of ethanol is also suspect.

### **Immersion deaths and drowning**

Bodies recovered from water and drowning deaths present a special problem for the forensic pathologist when manner of death is ascertained – whether accident, suicide or murder. The significance and interpretation of any elevated BAC also presents difficulties in interpretation. Both losses and increases in the concentration of ethanol in body fluids can occur when a body has been submerged in water for an extended period. Decreases in the concentration of ethanol are likely owing to dilution of body fluids with water as time passes before recovery. Environmental factors particularly the temperature of the water during summer months, the degree of trauma to the body and whether putrefaction processes were advanced should be considered when postmortem concentrations of ethanol are interpreted <sup>(25)</sup>.

### **Ketoacidosis as cause of death in alcoholics**

Many people die alone at home and the postmortem examination and toxicological report for presence of drugs and poisons show no obvious cause of death. The autopsy findings are usually unremarkable apart from fatty liver and the blood ethanol concentration is low or zero.

Evidence sometimes surfaces that many of these individuals were known to be

A growing number of studies have implicated ketoacidosis as a likely cause of death, which is supported by analysis of high levels of ketone bodies in body fluids, namely acetone, acetoacetate and particularly b-hydroxybutyrate <sup>(26)</sup>

Alcoholics on drinking binge neglect to eat properly, which leads to depletion of glycogen stores in liver and muscle tissue. The altered redox state in the hepatocyte also means that gluconeogenesis is diminished or stopped completely. This triggers lipolysis and conversion of triglycerides into free fatty acids, which in turn are metabolized in the liver into ketone bodies. Taken together these conditions can precipitate a dangerous state of ketoacidosis and also alcohol-induced hypoglycemia, which might be augmented by vomiting during a period of alcohol withdrawal.

### **CONCLUSION**

Accurate and precise estimation of alcohol is possible, but its interpretation is difficult and needs careful analysis. Blood samples should be from the femoral vein or chambers of the heart; for urine the bladder is to be punctured using sterile syringe. Blood and urine alcohol values indicate the absorption status of the alcohol. Vitreous humour analysis is helpful for postmortem synthesis of alcohol. Metabolites of alcohol indicates antemortem ingestion; alcohol values less than 10 mg/100ml is to be considered negative and less than 40/100ml to be considered doubtful. Sudden death is possible due to ketoacidosis where there is need for demonstration of ketone bodies. Sudden death due to alcohol toxicity can be possible if BAC is >360-400mg/100 ml.

Sodium fluoride or potassium fluoride is to be used as preservative which prevents the postmortem synthesis of alcohol in the blood. Post mortem synthesis of alcohol is not possible in urine, vitreous humour. Alcohol level can be seen diluted or increased in decomposed drowning dead bodies.

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# Unusual Presentation of Snake Bite- a Case Report

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## ABSTRACT

Snake bite is a commonest condition in tropical countries like India, Pakistan and Bangladesh, we have reported 4 cases of Neurotoxic snake Krait bite with an unusual presentations at our Rural Medical college Hospital, all the four cases are admitted in the intensive care unit under department of paediatrics, the most common and early presentation in all the 4 cases are Pain Abdomen, vomiting and autonomic disturbance followed by altered sensorium and developed neurotoxic Manifestations, In all the four cases the time of snake bite was mid night and early hours of the night, all the cases were treated with Polyvalent Anti snake venom with Artificial ventilation support.

**Keywords:** Krait Bite, Abdominal Pain, Autonomic Disturbance, Children

## INTRODUCTION

Snake bite is a major cause of morbidity and mortality in developing countries due to non -availability of treatment in the first golden hour. According to the American society of Tropical Medicine and Hygiene<sup>6</sup> in India 46,000 people are dying from snake bite in every year against the official figure of 15000, many of the deaths are under report in our country, more than 2.5 lakh cases of snake bite are reporting every year, in majority cases death occurring before reaching to the hospital due to poor transport and lack of health care facilities in the rural areas.

Our institution is located in a rural area 40 km away from the city outskirts in surrounding of several villages, many of the surrounding village people are doing agriculture and farming work are vulnerable to snake bite during the farming season. We report several cases of snake bite every year in which majority of the snakes are neurotoxic snakes like Cobra and Krait.

The common Krait<sup>1,2,3</sup> (*Bangarus caeruleus*) is a steel blue colour 3 to 4 feet in length, nocturnally active terrestrial snake come under elapidae group. The most distinctive features are a chain of hexagonal large scales throughout the mid dorsal aspect of the body and the fourth infra labial scale is large. Krait is a neurotoxic snake commonly present in India, Pakistan,

Bangladesh and srilanka. Krait lives very close to the human habitation. Highly venomous snake, fatal dose 6mg (1-3) of dried venom, fatal period half an hour to 6 hours<sup>2</sup>. The venom contain bangarotoxin a neurotoxic phospholipase-2, it is a neuromuscular depolarising blocking agent which produce curare like effect and paralysis especially respiratory centre<sup>2</sup>. Cholinesterase is rich in venom, it causes hydrolysis of acetyl choline to choline and acetic acid leading to impairment of neuromuscular transmission, death occurs due to respiratory failure<sup>2</sup>.

Krait bite produces various clinical manifestations<sup>4,5</sup> which include Headache, vomiting, myalgia, vertigo, blurred vision, hyper salivation, ptosis, ophthalmoplegia, paraesthesia, hypertension, tachycardia, tachypnoea, neuromuscular paralysis, hypokalaemia and renal failure. Facial muscles palate, jaws, tongue, vocal cords, neck muscles and muscles of deglutition becomes progressively flaccidly paralysed, many patients find it difficult to open their mouth and speak. Loss of consciousness and convulsions are terminal phenomena resulting from hypoxemia. We found Abdominal pain is an important finding consistently seen in paediatric age group, most of the children of krait bite presented abdominal pain and vomiting as an early finding followed by neuromuscular paralysis.

Majority of the cases of snake bite presented at casualty emergency with neurological manifestations,

altered sensorium and sometimes unconsciousness without proper history of snake bite, because most of the bites occur in the midnight when the patients were asleep and 20 % of the cases the site of the bite is undetectable, in emergencies the high degree of suspicion is required to reach at diagnosis.

## MATERIAL AND METHOD

A longitudinal observation study conducted at Mediciti institute of medical sciences, Dept of Paediatrics. Four cases of Neurotoxic snake bite (Krait) are admitted in the dept of paediatrics, all the cases are meticulously observed of their clinical manifestations and daily progress, information from the case sheet also collected and prepared case reports for this study,

## CASE REPORTS

### Case-1

A fourteen years old female child was brought to our hospital emergency casualty department with history of alleged snake bite, child complaints inability to speak, tightness in the throat, generalised weakness and severe abdominal pain. On examination two fang marks (snake bite) present over the dorsal aspect of the left hand, saliva drooling from the angle of the mouth, weakness present in all the limbs, ptosis present, child unable to open the eyes, semi-conscious drowsy, inability to speak, no history of bleeding, plantars absent on both the sides, deep tendon reflexes are not elicitable, blood pressure 140/80 mm of Hg, heart rate 140/mnt, respiratory rate 40/mnt. spO<sub>2</sub> 90%, on auscultation crepitation's present bilaterally on lower lobes of lungs, breathlessness present, child was admitted in intensive care unit and investigations were done, serum electrolytes are normal, renal parameters are normal, CT and BT normal, CBP shows leucocytosis, platelets normal, PT 16.6, APTT 42.6, child was given injection Tetanus toxoid, Polyvalent Anti snake venom a total of 15 Vials and ventilator support given, child recovered well without any neurological deficit and discharged on fourteenth day.

### Case-2

A 10 year old female child was brought to the emergency casualty department of the hospital with alleged history of snake bite occur in the mid night at her house, she had complaints of vomiting, pain abdomen, difficulty in swallowing, and generalised weakness. On examination there is a fang mark (snake

bite) present over the left palm dorsal aspect, child was drowsy, inability to speak, dysphagia, ptosis and weakness in all the limbs. Child has dyspnoea on auscultation bilateral crepitations present on both lower lobes of the lungs, spO<sub>2</sub> 80%, investigation were done leucocytosis present, electrolytes are normal, renal parameters are normal, Bleeding time and clotting were normal, child was admitted in intensive care unit and treated with polyvalent anti snake venom a total of 10 vials and ventilator support, child recovered well and discharged from hospital on eleventh day.

### Case-3

A 12 years male child with a history of snake bite was brought to the casualty, child had snake bite in the night, he had severe pain and swelling in the right leg bitten area, abdominal pain, weakness in the limbs, and breathlessness. On examination child had hypertension, tachycardia, tachypnoea, bilateral crepitations present in both lower lobes of the lungs, child was admitted in intensive care unit, polyvalent anti snake venom of 10 vials was given, on second day fasciotom and wound debridement was done and the child was discharged after complete recovery on fifteenth day.

### Case-4

A male child of 12 years age was brought to the casualty with a history of snake bite, bitten on left hand middle finger, on admission child was irritable, semi conscious, severe weakness in all the limbs, breathlessness present, crepitations present on both lungs lower lobes, Hypertension, tachypnoea and tachycardia present, child had pain abdomen, heart rate 115/mnt, respiratory rate 30/mnt, spO<sub>2</sub> 90%, intense pain and swelling present over the site of the bite, Fang mark (snake bite) present on dorsum of the middle finger, investigations are normal except leukocytosis, child was admitted in intensive care ward and polyvalent anti snake venom of 10 vials was given along with ventilator support the child was recovered well and discharged from the hospital on 10th day.

## DISCUSSION

Neuro paralytic Snake bite cases are common in worldwide, more number of cases are reporting from tropical countries, according to WHO recent statistics<sup>10</sup> shows 4,21,000 cases of snake bite occurring worldwide in every year and 20,000 deaths are reporting, I still feel this is under figure, the actual

number of cases are much more higher. We report 4 cases of krait bite in a paediatric age group, the incident of bite occur in all the cases are at midnight, krait nocturnally active snake enter in to the house in search of its pray and the people who are sleeping on the floor may be the victims of its bite, the cases are diagnosed on clinical basis and examination of snake in one case.

We noticed common clinical findings in all the 4 cases are Pain abdomen and vomiting which are early clinical manifestations, autonomic disturbance like Hypertension, tachycardia and excessive salivation are seen in all the four cases, children develop neuromuscular paralysis few hours after abdominal pain, difficulty in speech, dyspagia and breathlessness observed in 3 case, muscular weakness and ophthalmoplegia noticed in all the cases. Investigations are normal except leucocytosis and increased prothrombin time in all 4 cases, similar kind of picture also observed in others study.<sup>7,8,9</sup>

Diagnosis of snakebite is sometimes simple (the snake keepers bitten by their pet), but often difficult and occasionally obscure. This is especially true for children, who may present with sudden unexplained collapse and convulsions following snakebite, with neither a history of a snake bite, nor visible bite marks. Think of snakebite in the differential diagnosis of patients presenting with unexplained collapse, convulsions, progressive flaccid paralysis and renal damage. In case of krait bite abdominal pain followed by progressive neuromuscular paralysis.

Cholinesterase enzyme estimation is use full in detecting neuro toxic snake bites, elapid snake venom rich in cholinesterase enzyme. The ELISA-based rapid test, Snake Venom Detection Kit (SVDK) is available in Australia,<sup>11</sup> it can be used for clinically significant snakebite cases with a swab of the bite site to identify which antivenom is appropriate.

### CONCLUSION

Elapid snake bite is a common emergency situation in our country, most of the time they present to the emergency department with a history of unknown bite. Abdominal pain and vomiting are important early clinical findings observed in krait bite in paediatric age group, high degree of suspicion is required to reach at diagnosis, these children suddenly develop

neuromuscular paralysis and death can occur, mortality is very high in krait bite cases, early diagnosis by clinical suspicion and administration of Anti snake venom is helpful to reduce the mortality.

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**Conflict of Interest:** Nil.

**Source of Funding:** Self,

**Ethical Clearance:** No ethical issues in this study, the identity of the case not revealed, permission from hospital authority taken, a copy of permission letter is enclosed.

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# Epidemiological Study of Unnatural Deaths in District Hospital, West India: a Retrospective Study

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## ABSTRACT

The incidence of unnatural deaths is a reflection of prevailing social setup & mental health status of the population. Medico-legal post-mortem examination is the most important tool for analysing unnatural deaths. The main aim of the present study was to determine the causes and epidemiological aspects of unnatural death. This retrospective 5-year study was carried at Forensic Medicine Department at Gujarat Adani Institute of Medical Sciences, Bhuj. All the cases of unnatural deaths brought to post-mortem centre at G.K. General Hospital, Bhuj during 1st January 2008 to 31st December 2012 were studied. Trauma was the most common cause of death (n=598; 35.51%) followed by burn injuries (n=539; 32.62%), poisoning (n= 201; 12%) and violent asphyxia deaths (n=193; 11.46%).

*Keywords:* Epidemiology, Unnatural deaths

## INTRODUCTION

Unnatural deaths are those deaths resulting from an external cause i.e. injury or poisoning which may be intentional (homicide or suicide) or unintentional (accident). Unnatural deaths known to claim substantial number of lives & the number is increasing owing to several factors. The biggest share among unnatural deaths belongs to road traffic accidents followed by thermal injuries, poisoning & violent asphyxial deaths. The incidence of unnatural deaths is a reflection of prevailing social setup & mental health status of the population. Autopsy is a scientific examination of the dead body sent by investigating authority. Medico-legal post-mortem examination is the most important tool for analysing unnatural deaths as in the most of the cases the unnatural deaths, dead body is sent for post-mortem examination.

The main aim of the present study was to determine the causes and epidemiological aspects of unnatural death.

## MATERIAL AND METHOD

This retrospective 5-year study was carried at Forensic Medicine Department at Gujarat Adani Institute of Medical Sciences, Bhuj. All the cases of unnatural deaths brought to post-mortem centre at G.K. General Hospital, Bhuj during 1<sup>st</sup> January 2008 to 31<sup>st</sup> December 2012 were studied. Medico-legal reports were studied for information about age, sex and cause of death. The data was collected by preparing structured proforma & was analysed as per age, sex and cause of death. The causes of deaths were divided into four groups namely, mechanical trauma, burns, poisoning and violent asphyxia deaths.

## OBSERVATIONS

Total 1866 medico-legal post-mortem examinations conducted during above mentioned period. Out of these, 1684 (90.25%) were due to unnatural causes while remaining 180 (9.75%) were due to natural causes.

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**Table No. 1: Year wise distribution natural & unnatural deaths:**

Year	Unnatural deaths	Percentage	Natural deaths	Percentage	Total
2008	338	95.48%	16	4.52%	354
2009	357	92.49%	29	7.51%	386
2010	326	88.11%	44	11.89%	370
2011	343	88.40%	45	11.60%	388
2012	320	86.96%	48	13.04%	368
Total	1684	90.25%	180	9.75%	1866

As per tables & charts no. 2 to 4, it is clearly revealed that the trauma was the most common cause of death (n=598; 35.51%) followed by burn injuries (n=539; 32.62%), poisoning (n= 201; 12%) and violent asphyxia deaths (n=193; 11.46%). Little more than half of the unnatural deaths were those of males (n=896; 53.21%) and remaining were those of females (n=788; 46.79%). Most of the cases of unnatural deaths were from age group 21-30 years (n= 579; 34.38%) followed by age group 31-40 years (n=326; 19.36%).

Considering deaths due to trauma, these were common among males (n=449; 75.08%) than females (n=149; 24.92%). The most vulnerable age group for trauma was 21-30 years (n=143; 23.91%) closely

followed by age group 31-40 years (n=141; 23.58%). In case of burn injuries, overwhelmingly predominant gender was female (n= 432; 80.15%) than male (n= 107; 19.85%). The most common age group for burn injuries was 21-30 years (n= 241; 44.71%) followed by age group 31-40 years (n=112; 20.78%). The death due to poisoning was common among males (n= 135; 66.83%) than females (n=67; 33.17%). The deaths due to poisoning were common among age group 21-30 years (n=64; 31.68%). The violent asphyxia deaths such as drowning, hanging etc. were common among males (n=128; 66.32%) than females (n=65; 33.68%). The most common age group for violent asphyxia deaths was 21-30 years (n=72; 37.31%).

**Table No. 2. Year wise & Cause wise distribution of unnatural deaths (n=1684)**

Year	Trauma	Burn Injuries	Poisoning	Violent Asphyxial Deaths	Others
2008	109	123	35	32	39
2009	106	123	37	37	34
2010	107	114	33	48	24
2011	134	93	46	39	31
2012	142	86	31	37	24
Total (%)	598 (35.51%)	539 (32.01%)	201 (12%)	193 (11.46%)	152 (9.03%)

**Table No. 3: Sex & Cause wise distribution of Unnatural deaths**

Cause of Death	Male		Female		Total
	Number	Percentage	Number	Percentage	
Trauma	449	75.08%	149	24.92%	598
Burn Injuries	107	19.85%	432	80.15%	539
Poisoning	135	66.83%	67	33.17%	201
Violent Asphyxial Deaths	128	66.83%	65	33.68%	193
Others	77	50.66%	75	49.34%	152
Total	896	53.21%	788	46.79%	1684

**Table No. 4: Age & Cause wise distribution of unnatural deaths**

Age Group	Trauma	Burns	Poisoning	Violent Asphyxial Death	Others	Total (Out of 1684)
0-10	34 (5.6%)	3 (0.56%)	3 (1.49%)	6 (3.11%)	35 (23.03%)	81 (4.81%)
11-20	60 (10.03%)	75 (13.91%)	61 (30.2%)	40 (20.73%)	30 (19.74%)	266 (15.80%)
21-30	143 (23.91%)	241 (44.71%)	64 (31.68%)	72 (37.31%)	59 (38.82%)	579 (34.38%)
31-40	141 (23.58%)	112 (20.78%)	24 (11.88%)	33 (17.1%)	16 (10.53%)	326 (19.36%)
41-50	127 (21.24%)	43 (7.98%)	32 (15.84)	21 (10.88%)	7 (4.61%)	230 (13.66%)
51-60	50 (8.36%)	35 (6.49%)	11 (5.45%)	11 (5.70%)	3 (1.97%)	110 (6.53%)
>60	43 (7.19%)	30 (5.57%)	7 (3.47%)	10 (5.18%)	2 (1.32%)	92 (5.46%)

## DISCUSSION AND CONCLUSION

The observations in the present study were compared with similar studies by other authors. The present study reveals that mechanical trauma was the most common cause of unnatural death (n=598; 35.51%) followed by burn injuries (n=539; 32.62%). This finding is comparable with that of Bansude M E<sup>1</sup> et al and Singh B et al<sup>2</sup>. But Sharma BR<sup>3</sup> et al in their study observed that second common cause of death is poisoning. This difference can be explained by agrarian economy in their study area i.e. Northern India. The cases of death due to trauma are common among males (n=449; 75.08%). This finding is comparable with studies by Govekar G et al<sup>4</sup> and Panda S et al<sup>5</sup> where deaths due to trauma were significantly higher in males. In present study, females (80.15%) were more common victims of burns than males (19.85%). Similar findings were noted by Vaghela P et al<sup>6</sup>, Chawala R et al<sup>7</sup> and Ganguly<sup>8</sup>. In this study most of the cases of burn injuries were in the age group 21-30 years (44.71%). The study by Chawala R et al<sup>7</sup> noted that 52% of the burn cases belonged to this age group. This can be explained by 'Dowry deaths' or 'Bride burning' which is a form of domestic violence prevalent in India. RC Zariwala et al<sup>9</sup> observed higher incidence of poisoning in males and age group of 20-29 years. Similar incidence was found in present study with males (n=135; 66.83%) and age group 21-30 years (n=64; 31.68%) dominating the findings. The violent asphyxia deaths were common among males (n= 128; 66.83%) and in the age group 21-30 years (n=72; 37.31%). This finding is similar with the studies by Patel A P et al<sup>10</sup> & Chaurasia N et al<sup>11</sup>.

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**Conflict of Interest:** None declared

**Ethical Clearance:** Ethical clearance was not necessary as it was a retrospective study which included only collection of data.

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# Sexual Assault in Benin City, Nigeria, a Silent Epidemic

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## ABSTRACT

This study is a 6-year retrospective review of sexual assault cases seen at central Hospital, Benin City, Nigeria. There were 907 cases involving 903 males and 4 female accounting for 99.6% and 0.4 % respectively. An annual rising incidence was demonstrated with 24.4% occurring in 2013. Children and adolescents accounted for an overwhelming majority of cases with 79.1% occurring in this age group. In 77.6% of cases, only one assailant committed the crime and the victim is familiar with the assailant in most of the cases.

**Keywords:** Sexual Assault, Rape, Epidemic

## INTRODUCTION

There is no universal definition of what constitutes sexual violence as it varies across countries, religion and cultures. According to World Health Organization(WHO), sexual violence includes “any sexual act, attempt to obtain a sexual act, unwanted sexual comments or advances, or acts to traffic women’s sexuality, using coercion, threats of harm or physical force, by any person regardless of relationship to the survivor, in any setting, including but not limited to home and work”. This definition also includes forced sex, sexual coercion and rape of adult and adolescent men and women, child sexual abuse and abusive sexual contacts.<sup>1</sup> In Nigerian legal context, the major sexual offences include rape, defilement and homosexuality.<sup>2,3</sup>

Sexual violence in its various forms is endemic globally. The true incidence is unknown partly because of significant variation in research methodologies used.<sup>4</sup> Reports from international studies however, show that 20% of women experienced sexual abuse during childhood.<sup>5</sup> About one in four women has been estimated to experience sexual violence by an intimate

partner in her life time. Incarcerated men widely report rape by fellow inmates, prison officials, and police in many countries.<sup>4</sup>

Sexual assault is largely an underreported crime. A study in South Africa shows that 8 out of every 9 cases is unreported.<sup>6</sup> The stigma of compromising chances of marriage, and of being considered promiscuous and responsible for the incidence, the risk of losing the respect of the society, the negative effect of publicity, the ordeal and embarrassment caused by court appearance and cross-examination, the fear of reprisal attacks, the age of the victim and the relationship of the victim with the perpetrator, among other factors, have been attributed to this ice-berg phenomenon.<sup>7,8,9</sup>

Sexual violence is usually perpetrated against women and less often against men.<sup>4</sup> These perpetrators range from close relatives, neighbours, friends, schoolmates, teachers, caregivers, husband, guardian to strangers.<sup>10</sup> Reports has also shown that women are more likely to be raped by men familiar to them than by men they don’t know.<sup>4,10</sup>

The impact of sexual violence resonates in all areas of health and social programming with devastating immediate and long-term physical and mental health consequences. The survivors are more likely to experience genital tract infection, unintended pregnancy and a higher incidence of unsafe abortion. Accidental death, homicide death, psychological

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trauma, psychiatric disorders, parasuicide and suicide have been commonly reported in association with sexual assault.<sup>4,11</sup>

Though sexual violence is a well recognized problem, it is a subject of very little research. The present study is undertaken to study the prevalence and pattern of sexual assault in one of the ancient cities in Nigeria (Benin City), and to compare the findings with reports in other parts of the globe.

**MATERIALS AND METHOD**

Benin City is the largest city in Edo State, located in the South-South region of Nigeria with a population of about 2,406,697 people.<sup>12</sup> It is a vibrant cosmopolitan city and home for people from different part of Nigeria.

All crimes (including sexual assault) reported to the Police and requiring medical reports are usually referred to Central Hospital, Benin City.

The study is a descriptive retrospective audit based on the review of available case notes of sexual assault victims seen at Central Hospital, Benin City between January 2008 and December 2013. Information extracted for the study included nature of sexual assault, age and sex of victim, relationship between victim and alleged perpetrator, date of assault and time

interval between assault and clinical consultation. These information were subsequently analyzed using SPSS (version 16), and presented in tables and figures.

**RESULTS**

During the 6 years under review, 8927cases of assault were seen out of which 907 cases (10.2%) were sexual assault, involving 903 females and 4 males and accounting for 99.6% and 0.4% of the cases respectively. An average of 13 cases were seen monthly, during the study period. The details of the age distribution of cases on annual basis is shown in Table 1. There was a steady rise in incidence with 24.4% of cases(n=244) being recorded in 2013. Most of the cases (88.6%) occurred in children and adolescents with children (≤ 15 years) accounting for 64.2%.

The gender distribution of the victims is shown in table 2, with females accounting for 99.6% of cases.

Table 3 shows the number of assailants in each case of sexual assault. In 85.3% of cases, only one assailant was involved, while gang raping was seen in the rest of the cases.

The time interval between the sexual assault and clinical consultation is shown in table 4 while table 5 shows the class of assailants in each case.

**Table 1: Age and annual distribution of sexual assault**

Age(yrs)	2008(%)	2009(%)	2010(%)	2011(%)	2012(%)	2013(%)	Total (%)
0-5	15(1.7)	14(1.5)	10(1.1)	16(1.8)	11(1.2)	37(4.1)	103(11.4)
6-10	30(3.3)	27(3.0)	32(3.5)	26(2.9)	36(4.0)	52(5.7)	203(22.4)
11-15	30(3.3)	34(3.8)	49(5.4)	36(4.0)	51(5.6)	76(8.4)	276(30.4)
16-20	13(1.4)	27(3.0)	34(3.8)	41(4.5)	38(3.8)	53(5.8)	206(22.7)
21-25	5(0.6)	13(1.4)	3(0.3)	12(1.3)	15(1.7)	15(1.7)	63(7.0)
26-30	1(0.1)	5(0.6)	2(0.2)	7(0.7)	5(0.5)	8(0.8)	28(28.1)
31-35	2(0.2)	1(0.1)	2(0.2)	2(0.2)	4(0.4)	-	11(1.2)
36-40	1(0.1)	-	3(0.3)	1(0.1)	2(0.2)	-	7(0.8)
41-45	1(0.1)	-	1(0.1)	1(0.1)	-	1(0.1)	4(0.4)
46-50	1(0.1)	-	1(0.1)	-	1(0.1)	-	3(0.3)
51-55	-	-	-	1(0.1)	-	-	1(0.1)
61-65	-	-	-	-	-	1(0.1)	1(0.1)
71-75	-	-	-	-	-	1(0.1)	1(0.1)
Total	99(10.9)	121(13.3)	137(15.1)	143(15.8)	163(18.0)	244(26.9)	100%

**Table 2: Gender distribution of sexual assault victims**

Year	Female	Male
2008	97	2
2009	120	1
2010	137	
2011	143	
2012	163	
2013	243	1
Total	993(99.6%)	4(0.4)

**Table 3: Number of assailants per case of sexual assault**

NO	2008	2009	2010	2011	2012	2013	TOTAL(%)
1	83	100	113	119	143	216	774(85.3)
2	10	12	9	11	13	15	70(7.7%)
3	3	3	8	8	4	5	31(3.4)
4	2	2	1	2	2	3	12(1.3)
5	1	1	6	1	0	3	12(1.3)
≥6	0	3	0	2	1	2	8(0.2)

**Table 4: Time interval between assault and clinical consultation**

TIME(Days)	Frequency(N=752) %
1	40%
2-4	9%
5-7	5%
8-14	10%
≥ 15	36
Total	100

**Table 5: Class of assailants**

Class	No of Cases	Frequency(%)
Relations	12	1.7
Neighbours	243	34.4
Acquaintances	219	31.0
Authority figure	24	3.4
Stranger	209	29.6

## DISCUSSION

This study shows that sexual abuse is a common occurrence in our environment and has assumed an epidemic proportion with as much as 13 cases occurring monthly. The alarming rising incidence is attested to by the more than twofold increase in the number of cases seen in the year 2013 when compared to the number of cases seen in 2008 when the study was commenced. A similar study in South Africa spanning the 6 year period of 2001 and 2006 also reported a yearly rising incidence with up to tenfold increase by 2006.<sup>13</sup>

Sexual assault accounted for 10.2% physical assaults, which is higher than the 7.7% and 8.3% reported by Amakiri et al<sup>14</sup> and Akhiwu et al.,<sup>15</sup> in Nigeria respectively. While the differences may be related to difference in study design and inclusion criteria, the higher incidence in this series which is more recent corroborates the fact that sexual assault incidence is on the rise in Nigeria.

This study showed that children and adolescents (≤ 20 years) accounted for 86.5% of the cases. This is

comparable to an earlier study in Southwestern Nigeria where 75% of the cases were reported in children and young adults, that are less than 18 years of age.<sup>16</sup> Our finding is however lower than report from Police Medical Centre, in Benin City where 84.7% of the cases were seen in children and adolescents.<sup>15</sup> Studies in other parts of the globe has also shown that children are most vulnerable to sexual assaults.<sup>4</sup> The power imbalance between the perpetrators and this age group, makes them safer and more secured to commit this offence, thus making children and adolescents the most vulnerable age group. Their inexperience in matters of sexuality may also account for their vulnerability.

Our study showed that sexual assault is perpetuated predominantly against the female gender. Only 4 cases involved males, accounting for only 0.4% of the victims. Nigeria is generally a traditional and religious society and naturally heterosexual. However evidence also suggests that males may be even less likely than females to report sexual assaults to authorities due to shame, guilt, fear of not being believed or of being denounced.<sup>4</sup>

It is evident from this study that gang raping accounted for 22.4% of the cases. Though local statistics are lacking, in USA, 25% of rape cases are gang rapes, while in South Africa, it has been found that 44% of rapists has been involved in gang rape.<sup>17,18</sup> This violent act may be related to increasing rate of gangsterism, armed robbery, cultism, and unemployment in the country.

It is a general observation that sexual assault victims know most of their assailants.<sup>4</sup> Our findings concur with this earlier established fact. These perpetrators include blood relations, pastors, landlords, school teachers, neighbors, friends and friends of family members, and the existing relationship between the perpetrators and the victim may undermine reporting of these crimes.

Our report shows that 46% of the victims presented a week after the crime was committed. This is of medicolegal significance as corroborative evidence on the body and cloth of the victim, required to establish evidence of rape may not be available after 24-48 hours of the incidence<sup>19</sup> thus reducing the victim's chances of securing justice. Also the effectiveness of post HIV exposure prophylaxis, and post-coital contraceptive is time-bound and therefore, late presentation at the hospital may have serious health consequences.

Report from Benin City, Nigeria,<sup>15</sup> has shown that only about 7% of cases presenting in hospital go to court, possibly because of stigmatization and the cost of mobilizing police to make arrests and charge the cases to court. Moreover, these victims are often denied justice when these cases go to court.<sup>14</sup> Only few cases that are charged to court are convicted.<sup>ref</sup> It is therefore obvious that very little is being done to minimize or prevent the crime

In conclusion, this study has shown that sexual assault is not only very common in our environment, but the incidence is on increase. Therefore, if the society must win the battle against sexual assault, all hands must be on deck towards this herculean task. The government should overhaul the legal system and a special unit in Nigerian Police be established and empowered to handle sexual assault cases with passion. Public campaign and advocacy programmes must be instituted towards this evil and more importantly, the hospitals should be well equipped to care for the medical and forensic needs of these victims.

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**Ethical Clearance:** Permission to conduct this study was granted by Ethical Clearance Committee of Edo State Ministry of health before the study was commenced.

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# Present Day Health Care System - Public V/s Private Sector

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## ABSTRACT

This report is based on a survey conducted in a city in the State of Punjab, under which one hundred families were selected by randomized selection. These families were then enquired about their opinions on the prevalent conditions in the Government and Private Health setups, their preferences between the two and the reasons for the same. The data collected was organized to depict the prevalent trends. The results of the study indicate that a larger share of people prefer to visit a private care setting for their health needs. The major reasons being lesser time spent in getting a check up in a private clinic, a better attitude of the doctors, better care by the nursing staff, lesser frustration and more known doctors in the private health sector. The factors favoring the Government health setups according to the people, are better doctors in Government hospitals, presence of more facilities compared to private clinics, and lastly but importantly, they are more economical than the private hospitals. These findings have been further elaborated in the report along with some other minor factors influencing the people's choices. The variables that could affect the decision making in this context, like economic well being and education level of the people have also been taken into account.

**Keywords:** Healthcare, Government Sector, Private Sector, Health Setup, Health System, Hospitals

## INTRODUCTION

Health systems and policies everywhere are different, but all around, can be divided into two broad categories - The Public and The Private Sectors.

The private sector as defined by the oxford dictionary is the part of the national economy that is not under direct state control v/s the public sector, which is part of the economy controlled by the state. Either of these have varied dominance in the health system. This dominance is influenced by numerous factors, a few of them being national policies, the services offered by each, and the mindset of the people. The causes of health inequalities lie in the social, economic and political mechanisms that lead to social

stratification according to income, education, occupation, gender and race or ethnicity<sup>(1)</sup> Lack of adequate progress on these underlying social determinants of health has been acknowledged as a glaring failure of public health.<sup>(2)</sup>

This study was undertaken to compare the popularity of either sector amongst the people nowadays, and to find out the reasons behind their approach.

## SAMPLE AND METHOD

The population of interest for this study consists of 100 people, all adults, residing in the city of Patiala during the year 2014. Of these, 66 percent had an education  $\geq 10^{\text{th}}$  grade, 31 percent had an annual income of  $> \text{Rs. } 5 \text{ lakh per annum}$ .

A questionnaire was prepared, and the population was divided based on the colonies of the city, and the colonies were randomly selected. Within the colonies, areas were randomly selected for visiting. The

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questions for the survey were asked from the residents of houses in that area. The purpose of the study was explained to the participants and they had the freedom to decline participation in the study. Everyone, however, willingly agreed to participate. They were asked questions- comprising both leading and open ended questions. The data collected was then classified into categories based on the variables that affect the decision making of the people in choosing a health system, and the major reasons for their choices. These variables include their annual income and the level of

education received. The major reasons for their choices included better doctors, known doctors, difference in time consumed, care offered by the doctors as well as the nurses, provision of more facilities, a difference in attitude of the doctors, frustration due to repeated trips required for getting the work done, economic reasons, doctors in hospitals eventually referring the patients to their own clinics, cleanliness and the less common reasons have been included under the category of 'Others'.

### FINDINGS

Out of the 100 participants, the results showed the following outcome:

S.NO	CRITERIA	GOVT	PRIVATE
1.	Total no of people	39	61
2.	Income > Rs.5 lakhs p.a	7	24
3.	Income<Rs.5 lakhs p.a	32	37
4.	Edu ≥10 <sup>th</sup> grade	20	46
5.	Edu<10 <sup>th</sup> grade	19	15
6.	Better doctors	14	2
7.	Known doctors	8	14
8.	Less time consuming	0	24
9.	Care by Nurses	0	2
10.	Care by doctors	2	27
11.	More Facilities	6	4
12.	Better Attitude of doctors	0	9
13.	Less frustration	0	5
14.	Economic reasons	10	0
15.	Doctors in hospital Refer to personal clinics	0	2
16.	Cleanliness	0	1
17.	Others	4 (Govt. employees, ESI)	13 (bad experience in the past, no facilities for cancer patients, bad laboratory facilities, denial to prescribe expensive medications, no facilities for attendants, alliance with chemists and ripping patients off, need to have connections for doctors to listen to patient complaints.

The following graphs (Fig.1 and Fig.2) show the relative preference between government and private health systems, showing the variables and the reasons for their choices (represented on y axis) and the percentage of people making a particular choice (on x axis).

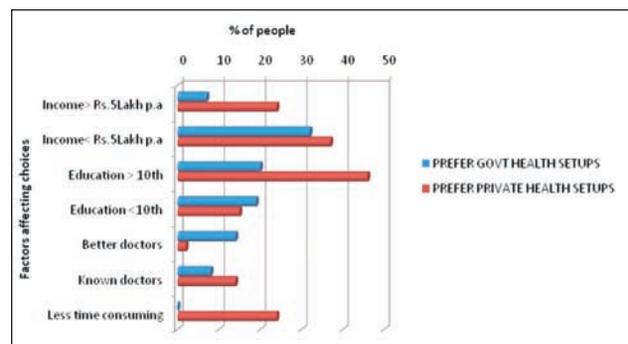


Fig.1. (Graph depicting Factors affecting choices of people between govt and private health setups and the strength of these factors indicated by the % of people affected by it. contd. in Fig 2.)

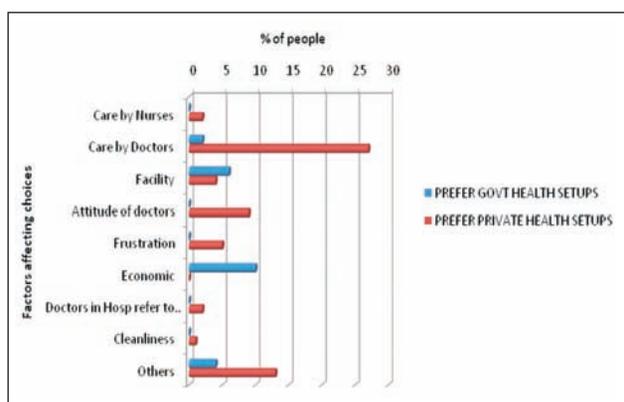


Fig.2 (continuation of Graph depicting Factors affecting choices of people between govt and private health setups and the strength of these factors indicated by the % of people affected by it.)

## CONCLUSIONS

The results of the study clearly indicate that a larger share of people prefer to visit a private care setting for their health needs. Even though government hospitals offer services at a cost much cheaper than the private hospitals, even people with lower range of per annum income, prefer to visit the private clinics for their health issues. However, the difference between the two choices here is very less as compared to the people in the category of annual income > Rs. 5 lakh, where a clear majority prefer private hospitals. Also, 10 % of the people visit Government hospitals solely because of economic reasons. The above two factors point towards the fact, that if given the resources, a large percent of the people from the population that does visit the Government hospitals, could shift to the private sector.

A similar trend is indicated by the bars taking education as a variable (also keeping in mind the fact that the level of education and annual income have a very strong correlation) indicate that people with a higher education prefer private setup more. The preference for government hospitals is however slightly more in the lower education group.

In one of the studies, the distribution of health care providers in the province with regard to sector of work (public/private), rural-urban location, qualification, commercial orientation and institutional set-up has been described. Of the 24,807 qualified doctors mapped in the survey, 18,757 (75.6%) work in the private sector. Fifteen thousand one hundred forty-two (80%) of these private physicians work in urban areas. The 72.1% (67793) of all qualified paramedical staff work in the private sector, mostly in rural areas.<sup>(3)</sup>

It is important to note here that in our study, a larger percent of people have voted for better doctors in the Govt. setup. In fact, this is the only field, besides economic factors, where the government sector seems to dominate over the private sector by a huge leap. The other factors favoring a government setup including provision of more facilities than small private clinics- (like doctors of various specializations and more machines), those working as government officials themselves prefer the government hospitals due to ample facilities offered, those covered by the ESI also visit government hospitals.

However, what is crucial here is to identify the factors that are killing the government system in healthcare. According to the graph, more time consumption, improper care by nursing staff, the uncaring and rude attitude of the doctors towards the patients and frustration due to repeated trips to get the work done are the major factors that are creating gaping holes in the success chart of the government setup. Whereas the prevalence of these problems is either zero, or negligible in the private sector as per the population studied, they seem to hold the most credit for driving the general public away from government services.

Some other factors that were pointed out by a very small percent of the population but worthy of mention include lack of cleanliness in the government hospitals and also the fact that some doctors working in government hospitals have been found to refer patients to their own private clinics for the treatment. These also include complaints like bad experience especially in the emergency services in the past, lack of facilities for cancer patients, bad laboratory facilities, lack of proper facilities for attendants. It has also been pointed out in one particular case that there is an ongoing alliance with some particular chemists who are called into the wards to sell medications to the patients, and the patients are made to buy more medication than is required. They are given no record of the supplies that were used, or were leftover.

3 percent of the people pointed out that it is required to have connections to someone known to the doctors, for them to listen to patient complaints.

The above study strongly points that majority of the people in the present times prefer to visit private care setups for their health issues despite the fact that it does burn a hole in their pockets. The reasons responsible for this have been mentioned in the report

above and are modifiable. The sole purpose of this report is to highlight these factors and urge the need for them to be looked into, so that better healthcare can be made available to the common Indian man at a lesser expense.

In order to ensure that the benefits of social security measures reach the intended sections of society, enumeration of Below Poverty Line families and other eligible sections is vital <sup>(4)</sup>

Important issues that the health systems must confront are lack of financial and material resources, health workforce issues and the stewardship challenge of implementing pro-equity health policies in a pluralistic environment<sup>(5)</sup>

The government should take strict action in cases of diversion of funds and goods from social security schemes through law enforcement, community awareness and speedy redressal mechanisms.<sup>(2)</sup>

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**Ethical Clearance:** We confirm that the people involved in the study were clearly explained the

purpose of the study and they had the freedom to decline participation. There is no material in the report that could lead to identification of the people who participated in the study.

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# Medical Ethics: Review of Literature

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## ABSTRACT

Ethics is the foundation of any society or civilization. Without ethics, life would become law of jungle. Medical ethics includes the moral principles that guide the members of the medical profession when dealing with their profession. From the days of Hippocrates there are codes of conduct for the doctors: which are violated often & has lowered the professional value bringing misery to the patients. Meditation, if practiced by the physicians, can change to good ethics.

**Keywords:** Professional Ethics, Hippocratic Oath, Declaration of Geneva, Spirituality

## INTRODUCTION

'Medical ethics' has its roots in philosophical ethics. Ethics, sometimes known as philosophical ethics involves; *systematizing, defending, and recommending* concepts of right and wrong conduct, often addressing moral diversity<sup>[1]</sup> The term comes from the Greek word 'ethos' which means *character*. Philosophical ethics investigates what is the best way for humans to live, and what kinds of actions are right or wrong in particular circumstances. Ethics seeks to resolve questions dealing with human morality—concepts such as good and evil, right and wrong, virtue and vice, justice and crime. <sup>[1]</sup> Ethics implicitly regulates areas and details of behaviour that lie beyond governmental control.

In this article, on the background of philosophical ethics: professional ethics and medical ethics are studied. I have used the internet source to study all these topics. One constant feature that I have observed is: all the ethical codes from time to time are changing due violations by the medical professionals. Life has become *trial and error*. The phrase '*Doctor, heal thyself*' still suits at this juncture.

Spiritual living is very important for the physician as he needs to be healthy himself and to cure others also. Through spirituality: ethics follows.

### Professional Ethics

Professional ethics encompass the personal, organizational and corporate standards of behaviour expected of professionals. <sup>[2]</sup> Professionals, and those working in acknowledged professions, exercise specialist knowledge and skill. How the use of this knowledge should be governed when providing a service to the public can be considered a moral issue and is termed professional ethics. <sup>[3]</sup>

Professionals are capable of making judgments, applying their skills and reaching informed decisions in situations that the general public cannot, because they have not received the relevant training. <sup>[4]</sup> One of the earliest examples of professional ethics is probably the *Hippocratic Oath to which medical doctors still adhere to this day*.

Most professions have internally enforced codes of practice that members of the profession must follow to prevent exploitation of the client and to preserve the integrity of the profession. This is not only for the benefit of the client but also for the benefit of those belonging to the profession.

### Ethics

Is a field of ethics or moral philosophy involves *systematizing, defending, and recommending* concepts of right and wrong behaviour.

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This philosophy usually divides into 4 general areas: Meta Ethics, Normative Ethics and, Applied Ethics, Descriptive ethics.

*Meta Ethics investigates* where our ethical principles come from and what they mean. Are they merely social conventions? Do they involve more than expressions of our individual emotions? Meta Ethical answers to these questions focus on the issues of Universal truths, the will of God, the role of 'reason' in ethical judgments and the meaning of ethical terms themselves.

*Normative Ethics* takes on a more practical task, which to arrive at moral standards that regulate right and wrong conduct. This may involve articulating the good habits that we should acquire, the duties that we should follow, or the consequences of our behaviour on others.

*Applied Ethics* involves examining specific controversial issues such as abortion, infanticide, animal rights, environmental concerns, homosexuality, capital punishment, or nuclear war.

*Descriptive Ethics* is also known as the study of people's beliefs about morality.

### **Meta Ethics**

Meta means 'after' or 'beyond'. It involves 'bird's eye view' of the entire project of Ethics.

*Meta Ethics* is the study of the kinds of things that exist in the universe. Some things are made of physical stuff, such as rocks and non-physical such as thoughts, spirits, and gods. Whether moral values are eternal truths that exist in a spirit like realm, or simply human conventions ('Other Worldly' or 'This worldly')

### **Psychological issues in Meta Ethics**

Psychological basis for our conduct: What motivates for us to be moral? Why be moral? Because to avoid punishment; to gain praise; to attain happiness; to be dignified; to fit in with society.

Egoism and Altruism: According to this principle morality is due to selfishness. Many of our actions are promoted by selfish desires. Even donating charity-feels happy because they maintain that self-oriented interests ultimately motivate all human actions. Psychological hedonism is related to psychological egoism. Pleasure is the specific driving force behind all our actions. Instinctive selfishness and pleasure prompt much of our conduct.

Emotion and Reason: Role of reason in motivating morality is the origin. German philosopher Immanuel Kant propounded this. Emotions influence our conduct.

Male and female morality: Traditionally morality is male oriented. Acquiring property, engaging in business contract, governing societies are examples. Women traditionally looked after nurturing duties, raising children, looking domestic life. There are no rules, they are spontaneous and creative. Is described as care based approached to morality.

### **Normative Ethics**

It involves arriving at moral standards that regulate right and wrong conduct. In a sense, it is a search for an ideal litmus test of proper behaviour. The Golden rule is a classic example of a normative principle: We should to others what we want others to do to us. The Golden Rule is an example of a normative theory that establishes a single principle against which we judge all actions. Other normative theories focus on a set of foundational principle or set of good character traits.

1. Virtue theories
2. Duty theories and
3. Consequential theories

**Virtue theories:** Many philosophers believe that it is important to develop good character. This will become habit to express good character. Once I acquired benevolence, I will then habitually act in a benevolent manner. No need to put extra conscious effort to show good character. It will automatically be happening.

In addition to advocating good habits of character; virtue theories hold that we should avoid acquiring bad character traits or vices, such as: Cowardice, Insincerity, Injustice, and Vanity.

**Duty theories:** Many of us feel that there are *clear obligations* we have as human beings, such as, care of our children, and not to commit murder.

Duty theories base morally on specific, foundational principles of 'Obligation'. These are called deontological theories. In Greek Deon =duty. These are also called non consequentialist, since these principles are obligatory, irrespective of the consequences that might follow from our actions.

**Right theory:** Most generally, a "Right" is a justified claim against another person's behaviour such as my right to not be harmed by you (Human Rights). Rights and duties are related in such a way that the right of one person implies the duties of another person. *Laws of nature* mandate that we should not harm any one's life, health, liberty, or professions. These are natural rights given to us by God. These rights are called *foundational rights*; they are Right to life, Right to liberty, and Right to pursuit of happiness.

### Consequential Theories

It is common for us to determine our moral responsibility by weighing the consequences of our actions. According to consequentialism, correct moral conduct is determined solely by a cost-benefit analysis of an action's consequences.

**Consequentialism:** An action is morally right if the consequences of that action are more favorable than unfavorable. Consequential normative principles require that we first tally both the good and the bad consequences of an action. Second, we then determine whether the total good consequences outweigh the total bad consequences. If the good consequences are greater, then the action is morally proper. Consequentialist theories are sometimes called teleological theories, from the Greek word 'telos' or 'end'. Since the end result of the action is the sole determining factor of its morality.

### Applied Ethics

Is the branch of ethics which consists of the analysis of specific, controversial issues such as abortion, animal rights and euthanasia. In recent years applied ethics have been subdivided into convenient groups such as medical ethics; business ethics; environmental ethics; and sexual ethics.

In this the moral issue should be *controversial*; and there should be *for and against arguments*.

In theory, resolving particular applied ethical issue should be easy. With the issue of abortion, for example we would simply determine its morality by consulting our normative principle of choice, such as act utilitarianism. If a given abortion, produces greater benefit then according to act utilitarianism it would be morally acceptable to have the abortion. But it will not be so easy in practice. We need to choose other alternatives.

### Normative principles in Applied Ethics

It is a challenging task. The principles selected must not be too narrowly focused, such as a version of act-egoism that might focus only on an action's short-term benefit. The principles must also be seen as having merit by people on both sides of an applied ethical issue. For this reason, principles that applied to duty to God are not usually cited since this would have no impact on a nonbeliever engaged in the debate.

### The following principles are most widely applied

- 1) Personal benefit.
- 2) Social benefit.
- 3) Benevolence {help those in need} and
- 4) Paternism {assist others} in pursuing their best interests when they cannot do themselves.

### Hippocratic Oath

Is an oath historically taken by physicians and other health care professionals swearing to practice medicine with honesty. It requires new physician to swear upon a number of healing Gods that he will uphold a number of professional ethical standards.

### Modern use and relevance

The oath has been modified multiple times. One of the most significant revisions was first drafted in 1948 by the World Medical Association. Called the Declaration of Geneva, it was "intended to be a self-conscious rewriting of the Hippocratic Oath, reaffirming Hippocratism in the face of the shame and tragedy of the German medical experience".

In the 1960s, the Hippocratic Oath was changed to "utmost respect for human life from its beginning", making it a more secular concept, not to be taken in the presence of God or any gods, but before only man.

### Declaration of Geneva

The Declaration of Geneva (Physician's Oath) was adopted by the General Assembly of the World Medical Association at Geneva in 1948, amended in 1968, 1983, 1994 and editorially revised in 2005 and 2006. <sup>[5]</sup> The Declaration of Geneva was intended as a revision of the Hippocratic Oath to a formulation of that oath's moral truths that could be comprehended and acknowledged in a modern way. <sup>[6 & 7]</sup>

The Declaration of Geneva, as currently published by the WMA<sup>[13]</sup>

### Changes from original

The original oath read "My colleagues will be my brothers," later changed to "sisters and brothers." Age, disability, gender, and sexual orientation have been added as factors that must not interfere with a doctor's duty to a patient; some rephrasing of existing elements has occurred. Secrets are to remain confidential "even after the patient has died." The violation of "human rights and civil liberties" replaces "the laws of humanity" as a forbidden use of medical knowledge. The original declaration stated that a doctor would respect human life "from the time of conception," and the 1994 revision stated "from its beginning," which was removed altogether in the editorial revisions in the English version but is still found in other language versions that have not followed the editorial changes such as the German Handbuch der ärztlichen Ethik.<sup>[8]</sup> "The health" in general of a patient is now the doctor's first consideration compared to the "health and life" as stated in the original declaration. This was apparently changed to free the medical profession from extending life at all cost.<sup>[9]</sup>

**The Declaration of Helsinki**<sup>[10]</sup> is a set of ethical principles regarding human experimentation developed for the medical community by the World Medical Association (WMA). It is widely regarded as the cornerstone document on human research ethics.<sup>[11][12][13]</sup>

Medical council of India from time to time is issuing guidelines for the doctors including for those in the medical colleges.

### Examples for the violation of medical ethics

Alexis Carrel (28 June 1873 – 5 November 1944) was a French surgeon and biologist who was awarded the Nobel Prize in Physiology or Medicine in 1912. He died a broken man after constant press attacks as a Nazi collaborator and his support of policies of gassing undesirables fully came to light.

Henry Andrews Cotton, MD (1876 – May 1933) was an American psychiatrist and the medical director of New Jersey State Hospital at Trenton. He believed that insanity was due to infections in the body. He practiced surgical removal of body parts to cure insanity.

"Health care professionals convicted of murdering patients" if one types in the Google search; you will

get list of the health care professionals, their details of crime, trials, and punishments.

### Yoga science

Human beings are not merely physical bodies. We are breathing and thinking beings also-living with complex thoughts, desires and emotions. Yoga Science (includes meditation); views the body as a covering outside the mind, and the mind as a covering outside the center of consciousness (the soul). To experience health and well-being, we must properly care all the three layers of the body, physical body; mind and the spirit or soul.<sup>[14]</sup>

Meditation is a process of healing and restoration of wholeness of mind, body and spirit. The words Meditation, Medicine and Medication all share the same Latin root 'Medico' meaning to cure. Meditation is probably derived from the same root as the Latin word 'Mederi' meaning to 'heal'. The word 'heal' comes from the Indo- European root 'to make whole'. Studies have shown how the state of mind affects physical health for example; anything that promotes a sense of isolation may lead to disease.<sup>[15]</sup>

**Interpretation:** Great efforts are being taken since from the Hippocrates's days to present day in formulating the professional codes for the doctors from time to time. In spite of that; *violation is happening resulting in morbidity and mortality among patients and lowering the value of the profession. Medical profession was considered noble profession; physician was considered as friend, philosopher and guide. Now that reputation is lost. Physician has become service provider and patient has become the client. The trust, faith, and respect no longer exist between doctor and the patient relationship.* There is no dearth of knowledge. Only practicing is the problem!

### Recommendation

1. During medical education ethics should be taught on the background of philosophical ethics.
2. Meditation is one of the spiritual practices. Spirituality brings holistic approach. Spirituality does not speak only of ethical and ceremonial duties. If a person becomes spiritual, naturally he becomes moral/ ethical. There will be holistic perception of life which is the basis of all religions. And this forms the *foundation for ethical behaviour*. It will bring increase in conscience and consciousness which will bring understanding to life and profession.

## CONCLUSION

Good ethics will automatically follow spiritual practice.

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# The Study of Fatal Burn Deaths in District Hospital, Gulbarga, Karnatak

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## ABSTRACT

**Background:** Burn deaths are a major public health problem in our country. In India, about 60,000 people suffer from burns annually, more than 50,000 are treated in hospitals and about 10,000 succumb to thermal injuries.

**Aims:** To study the demographic and the injury profiles of the fatal burn deaths, brought to the mortuary of the District Hospital, Gulbarga attached to department of forensic medicine, ESIC Medical College, Gulbarga.

**Subject and Method:** All (107) autopsies of the burn victims which were performed between April 2013 and May 2014 were analyzed with respect to the age-gender distribution, diurnal & seasonal variation, place of occurrence, source of the fire, survival period, body surface area which was involved and the cause of death.

**Results:** In our study of fatal burn deaths, 71.96% of the victims were females with male to female ration being 1:2.5. Majority (70%) of the burn victims were between the ages of 20-40 years with peak incidence at 21-30 years (33.64%). The highest proportion occurred in winter (45.79%). The incidence was high in day (60.75%) than in night (39.25%). The commonest location for burn deaths was home locations (76.63%). Accidental burning was observed in 74.8% followed by suicidal (23.4%) and homicidal burning (1.8%). The majority of the study victims (89.71%) sustained flame burns. 92.5% of the 107 victims sustained more than 50% of total body surface area (TBSA) burns. The majority of deaths (89.71%) due to burns occurred within 24hrs of the incident. In almost all cases (89.71%) of the 107 victims with fire and flames as cause of death had signs of vitality (soot in airways and/or digestive tract) at autopsy. The major cause of death was Hypovolaemic shock and Toxemia 57% cases, followed by neurogenic shock in 32.7%, Septicemia & pneumonia 8.4% and multi-organ failure in 1.86% of victims of fatal burns.

**Conclusion:** The results of this study provide the necessary information to develop proper burn prevention programs, thereby reducing the frequency of burns and burn-related deaths.

**Keywords:** Burns, Autopsy, Septicemia

## INTRODUCTION

In India fatal burns are considered as major health problems that are associated with high mortality and morbidity. About 60,000 people suffer from burns annually, more than 50,000 are treated in hospitals and about 10,000 succumb to thermal injuries<sup>1</sup>. Burns are an important cause of injury in all age groups, being the second most frequent cause of injury resulting in

deaths<sup>5</sup>. Burns have always been considered as one of the most destructive injuries, causing not only deaths but also major economic and psychological impacts and long term somatic sequelae as well. Burn injury is a common type of traumatic injury, causing considerable morbidity and mortality

Burns are injuries produced by application of dry heat such as flame, radiant heat or some heated solid

substance like metal or glass to the body. Local injury to the body by heat may result from dry heat, application of hot bodies, licking by flames resulting in simple burns, moist heat leading to scalds, and corrosive poisons resulting in corrosive burns. Electric spark, discharges, flashes and lightening leads to electric burns<sup>2,3,5</sup>.

The present study is a prospective study of deaths due to fatal burn cases presented in the mortuary of District Hospital Gulbarga attached to The Department of Forensic Medicine, ESIC medical college Gulbarga. The aim of this study was to record and evaluate the causes and the magnitude of the fatal burn injuries prospectively.

## MATERIALS AND METHOD

This study was done on deaths due to fatal burns, which were autopsied according to attorney request at mortuary of District Hospital Gulbarga attached to the Department of Forensic medicine, ESIC Medical College Gulbarga. Of the 530 total autopsies performed on all types of unnatural deaths between April 2013 and May 2014, 107 (20.18%) were the cases of burns. These 107 fatal burn cases form the material of this study.

An in-depth examination of the epidemiological features and medico legal aspects of these 107 burn deaths was performed in an effort to more clearly understand the dynamics surrounding these deaths. The information pertaining to their age, sex, Accident location, Type of burn, Manner of death, Duration of survive, Signs of vitality and Cause of death was gathered from police inquest report, dead body challan, clinical details from hospital records; correlated and checked from relatives, friends and attendants of the deceased.

## RESULTS

Among 530 cases of total autopsy done, only 107 (20.18%) were the victims of burns showing no definite ascending or descending time trend. Similarly there was no definite mortality trend as well seeing the total burn admission and burn death.

### Demographics

In our study of fatal burn deaths, 71.96% of the victims were female and 28.04% were male, with

Female: Male ratio equal to 2.5:1. The age of victims range from 1 to 75 years. 70% of the burn victims were between the ages of 20–40 years with peak incidence at 21–30 years (33.64%). minimal number of cases were observed in the extreme age groups outside 5–70 years. {Table 1}

### Seasonal & diurnal variation

The highest proportion occurred in winter (45.79%), followed by rainy season (33.64 %), and then summer (20.56%). Regarding variations in burn injury with time of day, the incidence is high in day (60.75%) than in night (39.25%). {Table 2}

### Accident location

The commonest location for burn deaths was home locations (76.63%), followed by work locations (14.01%) and a small percentage in outdoor locations (9.34%). {Table 3}

### Manner of burning

In our study, Accidental burning was observed in 74.8% followed by suicidal (23.4%) and homicidal burning (1.8%). {Table 4}

### Causes & types of burns

Table 5 shows the overwhelming majority of the victims (89.71%) sustained flame burns. Analysis of mode of flame burn injuries revealed that (64.4%) burns were due to fire, pouring of kerosene over body (25.20%). There were 5 victims (4.67%) died from scalds and Four victims (3.7%) from electrocution and two victims (1.8%) from lightening. {Table 5}

### Burn percentage (TBSA)

In our study 92.5% of the 107 victims sustained more than 50% of total body surface area (TBSA) burns. There was a positive correlation between the mean percentage of TBSB and Duration of survival. {Table 6}

### Duration of survive

The majority of deaths (89.71%) due to burns occurred within 24hrs of the incident. During this period the maximum number of deaths occurred within 6-24hrs (68.22%) compared to within 6hrs (21.49%).

**Signs of vitality**

In our study in almost all cases (89.71%) of the 107 victims with fire and flames as cause of death had signs of vitality (soot in airways and/or digestive tract) at autopsy.

**Cause of death**

The major cause of death was Hypovolaemic shock and Toxemia 57% cases, followed by neurogenic shock in 32.7%, Septicemia & pneumonia 8.4% and multi-organ failure in 1.86% of victims of fatal burns. {Table 7}

**Table 1: Demographic distribution of Fatal burn deaths**

Age yrs	Male	Female	Total (%)
1-10yrs		06	06 (5.06%)
11-20yrs	08	07	15 (14.01%)
21-30yrs	06	30	36 (33.64%)
31-40yrs	10	24	34 (31.77%)
41-50yrs	5	4	09 (8.41%)
51-60yrs	1	5	06 (5.60%)
60 yrs and more		1	0.9 (4.67%)
Total	30(28.03%)	77(71.96%)	107(100%)

**Table 2: Seasonal and diurnal variation of Fatal burn deaths**

Seasons	Day (%)	Night (%)	Total (%)
Winter	30	19	49(45.79%)
Rainy	21	15	36(33.64%)
Summer	14	08	22(20.56%)
Total	65(60.75%)	42(39.25%)	107

**Table 3: Accident location in relation to age in Fatal burn deaths**

Location	Home	Workplace	Outdoor	Total
No.of fatal deaths	82(76.63%)	15(14.01%)	10(9.34%)	107

**Table 4: Manner of deaths in Fatal burn deaths**

	Accident (%)	Suicidal (%)	Homicidal(%)	Total (%)
Total	80(74.8%)	25(23.4%)	02(1.8%)	107

**Table 5: Causes and Types of burns in fatal burn deaths**

	Accident (%)	Suicidal (%)	Homicidal(%)	Total (%)
Fire	69	-	-	69(64.4%)
Pouring of kerosene		25	2	27(25.20%)
Electric burn	04	-	-	04(3.7%)
Scalds	05	-	-	05(4.67%)
lighteninng	02	-	-	02(1.8%)
Total	80(74.8%)	25(23.4%)	02(1.8%)	107

**Table 6: Percentage of TBSB in relation to duration of survival**

	>6hrs	6-24hrs	2-6days	1-2weeks	>2weeks	Total (%)
<50%	3	5	3	-	1	12(11.21%)
50-70%	5	15	-	4	1	25(23.36%)
71-89%	6	22	1	-		29(27.10%)
>90%	9	31	1	-		41(38.31%)
Total		23(21.49%)	73(68.22%)	5(4.67%)	4(3.73%)	2(1.86%)

107(100%)

Table 7: Causes of death in fatal burn deaths

Cause of death	Neurogenic shock	Hypovolaemic shock and Toxemia	Septicemia & pneumonia	Multiorgan failure	Total
No of fatal burns	35(32.7%)	61(57%)	09(8.4%)	02(1.86%)	107(100%)

## DISCUSSION

Burn is a problem prevalent worldwide<sup>8</sup>, especially in developing countries<sup>9</sup>. Based on the available information regarding the incidence of burns and burn deaths, this should be considered as a significant problem in India.

In the present study, about 70% of the victims were in the age group of 20–40 years, which are similar to the observation of Singh et al.<sup>10</sup> from Chandigarh who reported two thirds of fatal burn cases in the young age group (21–40 years). The higher incidence of burn deaths among females (71.96%) was observed throughout the study period as women in childbearing age were reported to be at a higher risk. Burn<sup>11</sup> is the only unnatural cause in which female not only outnumbered the males, but the sex ratio being almost three times higher in female in India<sup>12</sup>. This is mainly because females take care of household work in India, exposed fire more often.

Seasonal variations in our study showed that burn deaths occurred mostly in winter (45.79%) followed by rainy season (33.64%)<sup>13,14</sup>. This might be due to the fact that, in winter, there is more need for hot water for bathing. The traditional kerosene stove; which is extensively used for cooking and providing the necessary boiling water for bathing; lacks any safety measures. Thus, it is condemned to be responsible for much of the flame and scald burns in our country<sup>12</sup>. This comes in accordance with the findings of other reporters<sup>12, 17</sup>. Though the majority of the incidents are accidental in nature, suicidal and homicidal cases were also observed. As noted with other studies, accidental burning was the commonest manner of deaths due to burning followed by suicidal and homicidal burning<sup>17-20</sup>. Flame is the major cause of burns, which is in consistent with the study from Manipal<sup>22</sup>. Contrary to this, scalds were reported to be the major cause of fatality from Angola, Ivory Coast and Jordan<sup>16, 22</sup>.

In the present series, the overwhelming majority (92.5%) of the victims had more than 50% of total body surface area (TBSA) burns indicating the

incompatibility with life even at a tertiary care center. In the current study, 89.71% cases died within a few minutes to 24 h, 10% cases within a week signifying that the burns are rapidly fatal. Similarly Virendra et al<sup>21</sup>, also reported death from burns within a week in 60.8% victims. Our study revealed that signs of vitality (soot in airways and/or digestive tract) were found at autopsy in large majority (89.71%) of victims who died from burns.

In the present study, the major cause of death was neurogenic shock and Hypovolaemic shock and toxemia in 89.70% cases, followed by Septicemia & pneumonia (8.4%), and Multiorgan failure (1.86%), Which is consistent with the leading cause of death as reported by Ragheb et al,<sup>22</sup> Veranda et al,<sup>21</sup> Rahul et al. and Stefan<sup>24</sup>.

## CONCLUSION

In conclusion, the present autopsy-based study has highlighted some important features pertaining to burn deaths in Gulbarga. The highest incidence rate of burn deaths was in adolescent group. Majority of the burn victims are females, in childbearing age. Flame was the major cause of burns. Accident is the commonest manner of death. A higher occurrence of fatal burns is in the day especially early morning. Furthermore, the accumulation of burn fatalities in winter suggests that there is a relation between people's habits and fatal burns. Signs of vitality were found at autopsy in a large majority of victims who died from burns. Hypovolaemic shock and neurogenic shock were the major causes of burn death, followed by Septicemia & Multiorgan failure.

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# A Prospective Study of Histopathological Changes of Lung, Liver, Kidney and Upper GI in Burns

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## ABSTRACT

Multiple organs are involved in causing mortality of burn patients. But most commonly lung, liver, kidney, upper GI are involved. Knowing these histopathological changes helps in determining the cause of death depending on the duration of survival. We carried out a study involving 50 autopsy cases of burns. Above organ samples collected, sent for histopathological examination and the reports were compared with the previous studies. It was noted that majority of lung specimens showed diffuse alveolar damage as the major histopathological change. The kidneys showed acute tubular necrosis in majority of specimens which is a common pathology behind acute renal failure in burn patients. The liver showed changes of hepatic necrosis, congestion, portal triaditis, fatty changes, cholestasis, cloudy swelling. The stomach and duodenum showed changes of superficial gastroduodenal ulcerations in the early stages of burns and Curling's ulcers in the later stages depending on the duration of survival. As there are less number of studies done in this regard, our study will throw some light on further research in the field of forensic pathology.

**Keywords:** Burns, Diffuse Alveolar Damage, Hepatic Necrosis, Acute Tubular Necrosis, Curling's Ulcer

## INTRODUCTION

Fire was perhaps, man's first double-edged sword, for throughout history, it has served as well as destroyed mankind. Burns have tremendous medicolegal importance as they may be considered to be the commonest cause of unnatural death in India. Often, the circumstances of burns are enveloped in mystery, obscurity and unreliable statements. The reason behind this action may be personal, domestic, occupational or social tragedy, and more recently dowry death<sup>1</sup>. A burn is an injury which is caused by application of heat or chemical substances to the external or internal surfaces of the body which causes destruction of tissues<sup>2</sup>. Every year more than 2 million people sustained burns in India, most of which (around 5,00,000 people) were treated as outdoor patients. About 2,00,000 were admitted in hospitals and 5,000 died<sup>3</sup>.

## MATERIALS AND METHOD

Deaths due to burns in Basaveshwara Teaching and General Hospital, Gulbarga brought to the Mortuary,

Department of Forensic Medicine and Toxicology and were autopsied. The specimens of Lung, Liver, Kidney, Upper GI (Stomach and Duodenum) were collected and preserved in 10% Formalin solution. The organs with the preexisting diseases were excluded from the study. The specimens were sent to the Department of Pathology for Histopathological analysis. The reports were collected. The histopathological changes of each organ were noted and tabulated. The observations were compared with the studies conducted by previous workers. The history noted from the relatives regarding age, marital status, religion, manner of death and history of past illnesses suffered by the victim. Hospital records of concerned victims were followed up to collect the details of duration of survival and percentage of burns.

## OBSERVATIONS AND RESULTS

The present study was conducted in the Department of Forensic Medicine & Toxicology with collaboration of the Department of Pathology in our hospital during November 2011 to April 2013.

Histopathological changes of diffuse alveolar damage was observed in 24 cases (48%) followed by interstitial pneumonitis was observed in 14 cases (28%). These histopathological features were correlated with duration of survival and it was observed that all cases showing diffuse alveolar damage had minimum duration of survival (0-72

hours) whereas cases showing interstitial pneumonitis had maximum duration of survival (6 days or more). Cases showing changes of diffuse alveolar damage and interstitial pneumonitis were distributed widely in correlation with duration of survival from 0-72 hours to 8 days and more (Table-1).

**Table 1: Correlation of histopathological changes in lungs with duration of survival**

Histopathological changes in lungs	Duration of survival				
	0-72 hours	4-5 days	6-7 days	8 days & more	Total (No. of cases)
Diffuse alveolar damage	11	05	04	04	24
Interstitial Pneumonitis	00	04	07	03	14
Anthracotic Pigment and carbon laden macrophages	00	02	00	01	03
Congestion	03	00	01	01	05
Intravascular microthrombi	00	01	00	03	04
Total (No. of cases)	14	12	12	12	50

The histopathological changes of hepatic necrosis were observed in 18% of cases and changes of fatty infiltration seen in 16% of cases. The other prominent changes noted are congestion (42%), portal triaditis (14%) and cholestasis (4%). Histopathological features observed above were correlated with duration of

survival and it was observed that all cases showing changes of venous congestion had minimum duration of survival of 0-72 hours and maximum duration of survival was observed with fatty change with 8 days and more (Table-2).

**Table 2: Correlation of histopathological changes in liver with duration of survival.**

Histopathological changes in liver	Duration of survival				
	0-72 hours	4-5 days	6-7 days	8 days & more	Total (No. of cases)
Cloudy swelling	00	01	01	00	02
Fatty change	00	01	01	06	08
Hepatic necrosis	04	01	03	01	09
Congestion	08	05	05	03	21
Portal triaditis	01	02	02	02	07
Cholestasis	00	02	00	00	02
Normal histology	01	00	00	00	01
Total	14	12	12	12	50

The histopathological changes of acute tubular injury were observed in 42% of cases followed by degenerative changes in 32% of cases. Cloudy swelling was observed in 16% of cases. Histopathological features observed above were correlated with duration of survival and it was observed that all cases showing

cloudy swelling had minimum duration of survival of 0-72 hours and maximum duration of survival of 6 days and more was noted with degenerative changes. The changes of acute tubular necrosis were noted in patients surviving for more than 48 hours (Table-3).

**Table 3 Correlation of histopathological changes in kidneys with duration of survival**

Histopathological changes in kidneys	Duration of survival				
	0-72 hours	4-5 days	6-7 days	8 days & more	Total (No. of cases)
Acute tubular necrosis	05	06	09	01	21
Cloudy swelling	07	01	00	00	08
Degenerative changes	01	04	02	09	16
Glomerular changes	00	01	00	02	03
Normal histology	01	00	01	00	02
Total (No. of cases)	14	12	12	12	50

The histopathological changes of gastro-duodenal mucosal ulcerations were observed in 36% of cases followed by gastro-duodenal hemorrhages in 22% of cases. The Curling’s ulcers were observed in 12% of cases. Histopathological features observed above were correlated with duration of survival and it was observed that all cases showing gastro-duodenal

mucosal ulcerations had minimum duration of survival of 0-72 hours and maximum duration of survival of 8 days and more was observed in cases showing changes of curling’s ulcers. The gastro duodenal hemorrhages are noted in patients surviving for e”3 days (Table-4).

**Table 4: Correlation of histopathological changes in stomach and duodenum with duration of survival**

Histopathological changes in stomach	Duration of survival				
	0-72 hours	4-5 days	6-7 days	8 days & more	Total (No. of cases)
Gastro-duodenal mucosal ulcerations	10	03	03	02	18
Gastro-duodenal hemorrhages	00	03	05	03	11
Inflammation(gastritis)	02	03	01	02	08
Curling’s ulcer	00	00	01	05	06
Congestion	01	03	02	00	06
Normal histology	01	00	00	00	01
Total	14	12	12	12	50

**DISCUSSION**

In the present study, wide varieties of histopathological features were observed. Although these features were overlapping in some cases, we had distributed all the cases according to predominant histopathological feature in each case.

Toor AH et al<sup>4</sup> (1990) observed diffuse alveolar damage in 48.48% patients and necrotizing interstitial inflammation in 21.21% patients. Argamaso R. V.<sup>5</sup> (1967) observed changes of pneumonitis in 26.66% of cases. These studies are in correlation with the present study. KSN Reddy<sup>2</sup> (2013) mentioned that the histopathological changes of pigment laden macrophages can be present in Lungs of burn victims. The observation made in the present study is in accordance with the above finding. P.S.Hasleton et.al<sup>6</sup> (1983) noted congestion of alveolar walls, interstitial and intra alveolar edema and intra alveolar hemorrhage in first 48 hours. Intravascular microthrombi denoting disseminated intravascular

coagulation along with above changes were also noted after 48 hours. So, the present study is in accordance with the above observations.

G. Watson James, III <sup>7</sup> (1951) observed evidence of fatty infiltration, cloudy swelling, increased pigments in the reticulo-endothelial cells, focal necrosis, and congestion in the liver substance. Marc G. Jeschke <sup>8</sup> (2011) observed changes of liver necrosis in 10-15% of thermally injured patients (Table-2). Lars H. Evers <sup>9</sup> (2010) observed changes of large intrahepatocytic fat droplets, centrilobular necrosis and cholestasis in most burn cases. The above studies are in accordance with the observations noted in the present study (Table-2). KSN Reddy <sup>2</sup>(2013) mentioned that liver may show cloudy swelling and the changes of cloudy swelling and tubular necrosis in kidneys of majority of burn victims depending on the duration of survival of each patient. The upper GI shows curling’s ulcers in 10% of burn cases. Also, mentioned that mucosal erosions and inflammation of stomach and duodenum can be seen

in most of the cases. The above noted observations are in accordance with the present study (Table-2, 3, 4). Gillman and Gillman <sup>10</sup> (1948) observed the histopathological changes of fatty metamorphosis of the epithelial cells in the central zone of the hepatic lobules observed after 21 to 57 hours after injury. After 57 hours observed venous congestion and evidence of degeneration and necrosis. Fatty changes in the liver were observed after 8 days of survival. This study is in accordance with the present study (Table-2).

Dr Yan<sup>11</sup> (1960) observed that the glomeruli exhibited consistent morphologic changes in most of the burn patients. Argamaso R. V.<sup>5</sup> (1967) observed changes of cloudy swelling in 10% cases whereas 33.33% cases had degenerative changes in the renal tubules (Table-3). Cernea Daniela et al<sup>12</sup> (2005), in their study "Microscopic assays regarding the renal damage following a post-combustional shock" observed that the kidneys displayed tubular necrosis, fibrous microthrombi and infarct areas with H-E stain in majority of cases. Palmieri T et al<sup>13</sup> (2010) observed changes of acute kidney injury in 53.3% of burns. So the above studies are in accordance with the present study. (Table-3) Argamaso R. V.<sup>5</sup> (1967) observed changes of cloudy swelling in victims who died quickly of suffocation whereas cases showing degenerative changes in the renal tubules survived between 4 and 26 days; one who died 16 hours after burning also showed destructive changes. So, these findings are consistent with observations made in the present study. Haberal M et al<sup>14</sup> (1993) observed the duration of survival of 4.5 days in a patient with acute renal failure having acute tubular necrosis and correlates with the present study (Table-3).

Czaja et al<sup>15</sup> (1975) observed changes of haemorrhage with duodenal disease in 16.21% of burns usually from posterior duodenal ulcer. Gastro-duodenal ulcerations were present in 32.43%. H A van Essen<sup>16</sup> (1986) observed Curling's ulcers in both stomach and duodenum in Burn victims. Chernov VN et al.<sup>17</sup> (1998) observed gastro-duodenal hemorrhages in 14% of burn cases. These observations are in concordance with the present study (Table-4). Czaja et al<sup>15</sup>(1975) observed acute erosive gastro-duodenitis occurring within 12 hours after burns. KSN Reddy<sup>2</sup> (2013) mentioned that curling's ulcers are seen on or after the 10th day of burn injury. The superficial gastro-duodenal ulcers can be seen within 1 day after burn injury. Both the studies are consistent with the findings in our study (Table-4).

## CONCLUSION

Usually victims of burns die due to hypovolemic shock, toxemia or septicemia. But in many cases it may not be possible to assess the actual cause of death from autopsy findings only. In these situations, depending on the duration of survival of the victim the changes that are noticed on histopathological examination of various vital organs like lungs, liver, kidneys, stomach and duodenum will help in concluding the final cause of death. In the present study majority of lung specimens showed diffuse alveolar damage as the major histopathological change which is due to the inhalation of incomplete products of combustion. The kidneys showed acute tubular necrosis in majority of specimens which is a common pathology behind acute renal failure in burn patients. The liver did show changes of hepatic necrosis, cloudy swelling, fatty changes but they cannot be the sole causes of death in burn victims. The stomach and duodenum showed changes of superficial gastro-duodenal ulcerations in the early stages of burns and Curling's ulcers in the later stages depending on the duration of survival.

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# Retrospective Study of Pattern of Injuries in Fatal Cases of Fall from Height in Children

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## ABSTRACT

Cases of fall from height is one of the leading cause of death in an unintentional circumstances, and cases of fall in children is not so uncommon which is commonly accidental in nature.

**Objective:** To study various pattern of injuries in fatal cases of fall from height in children.

**Study design:** Cross sectional hospital based study

**Materials and Method:** Autopsy done during the period of January 2013 to December 2013.

**Results:** 3844 autopsy were done during this period out of these 167(4.34%) cases were from fall from height and cases of children of fall from height 14(0.36%). Out of these majority were males 10(71.4%) followed by female 4(28.6%), 13(92.9%) children were known and 1(7.1%) child was unknown. Most of the incident occurred at home 8(57.14%) followed by at construction site 3(21.4%), 8(57.1%) cases were brought dead and 6(42.9%) cases were hospitalized. Among these 12(85.7%) cases died due to head injury, 1(7.14%) case died with chest injury and 1(7.14%) case died complication of femur bone fracture.

**Keywords:** Fall From Height, Children, Head Injury

## INTRODUCTION

The definition of a child specified in the Convention on the Rights of the Child, and thus focuses on injuries occurring in children "under the age of 18 years" <sup>(1)</sup>. Child injuries are a growing global public health problem. Hundreds of thousands of children die each year from injuries or violence, and millions of others suffer the consequences of non-fatal injuries<sup>(2)</sup>. Fall from height is defined in many ways, the international classification of diseases(ICD9) states that a fall from height is an event where a person falls to a Ground from upper level. Where as the frailty and injuries co-

operative studies of intervention studies (FICSIT) define fall from height as unintentionally coming to rest on the Ground, floor or other lower level <sup>(3)</sup>. A more recent definition of fall from height to be a descent upright, sitting or horizontal position, the descent height being less than or equal to 1metre <sup>(3)</sup>.

Fall from height can be classified in several ways.

- Depending on the height of fall which may vary from high rising building to ladder, chairs, tables or staircases, etc into:
- Low falls
- High falls
- Depending on condition affecting, into:
- Intrinsic (where some events or condition affects postural control)
- Extrinsic (where an environmental factor is the main contributing reason for the fall.) <sup>(3)</sup> during

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fall, the potential energy due to height is converted to kinetic energy under the influence of gravity. Victims of fall from height tend to sustain a unique pattern of injuries that depends on inertia of the body, movement of the body, rigidity of stationary objects and the nature of Ground nature against which body falls <sup>[4]</sup>.

A developing country like India due rapid modernization, increase workload, lack of care and supervision of their offspring's, crowded populations and growing n number of multiple storied buildings with lack of basic and essential preventive measures caused and causing the increase of fatality cases in fall from height. Pathological series of childhood- fall deaths have concentrated on short fall deaths and have only enumerated the deaths following falls from height, rather than giving detailed description of the associated pathology<sup>(5)</sup>.

Although fatal injury from a fall usually require a drop of a number of feet, there are well-authenticated instances of skull fractures and brain damage from trivial falls, including some medically witnessed falls from tables and settees<sup>(6)</sup>. The experimental work of Weber showed that the skulls of small infants could be fractured against a variety of floor surfaces from passive falls of only 34 inches<sup>(7)</sup>.

### MATERIALS AND METHOD

The material of present retrospective study is medico-legal autopsy of 14 cases of deaths due to fall from height in childhood, brought over a period of one year from January 2013 to December 2013 to mortuary, Department of Forensic Medicine, Bangalore Medical college & Research Institute, Bangalore.

Information regarding case details including height of fall and location of the body was obtained from police inquest paper, by interview of police officers, relatives and friends accompanying the dead body, this was accompanied by visit to the scene of incident added with analysis of photographs where visit was not possible. Complete medico-legal autopsy was done along with relevant study of hospital case sheets to arrive at the conclusions.

### RESULTS AND DISCUSSION

In this study period , 3844 medico – legal autopsies were conducted. Out of these 14(0.36%) were cases of fall from height in childhood(table1). Among these 14

cases 10(71.4%) were male children and 4(28.6%) were female children(figure1). This result coincides with the findings in the study conducted by Kirankumar JV et all<sup>[8]</sup>. In this study most of the victims were of age group less than 4year 6(42.9%) followed by age group between 5 to 9 years 5(35.7%)(figure3). This clearly indicates most the victims are of preschool and school going children who needs lots of attention and supervision .

Most of the cases were accidental 13(92.9%)(table2), in one case a dead newborn female baby was found near a drainage, on autopsy there was diffuse blood extravasations over scalp, no skull fractures associated with diffuse subdural and patchy subarachnoid hemorrhage, so the cause of death opined as Head Injury. Here it clearly shows act of commission and results correlates with findings in the study conducted by Venkataraghava S et all<sup>(9)</sup>.

In majority of cases victim fell from height of 10meters 5(35.7%), followed by height of 15meters 4(28.6%) and 4 cases(28.6%) from height less than 5 meters(table4), here it gives conclusion that majority of victim fell from height of 10meters or less. This result coincides with the findings in the study of Divesh Gulati<sup>(10)</sup>. Most of the cases occurred at home 8(57.14%) followed by at construction sites 3(21.4%), 1 case(7.14%) fall from second floor of a shopping mall, 1 case (7.14%) fall from roof a vehicle(figure2). Here most of the victims fell while playing or by slipping while climbing the staircase which gives indication of lack of basic and essential preventive measures at home and construction sites.

In deaths due to fall majority of the victims died due to head injury as the sole reason 8(57.14%), head injury associate with trunk and other injuries 4(28.6%), chest injury 1(7.14%), one case(7.14%) with complication of femur fracture(table5). Half of the victims died before reaching the hospital 8(57.14%) and all these victims had been associated with head injury which suggests that, fatality rate is higher in fall victim associated with head injury and this results correlates with findings in the study of Pressley JC et.al<sup>(11)</sup>.

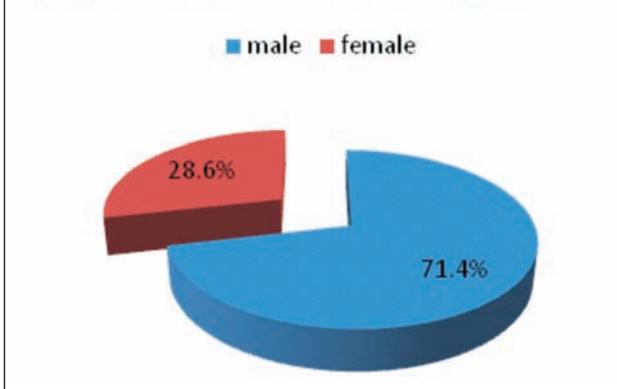
**Table 1: Distribution of study population based on incidence of autopsies**

Fall from height in children	Number of cases	%
NO	3830	99.64
YES	14	0.36
Total	3844	100

**Table2:Distribution of study population based on manner of death**

Manner	Number of cases	%
Accidental	13	92.9
Act of commission(homicidal)	1	7.1

**figure 1:Distribution of study population based on gender**



**Table3: Distribution of study population based on identity**

Identity	Number of autopsies	%
Unknown	01	7.1
Known	13	92.9
Total	14	100

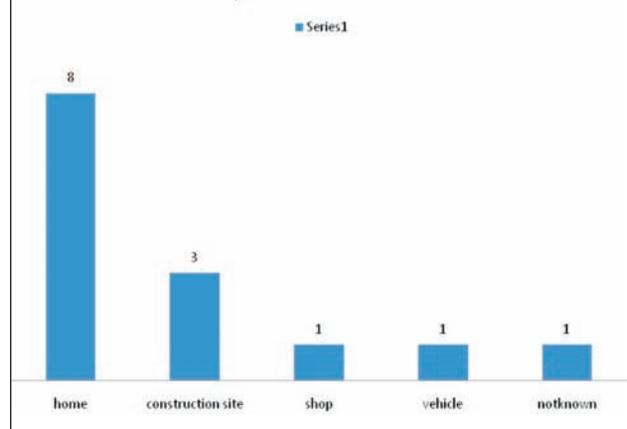
**Table4: distribution of study population according to height of fall**

Height of fall	Number of cases	%
0-5mts	04	28.6
6-10mts	05	35.7
11-20mts	04	28.6
Not known	01	7.1
Total	14	100

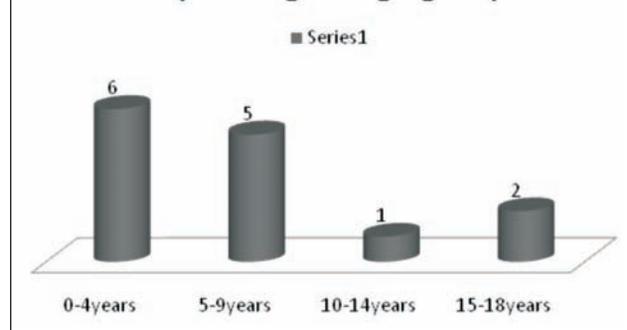
**Table5: Distribution of study cases based on cause of death and injuries sustained**

Injuries	Number of cases	%
Head injury	8	57.14
Head injury associate with other injuries	4	28.6
Chest	1	7.1
Lowerlimb(femur)	1	7.1
Total	14	100

**figure 2: Distribution of study population based on place of occurrence**



**figure3: Distribution of study cases depending on age group**



**CONCLUSION**

A retrospective study of pattern of injuries in fatal cases of fall from height in children subjected to medico-legal autopsy at Department of Forensic Medicine, Bangalore Medical College & Research Institute, Bangalore concludes:

- Fall from height in children subjected to Medico-Legal Autopsy contributed for 0.36% of total autopsies conducted.
- Most of the cases were accidental in nature 13(92.9%).
- One case there was allegation of act of commission.
- Majority them were males10(71.4%) than females(28.6%).

- Falls were more commonly seen in age group less than 9 years 11(78.6%).
- Half of the falls occurred at home 7 (50%).
- 9(64.3%) cases the height of fall was between 5 to 10 meters.
- Most of the fall victim died due to head injury and head injury associated with other injuries 12(85.7%).
- More than half of the victims of fall died before reaching to the hospital 8(57.14%).

The common risk factor observed was lack of safety measures at home/construction sites, lack of parental supervision of the children while playing.

### RECOMMENDATION

- Ensure safety at home by increasing height of parapet wall in terrace and balcony/verandahs.
- Proper fencing and safety measures at construction sites.
- Awareness campaign stressing the need of safety measures and supervision of children while playing.
- A uniform policy in this regard should be framed by the Government and made compulsory to be included in the blueprint of the building which should be verified by Development authority at the time clearance as well as after completion of the project<sup>(8)</sup>.

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# A Review of Mental Health Care Bill 2013

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## ABSTRACT

Michelle Funk, coordinator of Mental Health Policy and Service Development at WHO's Department of Mental Health and Substance Abuse commented: "Too few people with mental disorders and psychosocial disabilities in India have access to good quality mental health care, and too many within the system have experienced extensive human rights violations, including inhumane and degrading treatment, restraint, seclusion, physical, sexual, or emotional abuse, and neglect".

United Nations Convention for Rights of Persons with Disabilities (UNCRPD) was adopted in 2006, which marks a paradigm shift in respect of disabilities (including disability due to mental illness) from a social welfare concern to a human right issue. The new paradigm is based on presumption of legal capacity, equality and dignity. Following ratification of the convention by India in 2008, it became obligatory to revise all the disability laws to bring them in harmony with the UNCRPD.

This article discusses important salient features of the newly introduced MHCB 2013 and the background of its presentation and its purpose.

**Keywords:** *Mental Health Illness, Mental Health Act, Mental Health Care Bill 2013*

## INTRODUCTION

Legislation forms an important component in the implementation of mental healthcare. It is an expression of society with regard to the way it views and cares for mentally ill individuals. There is a dynamic relationship between the concept of mental illness, the treatment of the mentally ill and the law. <sup>(1)</sup>

Treatment of mentally ill sometimes requires the restriction of personal liberty. Whenever there is a problem to person's liberty there comes the role of the law. Most of the countries in the World have laws regulating treatment of psychiatric patients. As Rappeport has noted, for the psychiatrists the court is "another house ... with its different motives, goals and rules of conduct."<sup>(2)</sup> While the psychiatrist is concerned primarily with the diagnosis of mental disorders and the welfare of the patient, the court is often mainly

concerned with determination of competency, dangerousness, diminished responsibility and/or the welfare of society. <sup>(3)</sup>

The constitution of India provides under Article 21 that no person shall be deprived of his life or personal liberty except according to procedures established by law. It has been held that right to life and personal liberty under this article includes "facilities for reading, writing and expressing oneself in diverse forms, freely moving about and mixing and comingling with fellow human beings." <sup>(4)</sup>

The present judicial system of the country derives largely from the British system and is based on English Common Law, a system of law based on recorded judicial precedents. *Earlier legislations in respect of mental health were primarily concerned with custodial aspects of persons with mental illness and protection of the society.* The material was studied by using the key words 'mental illness in India', 'Mental Health Act 1987', 'Mental Health Care Bill 2013' in PUB MED and Google search.

Earlier Indian laws related to treatment of persons with mental illness

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Though there are elaborate descriptions of various forms of mental disorders in various treatises in Ayurveda, <sup>(5)</sup> the care of mentally ill in the asylums in India is a British innovation. <sup>(6)</sup> After the takeover of the administration of India by the British crown in 1858, a large number of laws were enacted in quick succession for controlling the care and treatment of mentally ill persons in British India.<sup>(7)</sup>

#### These laws were

- The Lunacy (Supreme Courts) Act, 1858
- The Lunacy (District Courts) Act, 1858
- The Indian Lunatic Asylum Act, 1858 (with amendments passed in 1886 and 1889)
- The Military Lunatic Acts, 1877 .
- Indian Lunacy Act 1912.
- Indian Mental Health Act 1987.

These Acts gave guidelines for establishment of mental asylums and procedure to admit mental patients. The British scene existing in the middle of the 19 century served as the background of lunacy legislations in that period in India. The various Acts of 1858 naturally reflected the legalistic frame for the management of the mentally ill. <sup>(8)</sup> During the first decade of the 20 century, public awareness about the pitiable conditions of mental hospitals accentuated as a part of the growing political awareness and nationalistic views spearheaded by the Indian intelligentsia. <sup>(7)</sup> As a result, the Indian Lunacy Act, 1912 was enacted. The 1912 Act guided the destiny of Psychiatry in India. <sup>(8)</sup> Lunatic asylums (named mental hospitals in 1922) were now regulated and supervised by a central authority. Procedure of admission and certification in this respect was clearly defined. The provision of voluntary admission was introduced. Still, the main stress was on preventing the society from dangerousness of mentally ill and taking care that no sane person is admitted in these asylums. Psychiatrists were appointed as full time officers in these hospitals. Provisions of judicial inquisitions for mentally ill persons were also given in the Act. After the Second World War, Universal Declaration of Human Rights was adopted by the UN General Assembly. Indian Psychiatric Society submitted a draft Mental Health Bill in 1950 to replace the outmoded ILA-1912. Mental Health Act (MHA-87) was finally enacted in 1987 after a long and protracted course. Main features of the Act are as follows.

- Definition of mental illness in a progressive way and introducing modern concept of their treatment with stress on care and treatment rather than on custody.
- Establishment of Central/State Mental Health Authority to regulate and supervise the psychiatric hospitals/nursing homes and to advise Central/State Governments on Mental Health matters.
- Admission in special circumstances in psychiatric hospital/nursing homes. Provisions of voluntary admission and admission on the reception orders were retained.
- Role of Police and Magistrate to deal with cases of wandering PMI and PMI cruelly treated.[persons of mentally ill]
- Protection of human rights of PMI. [persons of mentally ill]
- Guardianship and Management of properties of PMI.[Persons of mentally ill]
- Provisions of penalties in case of breach of provisions of the Act.

Though having many positive features, the MHA-1987 has been the target of criticism right since its inception. It is alleged to be concerned mainly with the legal procedure of licensing, regulating admissions and guardianship matters of PMI. Human right issues and mental health care delivery are not properly addressed in this Act. <sup>(9)</sup> Because of a large number of very complicated procedures, defects and absurdities in the Act and also in the Rules made under the Act, it can never be implemented properly. <sup>(10)</sup> Human right activists have questioned the constitutional validity of the MHA, 1987 because it involves curtailment of personal liberty without the provision of proper review by any judicial body. <sup>(11)</sup> MHA-87 is now replaced with Mental Health Care Bill 2013.

#### Review of the new mental health care bill

The new Bill is much longer than the existing MHA 1987 having 16 Chapters and 137 clauses. The Mental Health Care Bill, 2013 was introduced in the Rajya Sabha on August 19, 2013. The Bill repeals the Mental Health Act, 1987.

#### Definition of 'mental illness'

One of the significant advancement in the MHC Bill is the definition of 'mental illness.' It defines mental

illness as "a disorder of mood, thought, perception, orientation and memory which causes significant distress to a person or impairs a person's behaviour, judgment and ability to recognize reality or impairs that person's ability to meet the demands of daily life and includes mental conditions associated with the abuse of alcohol and drugs, but does not include mental retardation".<sup>(12)</sup>

This definition of 'mental illness' is a major improvement over the MHA1987 which did not provide any guidance as to what would constitute mental illness – except for stating that a person who was mentally ill was anyone needing treatment and who did not come under the definition of mental retardation. This was clearly from a medical model of disability, while the MHC Bill seeks to understand mental illness from a social model, giving a broad and inclusive definition as to what may constitute mental illness.

### Post admission judicial review

All involuntary admissions, in all Mental Health Establishments, wherever a person with mental illness is admitted even for a day, whenever challenged by the patient; will undergo a review by panels of Mental Health Review Commission, which will be located at district levels.

The provision in principle is undoubtedly progressive. After all we are talking about civil detention and curtailing patients' most basic right, that is, liberty; and so, a review if asked for by the patient, should be possible. It will also take care of an occasional complaint that patients file with the police, who having no sensitization about situations associated with severe mental illness, are sometimes a source of considerable trouble to mental health professionals.

### Advance directives

This provision enables all persons who have had mental illness in the past and are currently in a competent state to write down their wishes on a plain paper on how they would like to be treated in the event of a future episode and how they would specifically not like to be treated.

A typical advance directive may be that the individual will like to be treated with only medication and not electroconvulsive therapy (ECT) or he would like to be treated as an outpatient and not be admitted to a hospital.

- Advance directives not being applicable during first 72 hours of "emergency treatment" and all advance directives of "no treatment at all" having to be registered with the review commission.

Thara and Rameshkumar<sup>(13)</sup> have reported that in an Indian setting it was possible for the patients to understand the concept and participate in a decision making process about planning treatment for a future eventuality.

### ECT

The important change in the new MHCB-2013 that the psychiatrists have been uniformly unhappy about is to do with ECT. The new bill proposes to ban ECT. The psychiatrists argue that it will ultimately work against patients' interests.

Andrade et al.<sup>(14)</sup> have published a well-argued position statement regarding unmodified ECT in the context of the proposed prohibition.

The bill also stipulates that ECT to minors will be given only after permission from the Review Commission on a case-to-case basis. Psychiatrists point out that there is no evidence that ECT has more side effects in minors than in older adults. It is also important to know that youngsters with catatonic features where ECT is the treatment of choice often present as an emergency when there is no time to run around for permissions.

### Right to access

According to Section 18, "Every person shall have a right to access mental healthcare and treatment from mental health services run or funded by the appropriate government". If a particular district has no public mental health services, the individual has a right to access private services and get refunded. The governments are mandated by the bill to provide essential psychotropic medications free of cost. The insurance companies will have to consider mental illness at par with physical illnesses, and will not be allowed to include mental illness as one of the exclusion criteria. These measures have been hailed as progressive and 'pro-poor' by Gopikumar.<sup>(15)</sup>

### First 72 h in case of emergencies

Where there is danger to patient's health or the patient is violent or suicidal, any Registered Medical Practitioner (and above) can give any appropriate treatment (except ECT) in any setting including home

or community for the first 72h (120 h for the northeast). The emergency treatment can include transportation of a patient to a mental health facility.

### **Autonomy and Equality of Persons with Mental Disabilities in the MHC Bill**

- a) Autonomy and Legal Capacity Article 12 sets out the right to recognition everywhere as persons before the law,<sup>(16)</sup> as well as the recognition that persons with disabilities enjoy legal capacity on an equal basis with others in all aspects of life.<sup>(17)</sup> This provision proscribes discrimination on the basis of the mental disability of a person. The Article also makes a paradigm shift from 'substituted' to 'supported' decision making, thus abolishing any transfer of rights of decision making to another person.<sup>(18)</sup>
- b) Equality and protection of rights of persons with mental disabilities:

The MHC Bill brings about a rights-based protection of mentally-ill persons.<sup>(19)</sup> This was never the focus of the MHA, and the MHC Bill fills the requirement of the UNCRPD by guaranteeing to all persons the right to access to mental healthcare, and a range of services for persons with mental illness including shelter homes, supported accommodation, community based rehabilitation; the right to community living, the right to live with dignity, protection against cruel, degrading and inhuman treatment, the right to equality and non-discrimination, the right to information, confidentiality and access to medical records; right to personal communication, legal aid and the right to make complaints about deficiencies in provision of services in addition to other similar legal remedies

### **Duties of the Government**

The burden of planning, designing, implementing programs for promotion of mental health and prevention of mental illness, creating awareness about mental illnesses, reducing stigma, sensitizing govt. officials including police officers, implementing public health programs to reduce suicides and other such programs has been placed on the appropriate government.<sup>(20)</sup> Insufficient awareness, advocacy and sensitization about mental illness were serious pitfalls of the MHA and this is being remedied by the Bill.

### **Decriminalization of Suicides**

A remarkable provision in the MHC Bill provides

that a person who attempts to commit suicide will be presumed to have a mental illness and will not be subjected to any investigation or prosecution.<sup>(21)</sup> In 2011 alone, a staggering 1,35,585 people committed suicide and this number has increased 25% over the last decade (National Crime Records Bureau 2012). The Bill adopts a beneficial approach towards people who attempt suicide and casts an obligation on the appropriate government to provide care, treatment and rehabilitation to reduce the risk of recurrence of attempted suicide.<sup>(22)</sup>

### **CONCLUSION**

The government ratified the United Nations Convention on the Rights of Persons with Disabilities in 2007. The Convention requires the laws of the country to align with the Convention. The new Bill was introduced as the existing Act does not adequately protect the rights of persons with mental illness nor promote their access to mental health care. Human right activists are pressing for legal capacity to mentally ill in absolute terms, whereas psychiatrists are in favor of retaining provision for involuntary hospitalization in special circumstances. It must be emphasized that the ultimate aim of any legal provision should be the welfare of the mentally ill and the society at large.

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# Determination of Age of Intrauterine Life of Foetus by Examination of Long Bones of Skeleton

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## ABSTRACT

Causing death to a human being is a heinous crime. Infanticide is no exception to this. More so it is easier to dispose dead foetus in the normal Indian condition, where water bodies like lake, river, rivulets and some amount of jungle are rampant. In such conditions the medicolegal experts faces a lot of challenges as police often gets a bundle of bones for investigation into death of foetuses. Estimation of intrauterine age is most important in determination of identity of the dead foetuses in day-to-day work by the medicolegal expert.

Keeping the above facts in mind 26 skeleton of still born foetuses were examined during the period September 2003 to September 2004 in the department of forensic medicine GSL Medical College Rajamundry. The skeletons were prepared from the stillborn foetuses & examined by measuring the long bones with the help of measuring calipers.

The length of long bones like humerus, radius, ulna, femur, tibia, and fibula show a striking ratio with the age of foetus. Our experiment has devised a simple method of measuring long bones, which will be helpful in determining the age of foetuses in day-to-day work by the medicolegal expert.

This being a preliminary study, study with larger samples is necessary to throw some more light into the determination of the age of the foetus.

*Keywords: Foetus, Infanticide, Calipers, Age of Infant*

## INTRODUCTION

Infanticide is as old as human history. Present natural conditions of India presents a safe haven for disposal of the killed foetuses. On many occasions the police produce a bundle of foetal bones before the medico legal expert for finding out the cause of death, age of the foetus & viability of foetus.

### Review of literature

Several investigators have produced linear regression formulae based on crown-heel length, crown- rump length or body diameters to determine gestational age of the foetus. Oliver&Pineau(1958)<sup>1,2</sup> calibrated new relative numbers by which the age of

unknown foetuses can be determined on the basis of length of some long bones. Fazeka & Kosa (1978)<sup>3</sup> studied foetal skeleton and came to a conclusion that as the age increases, the length of the bone increases proportionately with the growth in the length of the body. Warren, MW<sup>4,5,6</sup> re-examined the relation between foetal bone length and gestational age from radiological measurement of diaphysis of major long bones and found a strong positive correlation. He derived a regression formula for estimation of crown-rump length and the length of long bones thus measured radiologically.

In our country Sreeramulu K.et al<sup>7</sup> studied 52 foetal skeletons & derived a linear regression formula

between crown-heel length and length of long bones. After this no further sincere efforts were made in this country for an Indian formula for the foetus.

Keeping all these facts in mind present work has been undertaken.

## MATERIALS AND METHOD

26 numbers of human still born foetuses were randomly collected during the period 2003-2004 from delivery of healthy mothers in labour room of GSL Medical College Rajamundry. The foetuses were carefully selected random samples. All the foetuses are of healthy parents; the previous history did not record any evidence of diseases, constitutional anomalies, pathological conditions of skeletal system. Macerated foetuses were discarded, as accurate measurement of parameters of foetuses are not possible.

The history of duration of amenorrhoea of mothers, crown heel and crown-rump length of foetus with head circumference, development of scalp hair, nails of toes & fingers, position of umbilicus, position of testicles and meconium in intestines were taken note of and tentative ages of gestation was determined.

The foetuses were submerged in water and complete maceration and separation of soft tissues from the bones occurred in a few days. The bones were washed repeatedly with water and kept dried in shade.

### Measurements of bones

The diaphyseal lengths of femur, tibia, fibula, humerus, radius and ulna of all the 26 fetuses were measured with osteometric calipers to the nearest millimeter as follows.

- 1) **Femur:** Greatest overall length from the medial (in contact with the fixed vertical planes) to the head. The bone lies with its anterior surface uppermost and is moved from side to side until the maximum reading is obtained.
- 2) **Tibia:** Greatest length exclusive of intercondylar eminence from the lateral condyle (in contact with the fixed vertical planes) to the tip of medial malleolus. The bone lies with its anterior surface uppermost and its long axis parallel to that of the table.
- 3) **Humerus:** Greatest overall length from most distant margin of trochlea (in contact with the fixed

vertical planes) to the head. The bone lies with its anterior surface uppermost & is moved from side to side until the maximum reading is obtained.

- 4) **Radius:** Greatest length from tip of the styloid process (in contact with the fixed vertical planes) to the head. The bone lies with its posterior surface uppermost and its long axis parallel to that of the table.
- 5) **Fibula:** the upper end is kept in the sliding limb and the lower end to fixed limb with the back surface touching the table and the measurement is made.
- 6) **Ulna:** Keeping the upper end at the fixed limb and lower end at the sliding limb and the back surface touching the table, the measurement is made.

## OBSERVATION

Total 26 foetuses and their skeletons were examined. Number of female foetuses is 9 while that of male is 17. The estimated gestational age of foetuses derived from menstrual history and clinical examination of the foetuses before skeletonisation ranges from 4 months to 10 months.

All the data thus obtained related to age of the foetus, crown-heel length, sex of the foetuses and length of long bones of the foetuses are computed in the Department of Community Medicine (statistical section), GSL Medical College Rajamundry using SPSS. It revealed that there is no significance in the data of the left & right side and sex of long bones in relation to age. There is a great significance of the length of long bones to the age of the foetus.

## DISCUSSION

Sreeramulu K. et al<sup>4</sup> in their study found out no significance of the length of long bones in relation to sex or side of the bones. In our study also we found the same result. As in the study of Fazeka & Kosa (1978)<sup>2</sup> our study revealed significances in relations between length of long bones and gestational age of the foetus from which a linear regression formula could be possible. However due to small sample size we are not able to deduce the formula at present.

## CONCLUSION

We recommend a study with larger sample size to find out an Indian standard formula between length

of long bones and gestational age of the fetuses.

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# Lip Print: an Aid to Human Identification

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## ABSTRACT

Among the various methods of identification, cheiloscropy is one of the most interesting emerging techniques. It is a method to establish the identity of a person based on the presence of grooves on the red part of human lips as various studies have revealed the unique nature of lip prints just like finger or footprints. Edmond Locard of France was the first to recommend the use of lip prints for individual identification. Since 1950, the Japanese has carried out extensive research in the matter. Lip prints at a scene of crime, apart from identification, may help to point as to the nature of crime, sex of the person involved, type of cosmetics used, habits or any pathological changes of lips. Credibility of lip prints as a human identification tool for evidential purposes is yet to be accepted by courts in India as literature reveals very little research done in this field. There is a need to review the various methods of recording and collection of the lip prints at the crime scene and also the means to develop the latent lip prints. This paper reviews in detail all the important aspects of cheiloscropy like its scope in crime investigation, limitations and current research carried out in this field.

**Keywords:** Cheiloscropy, Lip Prints, Identification, Latent Lip Prints

## INTRODUCTION

Among the various identification data like anthropometric measurements, fingerprints, scar marks, etc. that help fix the identity of a person lip print study is another upcoming forensic science that's gaining popularity as an identification aid for the individuality of a person. A Lip print is a characteristic pattern produced by the numerous elevations and depressions present on the red external surface of the lips. Lip prints are unique and permanent, i.e. does not change during the life of a person.<sup>1,2,3</sup>

### History

The anthropologist R. Fischer was the first to note and describe the presence of wrinkles and furrows on the human lip in 1902.<sup>4,5</sup>

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The criminologist, Edmond Locard, in 1932 emphasized the significance of lip print studies.<sup>6</sup> Synder L, M, in 1950, described the possible role of using the lip prints as a tool of personal identification.<sup>7</sup> Japanese scientists Suzuki and Tsuchihashi, during 1970 and 1974 in their studies demonstrated the hereditary character of lip prints. They devised a classification of six different types of grooves. It was observed that not even the uniovular twins had exactly the identical lip print patterns.<sup>3,8</sup> Since 1985, in Poland, the methods of finding and recovery of lip traces, recovering comparative material, and techniques employed to carry out that expertise have been introduced into the casework of the fingerprint Department of the Central Forensic Laboratory of Police in Warsaw.<sup>9</sup>

### Studying the lip prints

Lips are composed of skin, muscle, glands and mucous membrane. The mucosal area, also called Klein's zone,<sup>10</sup> is covered with wrinkles and grooves that form a characteristic pattern – the lip print. As shapes and size of lips differ among individuals, following four groups have been identified<sup>10</sup>:

1. Thin lips (common in European Caucasian)
2. Medium lips (from 8 to 10 mm- most common type)
3. Thick or very thick lips (seen in Negroes)
4. Mix lips (usually seen in Orientals)

Santos classified the lip grooves for the first time as simple and compound type. Simple grooves were further divided into straight, curved, angled and sine-shaped line. And compound type was further subdivided as bifurcated, trifurcated and anomalous groups.<sup>11</sup> Suzuki and Tsuchihashi's classification of lip prints is the most commonly used classification in literature. They classified lip prints into six types<sup>3, 12, 13</sup> (Table-1):

**Table: 1**

Classification	Groove type
Type I	Complete vertical
Type I'	Incomplete vertical
Type II	Branched
Type III	Intersected
Type IV	Reticular pattern
Type V	Irregular

According to Renaud's classification,<sup>10</sup> the lips are studied in halves (left and right), and every groove, according to its form, has a number. Kasprzak's, Afchar-Bayat's are the other classifications of significance. Kasprzak determined the pattern based on the numerical superiority of properties of the lines on the fragment and then prepared a catalogue of individual features, 23 types of individual properties were differentiated. The middle part of the lower lip, 10 mm wide, was taken as the basis for classification.<sup>4, 5</sup>

### Recording, collection and analysis of lip prints

Lip prints can be recorded by applying lipstick or other suitable transfer medium to the lips and then pressing the lips to a piece of paper or cellophane tape.<sup>1, 3, 14, 15</sup> Or they may also be taken without applying lipstick or any other transfer medium on a suitable surface and then these prints are processed with conventional or other fingerprint developing methods. Photographing the suspect's lips, or the use of a finger printer (roller finger printer) are the other ways of collecting the lip prints.<sup>1, 3</sup>

Lip prints encountered in crime scene investigation may be seen as visible lipstick smears or they may not

be visible at all i.e. latent prints. The vermilion border of the lips has minor salivary and sebaceous glands which, together with the moisturizing done by the tongue, leads to the possibility of the existence of latent lip prints.<sup>8,10</sup> Latent lip prints could be studied in a similar way to fingerprints, using similar techniques.<sup>16,17,18,19</sup> Latent prints present on porous or multicolored surfaces can be easily seen using fluorescent dyes.<sup>10</sup> Nowadays persistent lipsticks are also there which do not leave a visible smear or mark.<sup>16</sup> Conventional powders are not effective for development of lip prints from persistent lipsticks because of minimal oil content in them so lysochromes (Sudan III, Oil Red O and Sudan black) in such cases are very effective when used on long-lasting lipstick prints, even on porous surfaces.<sup>20</sup>

Commonly used substances for development of lip prints are Aluminium powder, silver metallic powder, silver nitrate powder, plumb carbonate powder, fat black aniline dyes or cobalt oxide.<sup>16,18</sup> DFO (1,8-Diazafluoren-9-one), ninhydrin, cyanoacrylate dye and iodine spray reagent are the agents suitable to develop latent lip prints over non-ideal surfaces.<sup>10,21</sup>

For the study and analysis of lip prints, following technical methods can be applied:<sup>4,5,22</sup>

- The method of determining common features (similar to dactylography): Establishment of seven to nine fine characteristics lead to positive identification.
- The photographic montage method.
- The contour method.

Determining the common properties is the most basic identification method. The photographic montage method and the contour method supplement and support the method of establishing common properties.<sup>22</sup>

### Limitations of recording and analyzing the lip prints

There may be variation in lip print appearance of the same person according to the pressure, direction and method used in making the print. The type of lipstick, its amount applied, the quality of paper, etc. affects a lip print and may pose difficulty in its analysis. The presence of some pathological conditions like congenital lip fistula, lip scleroderma, Merkelson-Rosenthal syndrome, syphilis, etc. limit the reliability of lip print studies.<sup>23</sup> Utsuno et al. Studied the post-mortem changes in lip prints from cadavers and

concluded to have achieved satisfactory identification rate, but as the study was carried out in laboratory settings its validity in lip prints obtained from cadavers exposed to natural environment is dubious.<sup>24,25</sup> Lack of antemortem lip print records invalidate telescopic importance in postmortem identification cases, i.e. the only use of telescope will be to relate lip prints to the lips that produced them.<sup>26,27,28,29,30</sup>

### CONCLUSION

Lip prints have been proved reliable to link a suspect to a crime and thus more emphasis should be given to this field and its application should be acknowledged and considered by both law enforcement agencies and legal professionals. Some studies have even revealed the possibility of identification of a person's gender with characteristic lip pattern and detection of DNA in latent lip prints.<sup>31</sup> The fact that the possibility of latent lip prints being found at a scene of crime on articles like cups, glasses, cigarette buds are not less. There is ample research to prove that lip prints are suitable for the successful comparison, analysis and identification of a person. In fact, there have been instances when successful convictions of perpetrators of crime have been carried out, who were positively identified by the analysis of their lip prints to those found at the crime scene.<sup>9</sup> The recent advances in the field of cheiloscropy establish its scope much more than commonly thought.

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# A Study of Permanent Physical Disability Pattern in Motor Vehicle Accident Cases Presenting at Sms Hospital, Jaipur During the Year 2012-2013 a Prospective Study

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## ABSTRACT

Worldwide motor vehicle collisions lead to death and disability as well as financial costs to both society and the individuals involved. The maximum numbers of disabled people as a consequence of motor vehicle collision in our study were in 21-30 years age group (30.3%) followed by 31-40 years (24.6%) and 41-50 years (15.7%). Majority of the disabled people were literates constituting 85.43% of total cases. Majority of the disabled persons in our study were persons engaged in the private sector (49%) and about 20 % of the disabilities were found to have occurred in students. Majority of the disabled persons were on motorized two wheelers (66.6%) followed by 22% pedestrians. Among the 350 disabled people, majority of the people suffered locomotor disabilities (88.57%) followed by visual (4%); hearing disability (3.15%) and speech disability (2.28%). The aim of this study to evaluate the level and patterns of disabilities resulting from traffic injuries among the study population as well as its distribution by age, gender and type of motor-vehicle user.

*Keywords: Disability, Motor Vehicle Collisions, Locomotor Disability*

## INTRODUCTION

Globally research into road traffic accidents in relation to disability and its socioeconomic impact seems much less than research into mortalities. Due to this gap, little is known about effects on livelihoods and wellbeing of road traffic accident victims and their households. Long-term impacts of traffic injury are poorly documented in all countries and little is known about this impact. While road traffic accident rates and related death and disability are decreasing in most industrialized countries, they are increasing rapidly in many less developed countries. Also vulnerable road users account for a much greater proportion of road traffic collisions in low-income and middle-income countries than in high income countries. They also exert a considerable economic burden on the developing countries. This might also be explained by the fact that road construction and road safety measures are not developed to match the increase number of vehicles which lead to road traffic accidents

inducing physical disability and fatalities. The disabilities resulting consequent to traffic injuries can occur in the form of mental impairment, visual impairment, hearing impairment, speech impairment, somatosensory impairment, intellectual disability and locomotor.

## MATERIAL AND METHOD

All cases of alleged history of Motor Vehicle Accidents presenting for disability assessment to the designated medical board for the purpose of motor accident claim case during the study period and whose assessment revealed the presence of some resultant disability following a road traffic accident. The present study is prospective hospital based study during the period May 2012 to April 2013. Instrument used- Disability (Permanent physical impairment) assesment and Certification {Based on Guidelines and Gazette Notification Regd. No. Dl33004/99 (Extraordinary) Part II, Sec 1, June 13, 2001 Issued By Ministry Of Social

Justice & Empowerment, Government Of India} using Manual for Doctors to Evaluate Permanent Physical Impairment Based on Expert Group Meeting on Disability Evaluation & National Seminar on disability

Evaluation and Dissemination D.G.H.S. – W.H.O. – A.I.I.M.S New Delhi – 1981<sup>1</sup>.

All cases of other than history of MVA presenting at MACT Board in the study period were not included.

### OBSERVATION

**Table 1: Showing Age and Sex Wise Distribution of 350 Cases of Permanent Physical Disability**

Age Group(years)	No. of Disabled		Total No. of Males & Females	Percentage (%)
	Male	Female		
0-10	10	03	13	3.7%
11-20	26	06	32	9.1%
21-30	86	20	106	30.3%
31-40	70	16	86	24.6%
41-50	46	09	55	15.7%
51-60	30	09	39	11.2%
>61	14	05	19	5.4%
Total (%)	282 (80.57%)	68 (19.43%)	350	100%

The maximum numbers of disabled people as a consequence of motor vehicle collision in our study were in 21-30 years age group (30.3%) followed by 31-40 years (24.6%) and 41-50 years (15.7%). Thus, in our study majority of the disabilities resulted in persons

between 21-50 years (70.6%), which are the most active and the most productive persons of the society; the most common victims of road traffic accidents being actively engaged in the daily chores of life. The study group included 82.5% males and 17.5% females.

**Table 2: Showing Marital Status of 350 Cases of Permanent Physical Disability**

Marital Status	Male (%)	Female (%)	Total No of Males & Females	Percentage (%)
Married	192 (68%)	53 (77.9%)	245	70%
Unmarried	90 (32%)	15 (22.1%)	105	30%
Total (%)	282 (80.57%)	68 (19.43%)	350	100%

A total of 350 disabled persons were there in our study, of which 70 % were married and rest 30% were unmarried. Among the married people 78.4% were males and 11.6% were females and among the unmarried people 85.7% were males and 14.3% were

females. In all, 68.08% males were married and 77.94% females were married. Thus the majority of the people presenting with disabilities in our study were married males with dependant families to look after.

**Table 3: Showing Educational Status of the 350 Cases of Permanent Physical Disability**

Educational Status of the Disabled people	No. of Disabled people	Percentage (%)
Illiterate	51	14.57 %
Primary	48	13.72 %
Upper Primary	38	10.86 %
High School	72	20.57 %
Graduate	82	23.43 %
Post Graduate	59	16.85 %
Total	350	100 %

Majority of the disabled people were literates constituting 85.43% of total cases. Out of 350 people, 51 people (14.57%) were illiterate. 23.43% of disabled were graduates and 16.85% were postgraduates.

Educational status does not seem to have any relation with the resulting disabilities in different victims of road traffic accidents.

**Table 4: Showing Distribution of 350 Cases of Permanent Physical Disability according to their Occupation**

Type of Occupation	Male	Female	Total No of Males & Females	Percentage (%)
Private Job	156	16	172	49.1%
Student	56	13	69	19.7%
Government Job	24	07	31	08.9%
Housewife	00	28	28	008%
Manual Labourers	14	02	16	04.6%
Farmer	12	01	13	03.7%
Drivers	09	00	09	02.6%
Retired persons	08	00	08	02.3%
Business	03	01	04	01.1%
Total	282 (80.57%)	68 (19.43%)	350	100%

Majority of the disabled persons in our study were persons engaged in the private sector (49%) and about 20 % of the disabilities were found to have occurred in students. This reflects upon the burden that is added

upon the society such that after the occurrence of the disability, bread winning would be a challenge for them.

**Table 5: Showing Distribution of 350 Cases of Permanent Physical Disability According To Victim's Vehicle**

Victim's Vehicle	Male	Female	Total No of Males & Females	Percentage (%)
Two- Wheeler	190	43	233	66.6%
Pedestrian	59	18	77	22%
Car/ Jeep	19	05	24	06.9%
Cycle	08	01	09	02.5%
Heavy Commercial vehicles	05	00	05	01.4%
Bus	01	01	02	00.6%
Total	282 (80.57%)	68 (19.43%)	350	100%

Majority of the disabled persons were on motorized two wheelers (66.6%) followed by 22% pedestrians. Disabilities resulted more in people who were either on foot or on two wheelers as compared to the people

in four wheeled vehicles. It is obvious that the pedestrians and two wheeler drivers and pillion riders suffer more severe injuries than the drivers and occupants of four wheelers.

**Table 6: Showing Distribution of 350 disabled people according to the Type of Permanent Physical Disability**

Type of Disability	Male	Female	Total	Percentage (%)
Loco motor	251	59	310	88.57 %
Visual	11	03	14	4 %
Hearing	09	02	11	3.15 %
Speech	05	03	08	2.28 %
Psychiatric	06	01	07	2 %
Total	282	68	350	100 %

Among the 350 disabled people, majority of the people suffered locomotor disabilities (88.57%) followed by visual (4%); hearing disability (3.15%) and speech disability (2.28%). The type of disability which was observed in least number of disabled victims of road traffic accidents was psychiatric impairment (2%). Locomotor disabilities were the most common type of disability seen in victims of road traffic accidents suffering disabilities in our study.

## DISCUSSION

This study was undertaken with the aim of studying the pattern and levels of permanent physical disability in motor vehicle accident compensation cases who presented for disability assessment at SMS hospital, Jaipur during the study period in addition to the observation of their socio-demographic profile. No study could be retrieved on the same subject as pursued in our study. Though, similar studies were retrieved yet only a few of them have covered the topic of disabilities resulting from motor vehicle accidents in various parameters in the manner undertaken in this study. The observations of this study have been discussed as best as possible with the available literature wherever comparable. No such comparable study was found to have been conducted in this region and in India; thus, all comparative discussions are done with the relevant foreign literature. In our study, the maximum number of persons who were found to have suffered disabilities following road traffic accident were between 21 to 50 years of age (70.6%) which is the most productive age group of the society. These are the persons who range among the most active population of any region as regards to the professional, social and family lives. Also, these highlights upon the concern that should be given to these road traffic disabilities as they commonly affect the active sections of the society thus, resulting in an undue and avoidable socioeconomic burden over the social system and Governments. Similar findings have been reported by most authors (20-24 years by Fernando J et al, Spain, 1998<sup>2</sup>; 33.11 (SD:16.70) years by Esiyok B et al, Turkey, 2005<sup>3</sup>; 30-54 years by Baset MK et al, Bangladesh, 2012<sup>4</sup>; more in adult population by Lin T et al, China, 2013<sup>5</sup>). The children less than ten years of age and the elderly population i.e. the retired senior citizens more than sixty-one years of age comprised the least affected populations in our study. These are obvious findings as these are the least mobile age groups of the society thus at lesser risk of suffering traffic injuries and consequent disabilities.

The study population of the disabled people included in our study was predominantly of males (82.5%). Rest of the presenting disabled patients of the study group was females (17.5%). This finding again reflects upon the socio-economic burden caused to the society by this tertiary impact of road traffic accidents. Most other studies report predominance of males with disabilities following traffic injuries. Our findings are quite similar to those of higher in men than in women (Ferrando J et al, Spain, 1998); 64.7% males and 35.3% females (Esiyok B et al, Turkey, 2005); 63.6% males and 36.5% females (Suvapan D et al, Thailand, 2012<sup>6</sup>); significantly higher proportion of male victims (Baset MK et al, Bangladesh, 2012); higher road traffic disability odds in male gender (Lin T et al, China, 2013).

Out of the 350 victims who suffered some level of disability following motor vehicle accidents, majority were literates (85.43%) with about 40% people belonging to higher education strata. This is the pattern probably because educated people are engaged in varying professional fields wherein they are predisposed to an increased activity in daily life especially in terms of mobility from one place to other for purposes of work, education, entertainment and familial liabilities. In contrast Lin T et al, China, 2013 reported a preponderance of low education people again for the reason of variation in the study population. Almost half of the total 350 victims suffering disabilities were working in the private sector (49.1%) which may be for the reason that most private sector jobs are related to marketing, advertisement and sales requiring more activity and travelling for the purpose of job work. These were followed in numbers by the students (19.7%) being an unexpected finding, but quite explainable in modern times when education has gained importance and requires an active participation with increasing mobility to various centers for extra gains in addition to their main educational institution. Unexpectedly professional drivers who are in a profession where they are most predisposed to the possibility of such episodes and their resulting outcomes were among the group with least numbers of disabled victims. The reason behind this is probably that the mortality rate of drivers is higher as they usually drive commercial heavy vehicles and more so over the highways. In our study there was no unemployed victim which is in contradiction to that reported by Lin T et al, China, 2013 where a greater number of road traffic disability victims lacked employment. The only probable reason for the discrepancy in the findings of the two studies is for

the reason of variation in the study group. Our findings are also dissimilar to those of Suvapan D et al, Thailand, 2012 who reported that the majority of the disabled victims in their study were labourers.

Out of the 350 victims who became disabled after an episode of road accident more than half (66.6%) victims were on two wheelers (mostly motorcycles); more than three quarters of whom were riding the vehicle and the rest were pillion riders; followed by pedestrians (22%). The reason for the preponderance of two wheeled vehicles is quite explainable by their significant volumes on the roads in our country and also for their vulnerability of encountering a road traffic crash. Our study has quite similar results as those of Suvapan D et al, Thailand, 2012 who reported 78% motorbikes; 6.8% pickups; 5.5% non specified vehicles; 3.7% trucks; 3.6% bicycles; 1.7% cars and 0.7% buses. Our findings are quite in accordance to those of Suvapan D et al, Thailand, 2012; but slightly variable from those of Bull JP, Birmingham, 1985<sup>7</sup> who reported equal proportion of disabilities in occupants of two wheelers, pedestrians and the occupants of four wheelers and similar too when he reported a high relative frequency of injuries and severity of injuries among motorcyclists. The reason for this difference lies in the different periods of study being 1985 and 2013 due to the variation of the traffic cultures with changing times. Our findings are also variable from those of Ferrando J et al, Spain, 1998 who reported highest disabilities in occupants of two wheelers, followed by the car occupants and pedestrians ranking at the last.

### CONCLUSION

This study highlights that road traffic accidents being a major cause of death and disability for the population of any region is not just an issue for concern for their mortality rates but also the magnitude of permanent physical disabilities resulting from these casualties. There is a need to carry out further studies in this field on a larger scale to develop a baseline data regarding these disabilities in our country to reduce this tertiary complication and socioeconomic burden of road accidents in Indian society.

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# Sexual Dysfunction among Iranian Divorcing Couples

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## ABSTRACT

**Background:** Marital satisfaction is crucial for maintaining good relationship between couples. It is influenced by proper sexual satisfaction. On the other hand, it appears that sexual issues result from problematic or unsatisfactory relationships. The present study was aimed to assess sexual dysfunction as a notable basis of divorce among Iranian population.

**Material and method:** The studied couples were randomly selected from couples who had attended in state civil court to take permission for divorce. To investigate sexual dysfunctions, Golombok-Rust Sexual Satisfaction Inventory (GRSSI) was used. Their demographic data was also gathered. Their data was compared with couples who were selected from An OPD clinic. The study had been approved by local ethical committee of Arak's university of medical sciences. The collected data was analyzed using SPSS software version 16.0.

**Findings:** Both men and women in the study group had less frequent sexual intercourse. The men took total score  $51.18 \pm 18.75$  from Golombok-Rust Sexual Satisfaction Inventory, whereas the control group took the score  $30.16 \pm 14.41$ . Their difference was statistically significant (P value less than 0.001). The corresponding score was  $56.62 \pm 16.43$  and  $29.78 \pm 14.35$  in females; again is statistically significant (P value less than 0.001). The same is true for every dimension of the questionnaire.

**Conclusion:** Marital conflicts and decision to divorce may originate from sexual dissatisfaction. It is recommended that divorcing couples are referred to sex therapy clinic or psychiatrist, particularly in communities with restricted cultural freedom for expression of sexual needs such as Iranians.

**Keywords:** Marital Conflict; Divorce; Sexual Dysfunction; Iran

## INTRODUCTION

In the third millennium, family unit remains the most important element of the community. Marital satisfaction is considered crucial for every member of the society. It is related to the level and quality of general health, life satisfaction and loneliness sense <sup>(1)</sup>. On the other hand, divorce is one of the family and social crises which demolish the stability of the family and damage the mental health of members of the family. Most of the researchers believe that the serious reflections of this sad event are increasingly growing, and attack the individual and social health. Divorce is not only considered a personal phenomenon, but also considered as a social phenomenon <sup>(2)</sup>. For instance, the children of the family also suffer from its consequences. The intergenerational transmission of

marital quality and divorce is well documented. Young adults whose parents divorced are at greater risk for marital difficulties and divorce themselves <sup>(3)</sup>.

The factors associated with divorce varied from the process of marriage to the quality of sexual life and other individual characteristics <sup>(4)</sup>. It often appears that sexual issues result from problematic or unsatisfactory relationships. However, it is often difficult to discern causality, i.e. which came first. It is also difficult to examine the relationship between sexual problems and relationships <sup>(5)</sup>. Sexual dysfunction created in any way, have many negative consequences. Existing studies show that sexual deficits are closely associated with social problems such as sexual offenses, sexual rape, mental illness and divorce. Nervousness, abdominal and back pain, inability to concentrate and even

inability to perform common tasks are some other consequences of failure to satisfy the sexual instinct <sup>(6)</sup>.

Iranians have their own social and religious beliefs. Due to cultural restrictions prevailing in our country, sexual problems are hardly expressed, and remain untreated <sup>(7)</sup>. However, the problem cannot be quenched and may express in other ways; such as marital conflicts, unsolved fights, and tendency to divorce among the affected couples. If so, can we prevent divorce by means of early diagnosis of sexual dysfunctions and their proper treatment? The present study was designed to estimate exact prevalence of sexual dissatisfaction among divorcing Iranian couples to answer the question.

## MATERIALS AND METHOD

The studied couples were randomly selected from couples who had attended in state civil court to take permission for divorce; as directed by Iranian civil law. They were considered as study group. Persons in the comparison group were randomly selected from apparently healthy attendants of waiting room of an OPD clinic in Arak city, Iran. The sample size was determined by a biostatistician.

To investigate sexual dysfunctions, Golombok-Rust Sexual Satisfaction Inventory (GRSSI) was used. It

evaluates the quality of sexual relations and sexual dysfunctions. It consists of two different gender-specific forms, with 28 items, each having 7 dimensions. Out of the 7 dimensions, 5 dimensions (avoidance, satisfaction, communication, tactile contact, and frequency of sexual activity) are common for both sexes <sup>(8)</sup>. In the female form, there are dimensions regarding vaginismus, and orgasm problems, whereas in the male form there are dimensions regarding premature ejaculation and impotence (erectile dysfunction). The participants had been given informed consent before they were asked to fill the questionnaire.

The study had been approved by local ethical committee of Arak's university of medical sciences.

The collected data was analyzed using SPSS software version 16.0. T-test and chi-square tests were used to compare quantitative and qualitative variables between groups, respectively.

## RESULTS

One hundred fifty two individuals in study group (52.6% male and 47.4% female) and 208 in comparison group (48.1% male and 51.9% female) returned the filled questionnaires to the researchers. General characteristics of the participants were shown in table 1.

**Table 1: general characteristics of studied patients in study and comparison groups**

Variable	Female		Male		P value
	Study group	Comparison group	Study group	Comparison group	
	n=72	n=108	n=80	n=100	
<b>Age (year)</b>					
10-29	16.70%	25%	3.75%	5.00%	0.254 (female) 0.593 (male)
20-29	41.10%	50.90%	48.75%	55.00%	
30-39	15.30%	17.90%	33.75%	30.00%	
40-50	6.90%	6.50%	13.75%	10.00%	
mean	24.6	25.1	22.1	29.5	
<b>Age at the time of marriage</b>					
10-19	47.10%	47.20%	22.50%	22.00%	0.421 (female) 0.704 (male)
20-29	52.00%	51.40%	65.00%	70.00%	
30-39	0.90%	1.40%	12.50%	8.00%	
mean	20.3	20.7	21.9	28.9	
<b>Level of education</b>					
Primary school	58.30%	51.80%	42.50%	49.00%	0.134 (female) 0.179 (male)
Under diploma	2.80%	13.90%	10.30%	13.00%	
Diploma	18.10%	13.90%	24.00%	20.00%	
Bachelor degree	2.80%	1.90%	2.10%	2.00%	
Master degree	11.10%	12.00%	14.00%	9.00%	
Higher	7.00%	6.50%	7.10%	7.0%	

**Table 1: general characteristics of studied patients in study and comparison groups (Contd.)**

Variable	Female		Male		P value
	Study group	Comparison group	Study group	Comparison group	
	n=72	n=108	n=80	n=100	
<b>Number of sibling</b>					
0	45.80%	30.60%	43.75%	35.00%	0.493 (female)
1 or 2	26.40%	43.50%	25.00%	40.00%	0.233 (male)
3 or 4	22.30%	19.40%	18.75%	18.00%	
More	6.50%	6.50%	12.50%	7.00%	
<b>Age difference with spouse</b>					
0-2	38.90%	22.20%	25.00%	19.00%	0.432 (female)
4-5	29.20%	44.40%	37.50%	42.00%	0.474(male)
5-6	15.30%	10.70%	18.75%	13.00%	
7-8	7.90%	9.30%	7.50%	7.00%	
9-10	6.00%	7.40%	5.00%	8.00%	
Higher	2.80%	6.00%	6.25%	11.00%	
<b>Number of sexual intercourse with spouse during last 1 month (number per week)</b>					
Less than 1	54.50%	7.40%	50.00%	11.00%	Less than 0.001
1-2	29.10%	15.70%	33.75%	16.00%	
3-4	8.30%	36.10%	8.00%	39.00%	
More	6.90%	39.80%	7.25%	34.00%	

Scores of the studied individuals in sub-scores of Golombok Rust Sexual Satisfaction Inventory have been shown in table 2.

**Table 2: scores and sub-scores of studied individuals in Golombok Rust Sexual Satisfaction Inventory**

	Study group	Comparison group	P value
<b>Female</b>	<b>n=72</b>	<b>n=108</b>	
Total score	56.62±16.43	29.78±14.35	<0.001
Frequency	4.12±1.15	2.05±1.32	0.01
Communication	4.45±2.11	3.27±1.68	0.01
Satisfaction	8.11±4.13	6.76±4.55	0.008
Avoidance	6.79±3.11	3.76±2.34	0.009
Touch	7.54±3.24	2.91±2.34	<0.001
Vaginismus	8.77±4.37	3.81±2.65	<0.001
Failure to experience orgasm	7.93±4.43	4.20±3.11	0.008
<b>Male</b>	<b>n=80</b>	<b>n=100</b>	
Total score	51.18±18.75	30.16±14.41	<0.001
Frequency	4.33±2.01	2.47±1.64	0.01
Communication	4.87±1.56	3.33±1.87	0.02
Satisfaction	7.58±3.89	5.11±3.23	0.009
Avoidance	6.67±4.61	4.23±2.15	0.01
Touch	7.83±4.23	3.60±2.47	<0.001
Premature ejaculation	8.12±4.63	4.52±2.78	<0.001
Impotence	8.78±5.28	3.86±4.23	<0.001

**DISCUSSION**

The present study was performed on couples who were divorcing; mainly due to marital conflicts. We wanted to know the role of sexual satisfaction in their decision to divorce. We thought that marital conflicts

may root from poor sexual satisfaction. In communities without open space to disclose sexual problems based on cultural or religious restrictions, it is possible that the problem is expressed in other ways. The present study showed that sexual related problems are more

prevalent in divorcing couples compared to control group.

Khazaei and his coworkers have reported that Hypoactive sexual desire disorder and other sexual problems are prevalent among Iranian couples<sup>(1)</sup>. The same conclusion is reported by Akbarimehr<sup>(7)</sup>. Sexual problem is reported as one of important reasons for divorce by participants of study of Bolhari and his coworkers<sup>(2)</sup>. Failure to response to sexual desire of spouse has also been reported more frequently in disrupted weddings in study of Bhuiya and his coworkers in Bangladesh<sup>(4)</sup>. These studies are concordant with results of the present study.

Based on the few available community studies, it appears that sexual dysfunctions are highly prevalent in both sexes, ranging from 10% to 52% of men and 25% to 63% of women<sup>(9)</sup>. It has been suggested that psychosocial stress negatively affects sexual functioning<sup>(9)</sup>. To most individuals, it seems obvious that psychological and interpersonal factors play a major role in both the etiology and maintenance of sexual problems<sup>(10)</sup>. Maintaining factors such as relationship conflict, performance anxiety, guilt, inadequate sexual information or stimulation, psychiatric disorders, relationship discord, loss of sexual chemistry, fear of intimacy, impaired self-image or self-esteem, loss of sexual confidence, restricted foreplay, poor communication, and lack of privacy may prolong or exacerbate problems, irrespective of the original predisposing or precipitating conditions. Maintaining factors also include contextual factors that can interfere or interrupt sexual activity, such as environmental constraints or anger toward a partner<sup>(10)</sup>. Clinically, it has been observed that sexual problems are sometimes the cause and sometimes the result of dysfunctional or unsatisfactory relationships. These observations generally stem from clinical data rather than from controlled research with community samples. Often, it is difficult to determine which came first, a non-intimate and non-loving relationship, or sexual desire and/or performance problems leading to sexual dysfunction in one or both partners<sup>(10)</sup>. The sexual response is complex and incompletely understood. It has been influenced by socio-cultural taboos and physical factors. It is mediated by psychological/environmental and physiological factors e.g. hormonal, vascular, muscular, neurological, age or pathological factors such as urological, gynecological, surgical or medical conditions. Sexual dysfunction may be sometimes a healthy adaptive response to adverse conditions in the

interpersonal relationship or vice versa<sup>(11)</sup>.

Marital satisfaction is a multidimensional concept that includes different factors such as personality features, financial matters, child rearing styles, and sexual relations<sup>(12)</sup>. It is obvious to most sexual therapists that psychological and interpersonal factors are important in both the causes and maintenance of sexual problems<sup>(13)</sup>.

In summary, marital conflicts and decision to divorce may originate from sexual dissatisfaction. It is recommended that divorcing couples are referred to sex therapy clinic or psychiatrist, particularly in communities with restricted cultural freedom for expression of sexual needs such as Iranians.

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# Applications of Forensic Dentistry: a Review and Update

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## ABSTRACT

Forensic Dentistry is one of the most unexplored and intriguing branches of forensic sciences. It has been applied to variety of cases of civil and criminal, including identification, homicide, fraud, malpractice, professional misconduct and liability. It is the specialty with goal of investigating psychological, physical, chemical and biological phenomenon that can reach human being. Recent addition of DNA analysis to Forensic Dentistry is frequently used in identifying individuals or determining the origin of certain tissues. Since qualified forensic odontologists in India are very few, this paper reinforces awareness among the dental practitioners about the role of dentist in person identification and to awaken the social responsibility of maintaining dental records of all patients.

**Keywords:** Forensic Dentistry, Dental Age Estimation, Cheiloscopy, Bite Marks, Child Abuse.

## INTRODUCTION

Forensic Dentistry or Forensic Odontology is one of the most rapidly developing branches of forensic science and forensic medicine. This is mainly due to the immense importance of dental evidence in the identification of victim of mass disaster, abuse or organized crimes.<sup>[1]</sup> Forensic is derived from the latin word 'forum', which means 'court of law'. Odontology refers to the study of teeth. It is one of the most unexplored and intriguing branches of forensic sciences. It primarily deals with identification, based on recognition of unique features present in individual's dental structure.<sup>[2]</sup>

Interest in Forensic Dentistry was relatively dormant until the 1960s when renewed interest was sparked by the first formal instructional program in Forensic Dentistry given in the United States at the Armed Forces Institute of Pathology. Forensic Odontology is a vital and integral part of forensic

science that is most widely utilized for identification of the living and deceased persons. In recent times, Forensic Odontology has evolved as a new ray of hope in assisting forensic medicine.<sup>[3]</sup>

### Scope of Forensic Dentistry

The applications of Forensic Dentistry are expanding as the science develops. In addition to identification procedures of whole or fragmented bodies, the dentist may help with problems involving ageing, racial origins, habits and occupations, previous dental history and procedures, the study of fragments of jaws and teeth and the soft tissues of the mouth.<sup>[4]</sup>

Forensic Odontology involves the management, examination, evaluation and presentation of dental evidence in criminal or civil proceedings, all in the interest of justice. The Forensic Odontologist assists legal authorities by examining dental evidence in different situations.<sup>[5]</sup>

### Dental Tissue as Evidence

Teeth are the hardest tissue in the human body. Therefore they are the tissue that is most resistant to trauma, decomposition, water immersion, chemicals and fire (Clark, 1982; Knight, 1996) making them an invaluable evidential source. To match these natural requirements, the foreign materials subsequently placed in the mouth by the dental practitioner such as

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fillings, dentures, crowns, bridges and implants must be equally resistant to the intense mechanical demands placed upon them and therefore their survivability potential is also enhanced.<sup>[6]</sup>

A dental profile will typically provide information on the deceased's age, ancestry background, sex and socio-economic status.<sup>[5]</sup>

Forensic odontology involves the management, examination, evaluation and presentation of dental evidence in criminal or civil proceedings, all in the interest of justice. The forensic odontologist assists legal authorities by examining dental evidence in different situations. The subject can be divided roughly into 3 major fields of activity: civil or noncriminal, criminal and research.<sup>[5]</sup>

### **Dental Age Estimation**

Age estimation is one of the important techniques used in forensic science for narrowing the suspected victims. It is common knowledge that teeth and bones, which remain undamaged for a longer time than other body parts following death, are used for age estimation. Because teeth and bones undergo relatively regular changes due to growth and development up to the age of 20 years, age estimation is reliable and highly effective up to this age.<sup>[7]</sup>

Developmental stages of dentition and craniofacial skeleton are well established. Any disturbance during this period produces changes in these tissues and serves as a lifelong permanent record. Even after the complete development of dentition and craniofacial skeleton certain physical, chemical and biological changes takes place which aid in the age estimation.<sup>[8]</sup>

### **BITE Mark Analysis**

Bite marks analysis is a vital area in Forensic Odontology, which constitutes the commonest form of dental evidence presented in criminal court. Bite marks are the tool marks left by the actions of teeth and other oral structures during the biting of objects and people. It plays an important role in identification of suspects especially in cases of battery, child abuse, rape and homicide.<sup>[9]</sup>

### **LIP Print (Cheiloscopsy)**

The characteristic patterns of the wrinkles and the grooves present on the labial mucosa constitutes the lip prints.<sup>[10]</sup> The pattern of wrinkles on the lips has

individual characteristics as fingerprints. It is a forensic investigation technique that deals with identification of humans based on lips traces.<sup>[11]</sup>

In past decades, the lip-print studies attracted the attention of many scientists who declared the possibility of their use in the matter of human identification.<sup>[12]</sup>

### **Palatoscopy / Rugoscopy**

Palatoscopy or rugoscopy, is the name given to the study of palatal rugae in order to establish a person's identity. The use of palatal rugae was suggested as one of the methods of identification by Harrison Allen in 1889.<sup>[13]</sup>

When identification of an individual by other methods is difficult, palatal rugae may thus be considered as an alternative source of information enabling the search field to be narrowed. The study of palatal rugae, finds application in the field of anthropology, comparative anatomy, genetics, forensic odontology, prosthodontics and orthodontics.<sup>[14]</sup> Rugae have been used in medico-legal identification processes because their individual morphological characteristics are stable over time.<sup>[15]</sup>

### **Craniofacial Reconstruction**

Forensic facial reconstruction is the process of recreating the face of an individual from their skeletal remains through an amalgamation of artistry, forensic science, anthropology, osteology and anatomy. It is easily the most subjective—as well as one of the most controversial techniques in the field of forensic anthropology. Despite this controversy, facial reconstruction has proved successful frequently enough that research and methodological developments continue to be advanced.<sup>[16]</sup>

The identification of an unknown body is obtained by forensic identification techniques which are predominantly based on comparisons of ante- and post-mortem data, such as medical files, dental records, X-rays or DNA. The goal of craniofacial reconstruction is to recreate a likeness of the face of an individual at the time of death. Different 2D and 3D manual or computer-aided facial reconstruction techniques have been developed for this purpose and all are based on the assumed relationship between the soft-tissue envelope and the underlying skull substrate.<sup>[17]</sup>

## Child Abuse

The child abuse and neglect issue is one among the gray shades of the society. Each day, the safety and well being of some children across the Nation are threatened by child abuse and neglect. Intervening effectively in the lives of these children and their families is not the sole responsibility of single agency or a professional group, but rather is a shared community concern.<sup>[18]</sup>

In recent years, the community has become increasingly aware of the problem of child abuse in the society. Child abuse is prevalent in every segment of the society and is witnessed in all social ethnic, religious and professional strata.<sup>[19]</sup> Children are often maltreated by the adults in their lives. These adults could be their parents, caretakers, youth leaders, coaches or perhaps even a health care provider.<sup>[20]</sup>

Dentist may be called upon to examine suspected child abuse cases. They should be well informed regarding general and oral signs of abuse, examination of abuse cases and preparation of the report.<sup>[8]</sup>

The indicators that may be noticeable to the dental professional include trauma to the teeth and injuries to the mouth, lips, tongue or cheeks that are not consistent with an accident. Other common signs of child abuse include fractures of the maxilla and mandible and oral burns. Injuries to the upper lip and maxillary labial frenum may be a characteristic in severely abused young children.<sup>[21]</sup>

## Mass Disaster Victim Identification

The term 'mass disaster' means a chaotic event, initiated by a destructive force which results in the multiple fatalities necessitating identification. Mass disasters can be natural disasters due to earthquakes, hurricanes, fire storms and floods.<sup>[8]</sup>

A major disaster may be defined as any event that occurs with little or no warning causing death or injury, damage to property or the environment and disruption of the community, and the effects of which are of such a scale that they cannot readily be dealt by local services and authorities as part of their everyday activities.<sup>[22]</sup>

Immediately following the onset of a disaster, it is essential for national, regional, or local authorities to concentrate their actions and resources on three basic activities:<sup>[23]</sup>

1. The rescue and treatment of survivors;
2. The repair and maintenance of basic services; and,
3. The recovery and management of bodies.

## Sex Determination In Forensic Odontology

Sex determination of skeletal remains is part of the archaeological, anthropologic and many medico-legal examinations. The methods vary and depend on the available bones and their condition. The only method that can give a totally accurate result is the DNA technique, but in many cases for several reasons it cannot be used. Teeth are excellent material for anthropological, genetic and forensic investigations and can be used in the determination of sex.<sup>[24]</sup>

Determining the sex, or sexing, of unknown human remains is the second step in the triad of building a dental profile. Forensic Odontology plays an important role in establishing the sex of the victims with bodies mutilated beyond recognition due to major mass disaster. Sex can be determined based on data from morphology of skull and mandible, metric features, as well as by DNA analyses of teeth.<sup>[24]</sup>

Sex estimation from skeletal remains is crucial in the identification of human remains, as it halves the number of possible matches. Furthermore, other biological reconstruction variables, such as age at the time of death, rely on the knowledge of sex of the individual.<sup>[25]</sup>

## DNA Research in Forensic Dentistry

Human identification is one of the major fields of study and research in forensic science because it deals with the human body and aims at establishing human identity. The revolution caused in 1953 by Watson and Crick, who discovered the double-helix structure of DNA, which is responsible for the genetic inheritance of human beings, led to important changes in nearly all fields of science. This discovery was the basis for the development of techniques that allow characterizing each person's individuality based on the DNA sequence.<sup>[26]</sup>

Three decades later, Jeffreys *et al.* (1985) created radioactive molecular probes that could recognize highly variable regions of DNA and thus determine the specific patterns of each individual, which were named DNA fingerprints. The currently performed DNA profile tests are totally reliable, being accepted

as legal proofs in courts, such as for investigation of paternity and human identification.<sup>[26]</sup>

Several biological materials may be employed for isolation of DNA and accomplishment of laboratory tests for human identification, including bone tissue, hair bulb, biopsy sample, saliva, blood and other body tissues. It is possible to obtain DNA from virtually all human body tissues, only with variations in the quantity and quality of the DNA extracted from each tissue.<sup>[26]</sup>

### Forensic Radiology

Radiographs being non destructive method play a vital role in forensic dentistry to uncover the hidden facts which cannot be seen by means of physical examination. They have helped to solve difficult cases in the forensic science.<sup>[8]</sup>

It is however in the field of forensic medical investigation that forensic radiography is most widely employed. Its main uses are to determine and document the cause of injury or death, to detect and locate hazardous and/or illegal material concealed about the person, and to identify individuals.<sup>[27]</sup>

Forensic radiography is particularly important in the investigation process and identification of victims following mass fatality incidents such as transportation crashes and natural disasters.<sup>[27]</sup>

### Photography in Forensic Dentistry

The photographs become a key element and an integral part of forensic investigations and are usually the basis for determinations of responsibility. Due to their central importance in these cases, it is required they be shared with other parties to a legal undertaking.<sup>[28]</sup>

It is vitally important since the original evidence in homicide cases is eventually lost due to postmortem changes, burial and cremation. In live patients, injuries heal and will fade from sight. It is necessary for law enforcement to be certain that the injuries to skin and other objectives are properly documented, to be reproduced for later analysis. Conventional film photography is still the best, with digital pictures being useful for backup purposes.<sup>[29]</sup>

### CONCLUSION

Forensic odontology is an important and expanding field of dentistry. It is a vital and integral part of

forensic science having evolved as a new ray of hope in assisting forensic medicine. The use of the unique features of the human dentition to aid in personal identification is well accepted within the forensic field.

It is important for dental practitioners to be aware of various applications of dentistry. Dental records of patients are beneficial to legal authorities during identification procedures. Dental clinicians are at the forefront in detecting the signs of violence in their patients. Hence they should be aware of the criteria of abusive injuries to ensure a correct response by the concerned authorities.

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# Profile of Fatal Head Injuries in Road Traffic Accidents: Study Conducted in Puducherry, India

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## ABSTRACT

In India motor vehicle population is growing at a faster rate than the economic and population growth. This study was conducted from November 2011 to April 2013 at JIPMER, Puducherry. In this study there were 268 deaths due to road traffic accidents with head injury in a period of 18 months (November 2011 to April 2013). Males outnumbered females (81.71% vs 18.28%) with a ratio of 4.5 to 1. Road Traffic Accidents (RTAs) are more commonly seen in the age group of 31-45 years followed by 16-30 years. The major culprits are the two wheelers which amount to 198 vehicles (53.08%). In our study the number of pedestrian involved in accidents is 89 (33.20%) and the motor cyclists are 97 (36.19%). Frontal (51 cases; 28.33%) and occipital (50 cases; 27.77%) parts of the skull are more commonly fractured. In basal skull fractures posterior cranial fossa (PCF, 36 cases; 26.66%) and middle cranial fossa (MCF, 35 cases; 25.92%) are more commonly fractured. The most common type of haemorrhage is the combination of subdural and subarachnoid haemorrhage 134 cases (54.69%).

**Keywords:** Road Traffic Accidents, Pedestrians, Fissure Fracture, Subdural And Subarachnoid Haemorrhage

## INTRODUCTION

World Health Organization defined accident as an unexpected, unplanned occurrence that may involve injury.<sup>1</sup> Approximately 1.24 million people die every year on the world's roads, and another 20 to 50 million sustain nonfatal injuries as a result of road traffic crashes.<sup>2</sup>

The developing countries bear a large share of burden and account for about 85% of the deaths as a result of road traffic crashes.<sup>3</sup> India accounts for about 10% of road accident fatalities worldwide.<sup>4</sup> In India, 1, 20,000 people die and 12, 70,000 sustain serious injuries every year in road traffic accidents. The number of accidents for 1000 vehicles in India is as high as 35 while the figure ranges from 4 to 10 in developed

countries. National crime records Bureau statistics show 13 people die in our country every hour due to RTAs.<sup>5</sup>

Blunt head injuries are most frequently caused by traffic accidents, assaults, fall from high altitudes, home accidents, industrial accidents, incident of terrors and wars.<sup>6</sup> The extent and degree of an injury to the skull and its contents is not necessarily proportional to the amount of force applied to the head. Any type of craniocerebral injury can be caused by any kind of blow or any sort of head.<sup>7</sup> Severe head injury with or without peripheral trauma, is commonest cause of death and/or disability up to the age of 45 years in developing countries.<sup>8</sup>

## MATERIALS AND METHOD

All deceased of road traffic accidents with head injuries reported in Dept of Forensic Medicine, JIPMER, during the study period, November 2011 to April 2013 are included in the study. Among the 1041 cases, 391 cases were road traffic accidents and 268 cases were RTA with head injury. A detailed post-mortem examination was conducted on the 268 cases.

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The information was collected from the relatives of the deceased, investigating officer, hospital records and post mortem findings.

### OBSERVATIONS

RTAs are more commonly seen in the age group of 31-45 years followed by 16-30 years and the least being the 0-15 age group. In all the age groups males are more commonly involved (Table 1). In the present study the commonest mode of trauma is 2 wheeler vs 4 wheeler (72 cases; 26.86%) followed by pedestrian accidents either by 2 wheeler (42 cases; 15.67%) or 4 wheeler (43 cases; 16.04%). Of 373 vehicles involved, the major culprits are the two wheelers which amount to 198 vehicles (53.08%). The peak occurrence of the accidents was in Sundays, 46 cases (17.16%) followed by Saturdays, 43 cases (16.04%).

Most of the accidents have occurred during 12.01 - 18.00 hrs (96 cases; 35.8 %) followed by 18.01 - 24.00 hrs (88 cases; 32.83 %). Types of fractures of skull were studied separately into two groups; vault fractures and base of skull fractures. Frontal (51 cases; 28.33%) and occipital (50 cases; 27.77%) parts of the skull are more commonly fractured followed by temporal (43 cases; 23.8%) and parietal (36 cases; 20%) parts. In basal skull fractures posterior cranial fossa (pcf, 36 cases; 26.66%) and middle cranial fossa (mcf, 35 cases; 25.92%) are more commonly fractured. In the present study on

studying the type of skull fracture fissure (140 cases; 63.34%) fracture heads the list. The next most common type of fracture is the comminuted fracture (44 cases; 20%), depressed fracture (29 cases; 13.12%), diastatic fracture (6 cases; 2.71%) and hinge fracture (2 cases; 0.9%). Out of all the intracranial haemorrhages, subarachnoid haemorrhages were high in incidence. In the present study most of the cases have more than one intracranial haemorrhage. Of the 268 cases, fractures of the limbs constitute around 66 cases (41.77%). Involvements of the facial bones were seen in 15 cases (10%) in the form of fracture of the mandible or maxilla or the nasal bone or its combinations. More importantly rib fractures are seen in 48 cases (30.37%).

Of the 268 cases most of the cases were given general (supportive) treatment (205 cases; 76.49%). 31 cases (11.56%) were brought dead to the hospital. Craniotomy was done for 21 cases (7.83%), intercostal drainage tube for 4 cases (1.50%). In some cases specific management such as brachial artery repair, duodenal repair, external fixation of the upper limb, laparotomy, ligation of the subclavian vessels, splenectomy and thigh amputation was done.

In this study out of 268 cases, 208 cases (77.61%) died exclusively due to head injuries, followed by 26 cases (9.7%) died due to diffuse axonal injury, 24 cases (8.95%) due to associated injuries along with head injury, and 10 cases (3.73%) died due to septicaemia.

**Table 1: Distribution of cases with respect to age and gender**

Age (in years)	Gender				Total Number of cases	Percentage
	Female	Percentage	Male	Percentage		
0-15	8	2.98%	8	2.98%	16	5.96%
16-30	4	1.49%	69	25.74%	73	27.23%
31-45	14	5.22%	81	30.22%	95	35.44%
46-60	16	5.97%	41	15.29%	57	21.26%
>60	7	2.61%	20	7.46%	27	10.07%
Total	49	18.27%	219	81.69%	268	100%

**Table 2: Types of victims involved in the accidents**

Road users	Number of cases	Percentage
Pedestrian	89	33.20%
Motor cyclist	97	36.19%
Pillion rider	33	12.31%
Cyclist	13	4.85%
Occupant of 4 wheeler	23	8.58%
Occupant of 3 wheeler	5	1.86%
Driver of 4 wheeler	5	1.86%
Driver of 3 wheeler	1	0.4%
Occupant of bullock cart	1	0.4%
Child standing in front of tvs excel	1	0.4%
Total	268	100%

**Table 3: Association between survival period and age group of the cases**

Survival period in hrs	Age in years					Total Number of cases	Percentage
	0-15	16-30	31-45	46-60	>60		
0-6	4	22	28	19	10	83	31.0%
6-12	3	11	14	7	5	40	14.9%
12-24	3	13	12	5	3	36	13.4%
24-48	2	6	10	5	4	27	10.1%
48-72	0	10	7	7	3	27	10.1%
3-7 days	2	9	14	9	1	35	13.1%
>7 days	2	2	10	5	1	20	07.5%

Chi square test:  $\chi^2$  15.361 d.f=24 P=0.91

**Table 4: Association between age group to the victims with or without fracture of the skull**

Age group in years	Number of cases		Total number of cases	Percentage
	With fracture	Without fracture		
0-15	11	5	16	6.0%
16-30	46	27	73	27.2%
31-45	58	37	95	35.4%
46-60	36	21	57	21.3%
>60	18	9	27	10.1%

Chi square test:  $\chi^2$  0.538 d.f=4 P=0.97

**Table 5: Showing the association between the genders with the skull fracture**

Gender	Number of cases		Total number of cases	Percentage
	With fracture	Without fracture		
Male	138	81	219	81.7%
Female	31	18	49	18.3%
Total number of cases	169	99	268	100%

Chi square test:  $\chi^2$  0.001 d.f=1 P=0.974

**Table 6 : Distribution of the intracranial haemorrhages**

Type of intracranial haemorrhage	Number of cases	Percentage
Extradural haemorrhage (EDH) alone	1	0.4%
Subdural haemorrhage (SDH) alone	6	2.44%
Subarachnoid haemorrhage (SAH) alone	18	31.83%
EDH+SDH	1	0.4%
EDH+SAH	6	2.44%
SDH+SAH	134	54.69%
EDH+SDH+SAH	19	7.75%

**Table 7: Showing types of intracranial lesions among the cases**

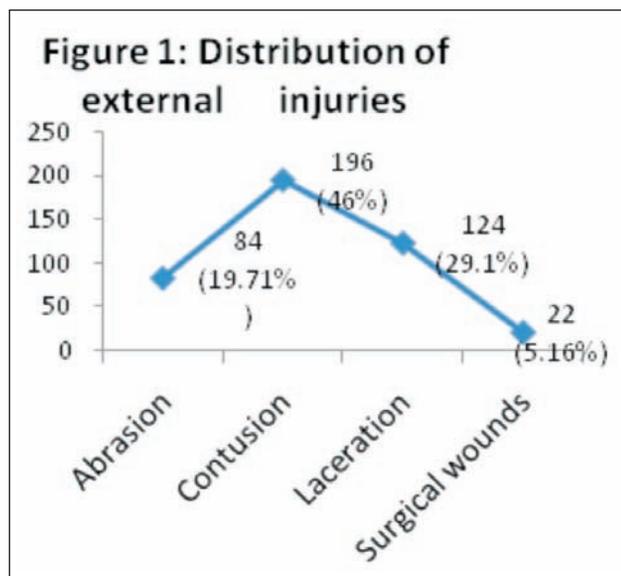
Intra-cranial lesion	Number of cases	Percentage
Contusion	112	46.28%
Laceration	62	25.61%
Interventricular haemorrhage	23	9.5%
Intracerebral haemorrhage	18	7.43%
Pontine haemorrhage	26	10.74%
Cerebellar haemorrhage	1	0.41%

**Table 8: Association between intracranial haemorrhages with skull fracture in various age groups**

Age group in years	With skull fracture				
	EDH	SDH	SAH	ICH	IVH
0-15	1	7	10	1	0
16-30	7	25	38	4	7
31-45	8	34	50	9	12
46-60	4	19	25	4	3
>60	1	6	16	0	1

**Table 9: Association between intracranial haemorrhages without skull fracture in various age groups**

Age group in years	Without skull fracture				
	EDH	SDH	SAH	ICH	IVH
0-15	0	3	5	-	-
16-30	2	18	27	-	-
31-45	1	27	37	-	-
46-60	1	17	21	-	-
>60	2	4	9	-	-



## DISCUSSION

Current trends in population growth, industrialization and urbanization are putting heavy pressure on transport networks particularly on the road systems in the developing world. Because of this, deaths due to Road Traffic Accidents are steadily increasing in the developing countries.<sup>9</sup> The observations and results of the present study were compared with the work of preceding researchers.

In the present study, among the 268 cases studied; males outnumbered females, a finding that has been reported in previous work conducted by various researchers.<sup>10-14</sup> The highest number of victims who

suffered blunt head injury was in the third and fourth decades of age. This observation was similar to the observation of researchers.<sup>13,15</sup> The motor cyclists (97 cases; 36.2%) are slightly ahead of the pedestrians (89 cases; 33.2%) in the involvement of the accident. This is consistent with the other researchers.<sup>14,16</sup> In some studies, pedestrians were more involved than vehicular occupants.<sup>14,15,17</sup> National Injury Mortality Surveillance System (2004) reported that most of the transport related deaths occurred on Saturday (20.8 percent) followed by Sunday (17.1 percent).<sup>18-20</sup>

Most of the accidents have occurred during 12.01 - 18.00 hrs (96 cases; 35.8 %) followed by 18.01 - 24.00 hrs (88 cases; 32.9 %), which is in concurrence with study of Anand Menon<sup>21</sup> and Nilamber Jha et al.<sup>16</sup> Whereas, findings of some studies have showed that accidents were more between 18.01 - 24.00 hrs followed by 12.01 - 18.00 hrs.<sup>22,23</sup> In our study most of the victims died in hospital 88.4%, followed by 9.7%, that died while transporting to the hospital. 1.9% of the victims were died on the spot. Studies conducted by Arvind kumar, Y N Singh, Harnam Singh<sup>24-26</sup> are all similar to the present study indicating that most of the victims died in hospital. This denotes that due to active private hospital ambulance and 108 ambulance services most of the victims reach hospital soon.

On studying the type of skull fracture, fissure 63.34% fracture heads the list. The next most common type of fractures is the comminuted fracture 20% and depressed fracture 13.12%. Also, we found skull fracture with brain injuries more in motor cyclists

followed by vehicle occupants and pedestrians. The most common type of intracranial haemorrhage found was subarachnoid haemorrhage (237 cases; 55.89%), which is consistent with the study of Chandra et al.<sup>15</sup> This is followed by subdural haemorrhage, which was found in 160 (37.7%) of the cases. Apart from these two haemorrhages extradural haemorrhage is most common followed by, interventricular and intracerebral haemorrhages. These three were found in significantly less number of our cases, which is in concurrence with other studies. Therefore, it is difficult to predict the type and extent of injury, which would be compatible with life.

### CONCLUSION

This study shows that road traffic injuries remain a critical public health concern. Reducing the total number of road traffic deaths requires that increased attention be paid to improving the safety of pedestrians, cyclists and motorcyclists as half of all road traffic deaths occur among these road users. Many high-income countries have shown sharp reductions in crashes and casualty numbers over the past couple of decades. This has been achieved by adopting a systems approach to road safety that emphasizes environment, vehicle and road user interventions, rather than solely focusing on direct approaches aimed at changing the behaviour of road users. While there are many interventions that can save lives and limbs, political will and commitment are essential and without them little can be achieved. The time to act is now. Road users everywhere deserve better and safer road travel.

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# Abdomino-Pelvic Injuries in Case of Road Traffic Accidents" - an Autopsy Study

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## ABSTRACT

Blunt force injuries of the abdomen and pelvis are less common than head injuries, but they may be more difficult to detect initially. Blunt force when applied over abdomen may cause either only external wound, only internal wound or both. Due to soft and yielding nature of the abdominal wall application of even a heavy force may not cause only external wound on abdominal wall but the transmitted force may come serious internal wound. In abdominal and pelvic injuries, it is very crucial to accurately appraise the full extent of injury involving various organs/structures. The management and outcome of the case depends on the identification of the organ involved in the trauma cases. During this study period out of 200 Road Traffic accident deaths, 60(30%) cases were with abdomen and pelvic injuries. The maximum cases of road traffic accidents with abdominal and pelvic injuries were seen in the age group of 21-30 years (25%), followed by 31-40 years (21.66%). Males (52cases) outnumbered females (8 cases) and male - female ratio is approximately 6.5 : 1. The maximum number of victims were pedestrians i.e., 31(51.7%) cases, followed by motorcyclist in 24(40%) cases and the least were occupant of light motor vehicle and the most common offending vehicle is Heavy Motor Vehicles in 27 cases (45%), followed by motorcycle in 12 cases (20%) and others in 9 cases (15%). Liver was the common organ involved in majority of victims, i.e., 28(46.7%) cases, followed by spleen in 15(25%) cases and kidneys in 10(16.7%) cases. Pelvic bone injury is the most common skeletal injury in abdomino-pelvic region i.e., 6 (10%) cases, followed by injury to lumbar spinal column in 3 (5%) cases. Hence this study may help clinicians in diagnosing the case at the earliest stage

**Keywords:** Road Traffic Accidents, Abdomen And Pelvic Injuries, Unnatural Deaths

## INTRODUCTION

Accident is an event, independent of human will power, caused by an external force that acts rapidly and results in bodily or mental damage. Traffic accident may be road, road-railway, railway, air and others. Accidents are not often due to ignorance, but are due to carelessness, thoughtlessness and over confidence. William Haddon (Head of Road Safety

Agency in USA) has pointed out that road accidents were associated with numerous problems each of which needed to be addressed separately<sup>1</sup>.

An accident that takes place on the road involving a vehicle is termed as road traffic accident. Amongst all traffic accidents, road traffic accidents claim largest toll of human life and tend to be the most serious problem world over. Currently motor vehicle accidents rank 9th in order of disease burden and are projected to be ranked third in the year 2020. Nearly three quarter of deaths resulting from motor vehicle crashes occur in developing country<sup>2</sup>.

India is the largest country in the South Asian region with all the problems faced by rapidly developing nations, especially increasing

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motorization. In India, over 80,000 persons die in the traffic crashes annually, over 1.2 million injured seriously and about 3,00,000 disabled permanently. In India, for individuals more than 4 years of age, more life years are lost due to traffic crashes than due to cardiovascular diseases or neoplasm<sup>3,4</sup>. The problem appears to be increasing rapidly in developing countries<sup>5</sup>. Injuries due to RTA depend upon a number of factors - human, vehicle and environmental factors play vital roles before, during and after a serious RTA. The important factors are human errors, driver fatigue, poor traffic sense, mechanical fault of vehicle, speeding and road conditions, traffic congestion, road encroachment etc. India accounts for about 10% of road accident fatalities worldwide<sup>6</sup>. The incidence of Accidental Deaths has increased by 0.4% at National level during 2008 as compared to 2007. During the year 2008, 34.5% of accidental deaths are due road traffic accidents. It is observed that the rate of deaths per thousand vehicles has decreased marginally from 1.4 in 2004 to 1.3 in 2008 even as the number of vehicles in the country have increased and the quantum of Road Accidents has decreased. In India about 324 Deaths and 1285 injuries per day are due to Road Accidents<sup>7</sup>.

The abdomino-pelvic region is considered as one of the most vulnerable regions of the body and the injuries involving these regions are fatal. In most of the cases the clinicians in patients with road traffic accidents concentrate on the injuries to the head and blunt injuries to abdomino-pelvic region may be missed due to blunt injuries, as no external injuries are observed. In many cases the persons may sustain injuries to these regions with or without head injury. So in this study an attempt has been made to highlight the pattern of injuries to abdomino-pelvic region in deaths due to road traffic accidents and other socio-demographic factors. Hence this study may help clinicians in diagnosing the case at the earliest stage.

## MATERIALS AND METHOD

Department of Forensic Medicine, KIMS Hospital and Research Centre, Bengaluru is a postgraduate Institute which conducts autopsies of sudden, suspicious, unnatural deaths which occur in and around south Bangalore. The present study is a descriptive study of Road Traffic Accident cases which was autopsied at KIMS hospital, Bengaluru for a period of two years which form the material of the study. All Road Traffic Accident cases with abdomino-pelvic injuries autopsied at Kempegowda Institute of Medical Sciences and Research Centre, Bengaluru were

included in the study. Relevant autopsy findings and socio-demographic factors related to each of these cases were taken for analysis. All the cases of road traffic accidents with abdomino-pelvic injuries were included in the study. Road traffic accidents without abdomino-pelvic injuries, cases other than road traffic accidents and decomposed bodies were excluded from the study.

## RESULTS

During this study period 900 cases were brought for postmortem examination out of which 200 (22.22%) deaths were due to road traffic accidents. Out of 200 Road Traffic accident deaths, 60 (30%) cases were with abdomen and pelvic injuries. During the two years of study period 900 cases of unnatural death cases were autopsied out of which 200 cases (22.22%) were of road traffic accidents. Out of 200 cases of road traffic accident cases 60 cases (30%) were with abdomen and pelvic injuries. In this study the maximum cases of road traffic accidents with abdominal and pelvic injuries were seen in the age group of 21-30 years (25%), followed by 31-40 years (21.66%). Among 60 cases of road traffic accidents with abdominal and pelvic injuries, Males (52 cases) outnumbered females (8 cases) and male – female ratio is approximately 6.5:1. In this present study it is observed that the maximum number of victims were pedestrians i.e., 31 (51.7%) cases, followed by motorcyclist in 24 (40%) cases and the least were occupant of light motor vehicle. In this study it is observed that Heavy motor vehicles are the most common offending vehicle i.e., 27 cases (45%), followed by motorcycle in 12 cases (20%) and 9 cases (15%) are from others which include those vehicles which hit an immovable objects, hit and run cases, fall from moving vehicle and rollover crashes resulting in death of the victim. In case of abdomen abrasions were present in 27 cases, contusions in 29 cases, lacerations in 16 cases. There were no external injuries over abdomen in 15 cases. Over pelvic region abrasions were present in 10 cases, contusions in 18 cases, lacerations in 4 cases and nil injuries in 30 cases (Table-1). In the present study it is observed that liver was the common organ involved in majority of victims i.e., 28 (46.7%) cases, followed by spleen in 15 (25%) cases and kidneys in 10 (16.7%) cases (Table-2). In this study it is observed that pelvic bone injury is the most common skeletal injury in abdomino-pelvic region i.e., 6 (10%) cases, followed by injury to lumbar spinal column in 3 (5%) cases. Sacrum injury was found in only 1 (1.7%) case (Table-3).

**Table 1: Pattern of external injuries over abdomino-pelvic region:**

Type of injury	ABDOMEN (no. of cases)	PELVIS (no. of cases)
Abrasion	27	10
Contusion	29	18
Laceration	16	4
Nil	15	30

**Table 2: Incidence of organs injured in abdomino-pelvic region:**

Organs involved	No. of cases
Liver	28
Spleen	15
Kidney	10
Stomach	1
Small bowel	2
Large bowel	2
Mesentery	3
Urinary bladder	2
Pancreas	0
Adrenal gland	2
Uterus	0
Prostate	0

**Table 3: skeletal injuries in abdomeno-pelvic region:**

Bone involved	No. of cases
Lumbar spinal column	3
Sacrum	1
Pelvic bones	6

## DISCUSSION

Abdominal and pelvic trauma is one of the important causes of mortality in road traffic accidents. Its incidence is fast increasing due to various factors relating to modern civilization. The fast increasing incidence can be explained by lack of proper planning and failure to develop infrastructure to cope with the hazards of modern civilization.

In the present study deaths due to road traffic accidents were 200 cases (22.2%). Out of 200 road traffic accident cases abdomen and pelvic injuries were found out in 60 cases. This may be explained as a road traffic accident constitutes a complex phenomenon of multiple causation. The rise in number of RTA's is due to urbanization and tremendous growth in road transport sector. Population explosion is a catalyzing factor for these numbers of RTA's. Congested roads, inadequate traffic planning, consumption of alcohol, disregard to traffic rules has contributed much for the occurrence of RTA's in our city.

In the present study of abdominal and pelvic trauma victims, it was observed that majority of the cases were in the age group of 21-30 years (25%), followed by the age group 31-40 years (21.6%). The present study is consistent with the study conducted by various authors <sup>8, 9, 14, 16</sup>. A large number of cases in this age group can be explained by the fact that young persons in this age group are more active, peak of their creativity and have the tendency to take undue risk, thereby subjecting themselves to the hazards of accidents and injuries. The minimum cases are seen in children and later ages i.e., more than 60 years. The reason for this may be that children are taken care of by elders and are less likely to use vehicles. The lower proportion of RTAs in those aged 60 years and above could be due to the generally less mobility of these population groups.

In this study, it was observed that males dominated females in the ratio of 6.5:1. This dominance of males has also been reported by various workers <sup>9, 10, 12, 13, 14</sup>. This dominance of males is readily explainable by the fact that males are more exposed to hazards of roads as they constitute working and earning member in majority of the families, while females usually stay at home and look after the house hold work.

In this present study it is observed that the maximum number of victims were pedestrians i.e., 31 (51.7%) cases, followed by motorcyclist in 24 (40%) cases and the least were occupant of light motor vehicle. This is in consistent with other studies conducted by others <sup>10, 11, 13, 15</sup>. These increased fatalities among pedestrians can be explained by the factors like lack of traffic sense, poor lighting of streets, infirmity, crossing roads away from the marked safety zone, in operability of traffic light signals, drinking etc. In our city number of motor cycle users are more as they are being more economical and suitable to Indian road conditions which are commonly used by middle class community.

In this study it is observed that Heavy motor vehicles are the most common offending vehicle i.e., 27cases (45%), followed by motorcycle in 12cases (20%) and 9cases (15%) are from others which include those vehicles which hit an immovable objects, hit and run cases, fall from moving vehicle and rollover crashes resulting in death of the victim. Similar results were observed in other studies done by other authors <sup>9, 10, 13</sup>. This is due to increase in the number of heavy motor vehicles (government city buses and others), congested narrow roads and recklessness.

In the present study pattern of external injuries over abdomen and pelvis i.e., abrasions, contusions, and lacerations were present in 75% of cases. In case of abdomen abrasions were present in 27 cases, contusions in 29 cases, lacerations in 16 cases. There were no external injuries over abdomen in 15 cases. Over pelvic region abrasions were present in 10 cases, contusions in 18 cases, lacerations in 4 cases and nil injuries in 30 cases. Similar results were observed by others<sup>12,13</sup>.

In this study it was observed that liver was the common organ involved in majority of victims i.e., 28 (46.7%) cases, followed by spleen in 15 (25%) cases and kidneys in 10 (16.7%) cases. Our study is consistent with the study conducted by other authors<sup>12,14</sup>. Liver is most commonly involved organ due to its large size, fixed location and solid consistency which make it an easy target for blunt injury to the upper abdomen especially on right side and spleen because of its thin capsule, weak supporting tissue and friable pulp, is easily susceptible to blunt injury to the left hypochondrium.

In this study it is observed that pelvic bone injury is the most common skeletal injury in abdomino-pelvic region i.e., 6(10%) cases, followed by injury to lumbar spinal column in 3 (5%) cases. Sacrum injury was found in only 1 (1.7%) case. This is in consistent with the study conducted by others<sup>9,11,16</sup>.

### CONCLUSION

All abdominal and pelvic injuries constitute a potential factor in increasing the amount of morbidity and mortality and therefore proper attention towards their accurate diagnosis and satisfactory management is mandatory. A multidisciplinary approach is required for treating trauma victims so that more severe injury takes priority over less severe injury. All the patients of head injury admitted with coma and developing shock soon after, must be considered as having intra-abdominal injury until proven otherwise.

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**Conflict of Interest:** NIL

**Source of Funding:** NIL

**Ethical Clearance:** Obtained from the Institutional Ethical Committee.

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# Knowledge and Attitude about Forensic Odontology among Undergraduate and Postgraduate Dental Students

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## ABSTRACT

**Background:** Forensic odontology is a major branch of forensic science, as dental tissues are the strongest tissues in the human body and their characteristics remain unchanged even after long periods of stay in extreme environments. Thus, the importance of dental identification is increasing year by year.

**AIM:** The aim of the present study is to evaluate the knowledge and attitude about forensic odontology among undergraduate and postgraduate dental students.

**Materials and Method:** In this cross-sectional study, 100 postgraduate and undergraduate (final year and interns) dental students studying in Chennai were randomly selected. Data was collected by means of a self-administered questionnaire which included fields about the respondent's personal profile and questions on forensic odontology

**Results:** The present survey indicates that the two-thirds of dental students have adequate knowledge about forensic odontology(65%). One-third of the dental students have less knowledge on forensic odontology(35%). This is mainly because of inadequate exposure to subject in the field of forensic dentistry, less importance given to the subject in the curriculum and lack of practical exposure to forensic cases.

The undergraduate and postgraduate programs must be improved by including lectures on forensic odontology, followed by clinical training. We wish to conclude that, for an efficient forensic investigation, a highly competent dental team should co-ordinate with other forensic experts for a fruitful outcome.

**Keywords:** Forensic Odontology, Knowledge, Bite Marks, Lip Prints, Ante-Mortem and Post-Mortem Details, DNA, Dental Records

## INTRODUCTION

Forensic odontology is a major branch of forensic science. Dental tissues are the strongest tissues in the human body and therefore their characteristics remain unchanged even after long periods of stay in extreme environments including exposure to biological agents in the natural environment<sup>1</sup>. Thus, the importance of

dental identification is increasing year by year. However, this field is not fully developed in southern countries, mainly due to lack of trained personnel and training facilities, limited exposure to the subject, and restricted knowledge on individual system. Dentists have a major responsibility in the development of this science<sup>2</sup>.

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### AIM

The aim of the present study is to evaluate the knowledge and attitude towards forensic odontology among undergraduate and postgraduate dental students

**MATERIALS AND METHOD**

In this cohort study, 100 undergraduate and postgraduate dental students studying in Chennai were randomly selected. Data was collected by means of a self-administered questionnaire that had questions on forensic odontology. The answers provided by the students were evaluated to analyze their knowledge and attitude towards forensic odontology.

**RESULTS**

The total study group included 100 Dental students which comprised 50 Postgraduates and 50 Undergraduate students (final year and interns). The questionnaire consisted of 12 questions in which the first 3 questions were formulated to evaluate the awareness and attitude towards forensic odontology, and the other 9 questions were formulated to evaluate the depth of their knowledge regarding forensic odontology. Distribution of knowledge about and attitude towards forensic odontology among undergraduate and postgraduate dental students is given in tables 1-5.

**Table 1: Percentage of responses provided by the students regarding the questions on different aspects of forensic odontology**

Questions		Respondents (N=100)	
		Yes(%)	No(%)
1.	Have you ever attended any conference or workshop on forensic odontology?	13	87
2.	Do you consider forensic odontology as a major branch of forensic science?	66	34
3.	Can dentist identify early child abuse	81	19
4.	Are lip prints unique as finger prints	80	20
5.	Can dental radiographs evaluate the post-mortem details	84	16
6.	Can saliva act as a tool for providing sex determination	72	28
7.	Tooth be used as an aid in DNA analysis?	79	21
8.	Are you aware of forensic odontology?	65	35

**Table 2: Percentage of responses provided by the students regarding the General methods to preserve 'Bite mark Evidence'**

9.	General methods to preserve 'Bite mark Evidence'	PERCENTAGE
A.	Photographic document of the bite site	0
B.	Impression of the bite site	7
C.	Both A and B	73
D.	None of the above	20

**Table 3: Percentage of responses provided by the students regarding the role of tooth in forensic dentistry**

10.	Tooth can aid in :	PERCENTAGE
A.	Age estimation	2
B.	Sex determination	3
C.	Crime investigation	28
D.	All the above	67

**Table 4: Percentage of responses provided by the students regarding the maintenance of dental records**

11.	How long should dental records be retained?	PERCENTAGE
A.	3 YEARS	2
B.	4 YEARS	12
C.	5 YEARS	35
D.	6 YEARS	50

**Table 5: Percentage of responses provided by the students regarding the Dentist Act 1948**

12.	Dentist act 1948 is an act	PERCENTAGE
A.	To provide guidelines for forensic dentistry	15
B.	To regulate the profession of dentistry	08
C.	To regulate medicolegal issues in dentistry	65
D.	To regulate the confidentiality for maintaining dental records	12

**DISCUSSION**

The present survey indicates that two-thirds of dental students (65%) have adequate knowledge about forensic odontology and one-third of the dental students(35%) have lack of awareness about forensic odontology. This is mainly because of inadequate exposure in the field of forensic dentistry and lack of practical exposure to forensic cases.

Our survey revealed that only 13% of the surveyed dental students had attended either a conference or workshop on forensic odontology, and they have better knowledge about forensic odontology when compared to the rest of the students<sup>2,3</sup>.

Among those who have attended either conference or workshop on forensic odontology, 76% were postgraduates. This shows that undergraduates have less exposure towards this field. 34% of the surveyed dental students did not consider forensic odontology as a major branch in forensic science, which shows their lack of awareness towards this branch. 73% of the surveyed dental students were aware of the methods to preserve bite mark evidence<sup>4,5</sup>.

81% of the surveyed dental students were aware that a dentist can identify early child abuse and 80% were aware that lip prints are as unique as finger prints<sup>11</sup>. 84% were aware that dental radiographs can help in evaluation of postmortem details. Almost 79% of the surveyed dental students were aware that teeth could be used as an aid in DNA analysis<sup>3,5,6</sup>.

Many dental students were not aware that teeth could aid in age estimation and sex determination. 28% of the surveyed dental students were not aware that saliva could act as a tool to aid in sex determination. Most of the surveyed dental students did not know the minimum period up to which the dental records have to be maintained and the Dentist Act of 1948 as well. The Indian Dental Association (IDA) recommends that for practicability, a doctor may maintain records up to a minimum of 5 years to satisfy consumers and the judiciary, for protection against medical negligence and complications<sup>7,8</sup>. Under Section 17-A of the Dentists Act, 1948, there are several benefits for those who are good at record maintenance in order to maintain professional respect and dignity for doctors. These records in question relate to the consent form, detection, diagnosis, and follow-up treatment records and recorded allergies for protection of life of a patient. There is usually a different requirement for the retention of records of children. These records must be kept for a certain period after the child becomes a major<sup>9,11</sup>.

We were able to find significant knowledge about forensic odontology among the dental student. The undergraduate and postgraduate programs must be improved by including lectures on forensic odontology, followed by clinical training. There must be a detailed program to ensure exposure to forensic cases analysis<sup>12,13,14,15</sup>.

## CONCLUSION

Forensic dental identifications play a vital role in the identification of individuals when identification

by visual or other methods fail. For an efficient forensic investigation, we need a dental team, comprising personnel from all branches of dentistry, working in close association with experts from other branches of forensic science. Training in forensic medicine and other branches of forensic science should include the importance of dentistry in forensic evaluation.

The demand for accurate forensic investigation in India will increase the scope of this interesting science in near future. We wish to conclude that, for an efficient forensic investigation, a highly competent dental team should actively involve for a fruitful outcome.

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**Conflict of Interest:** None

**Source of Funding:** Self

**Ethical Clearance:** Not required as it is a student based questionnaire study

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# Estimation of Stature from Palm Length and Deducing Correlation Coefficient and the Multiplication Factor among the Native Gujarati Population of Western India

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## ABSTRACT

Criminal investigation always involves the identification of individuals. Identification of individual is based on the available physical evidences. The most conventional method of identification of individuals is based on the fingerprints. There are certain instances wherein the identity of individual would be possible with the anthropometric data such as measurements of various body parts although the complete identification is possible with fingerprints and DNA analysis<sup>4,5,6</sup>. Still the primary characteristics of identification such as stature and sex can be determined with the available data.

In this study, an attempt has been made to establish the possible correlation between the palm lengths with the stature of individual. To get scrupulous results, the study has been done on the young adult population in the age range of 21-25 years<sup>6</sup>. A total number of 500 subjects were considered for the study that includes 200 boys and 300 girls. It was possible to deduce the correlation coefficient and multiplication factor for estimation of stature from palm length. The multiplication factor so deduced has been applied and regression analysis was done and was found to be significant and reliable.

*Keywords: Palm Length, Stature Estimation, Multiplication Factor*

## INTRODUCTION

In any cases of civil claims apart from criminal cases there is a need to establish identification. In a simple and uncomplicated case, the identification will not be much of an issue but in case of mutilated dead bodies or fragmented body parts, the identification will be done only through anthropometric data<sup>1,2,4</sup>. Though the ultimate identification is achieved through fingerprints, there are well established studies to correlate the size of various body parts with that of stature. In this study, an attempt has been made to establish correlation between stature of individual and palm length.

There always exists difference among people of various parts of country when such study is done. So this study has been done on native Gujarati population, as there are many other studies done on this aspect among different population groups<sup>1,2,7,8</sup>. An effort has

been made to establish the correlation coefficient and multiplication factor for the assessment of stature of individual when the mutilated body parts are available<sup>2,3,4</sup>.

This study finds its importance in such circumstances as natural disasters like earthquake, tsunami, floods and man-made disasters like terror attacks, road and rail traffic accidents, plane crashes etc. In all these conditions the first ever thing required to be done is the establishing the identity. In fact it is mandatory for social, legal & humanitarian reasons<sup>8,9,12</sup>.

By determining and estimating stature from measurement of palm length, there is an easy way of establishing the identity to certain extent. The authenticity could be well justified when the subjects under study belong to a particular race and ethnicity. So the area of the study and the data collection was done from Gandhinagar and Ahmedabad cities of

Gujarat state. In this study, each sample or data was collected accurately from every individual using simple and reliable techniques such as osteometric board and inch tape.

### OBJECTIVES

- To analyze the correlation between the stature of an individual with that of palm length among the native Gujarati population of either sex. \*To deduce the multiplication factor for effectively estimating stature with the palmer lengths. \*To analyze the possible existence of difference between male and female with anthropometric data

### MATERIALS AND METHOD

#### Estimation of stature

For the purpose of collection of data palm length amongst 200 boys and 300 girls, inch tape and osteometric board were used. These subjects are above 21 years but maximum of 25 years, as the growth of any individual gets completed at this age<sup>5</sup>. Before collecting the data, the subjects were informed about the purpose of the study and consent has been obtained from them.

For the measurement of stature, anthropometric measuring tape was used to collect the data of individual boys and girls. Individually, each person's stature in centimeter was measured using measuring (cms-inch) tape by making each person to stand erect in upright position with evenly distributed weight on both feet. It was measured as vertical distance from the vertex to the floor. Measurement was taken by making the subject stand erect on a horizontal resisting plane barefooted with shoulders and buttocks touching the wall and the palms and hand turned inwards and fingers horizontally pointing downwards. Anthropometer was placed in straight vertical position in front of the subject with head oriented in eye-ear-eye Plane (Frankfurt Plane). The movable rod of the Anthropometer was brought in contact with vertex in the mid saggital plane.<sup>1,2,6,10</sup> A set of personal data was also collected that includes socio-economic factors, dietary habits, genetic factors and parental history of disease. A sort of entire personal information was made available through questionnaire.



Fig.1. Palm length measurement



Fig.2. Palm length

#### Osteometric board

The palm length was measured using osteometric board<sup>8,12</sup> as shown in the figures 1 and 2. For palm length, palm of each subject was kept flat and straight and finger fixed but erect in upright position from edge of wrist on the osteometric board, then its length were measured on board by scrolling the scale and measurement was noted from tip of longest finger to edge of wrist and data was collected in centimeters.<sup>1,6,12</sup>

All the measurements have been noted in terms of centimeter. Those subjects who are having physical abnormalities such as Poliomyelitis, Dwarfism and Gigantism have been excluded<sup>6</sup>. A set of personal data has also been collected this includes socio-economic factors, dietary habits, genetic factors and parental history of disease. A sort of entire personal information was made available through questionnaire. They have been arranged in a tabular form for easy understanding. Separate tables have been prepared for Boys and Girls and correlation has been studied accordingly.

All the recorded data were subjected to various statistical analyses for the validity and authenticity of the derived data. This includes mean, variance, standard deviation, covariance, correlation coefficient, chi-square & calculated significance via the paired t-test, calculation of p value.

## RESULTS AND DISCUSSION

In case of boys, to deduce the multiplication factor for assessment of stature, each observed height in terms of centimeter has been divided by each observed palm length in centimeter. The mean multiplication factor so deduced was 7.87. Out of the 200 subjects 90% (180) have palm length ranging from 21cms to 22cms, sq.variance of (stature/palm length) is found to be 0.076, standard deviation is found to be 0.277. The mean of stature of all the 200 data of boys is found to be 167.9cms, variance of stature of all 200 data of boys is found to be 2.36 and standard deviation of stature is found to be 6.509. The mean of right and left hand's palm length of all the 200 data of boys is found to be 21.4cms. The sq.variance was found to be 1.2828cms and the standard deviation is obtained at 1.13. The mean multiplication coefficient is found to be 0.9424 and the mean covariance is obtained at 0.028174. The value of chi-square test for probability value is found to be 0.2029. The t-test for significance is obtained at 6.35 and correlation coefficient[r] is found to be 0.75 which all were observed to be highly significant. The confidence level of about 99.9% and the 0.001% was noted. The stature of all the subjects (300girls) found in standard method as mentioned earlier has been noted in terms of centimeter and is tabulated. In case of girls, to deduce the multiplication factor for assessment of stature, each observed height in terms of centimeter has been divided by each observed palm length in centimeters. The same procedure have been followed for all the subjects and mean of all data has been arrived at 8.15(stature/palmlength), 86% (260 out of 300 data)of subject are having palm length ranging from 19cms to 20cms, sq.variance of was found to be 0.063 and the standard deviation is found to be 0.2525. The mean of stature of all the 300 data of girls is found to be 159.1cms, sq.variance of stature of all 300 data of girls is found to be 2.9 and standard deviation of stature was found to be 4.6801.

The mean of right and left hand's palm length of all the 300 data of girls is found to be 19.6cms. The sq.variance was noted to be 0.527 and the standard deviation is obtained at 0.7260. The mean multiplication coefficient is found to be 0.08302cms and the mean covariance is obtained at 0.00658. The value of chi-square was found to be 0.137004. The t-test for significance is obtained at 3.48 and correlation coefficient[r] is found to be 0.62 and shows high level of significance of about 99.9% at 0.001 probability level.

**Table:1 Results of statistical analysis of palm length and stature among boys and girls**

Measurements	Boys (200)	Girls (300)
Mean of stature	167.9	159.1
Mean Variance of stature	0.75	0.48
Standard deviation of stature	6.509	4.6801
Mean of right and left palm length	21.7	19.6
Mean variance of right and left palm length	0.042	0.065
Mean square variance of palm length	0.04	0.06
Standard deviation of right and left palm length	1.13	0.7260
Mean of stature divided by palm length (Multiplication factor)	7.87	8.15
Mean sq.variance of stature divided by palm length	0.076	0.063
Standard deviation of stature divided by palm length	0.277	0.2525
Mean multiplication factor co-efficient	0.9424	0.08302
Mean covariance coefficient	0.02817	0.00658
Mean chi-square	0.2029	0.137004
T-test	6.35	3.48
Correlation coefficient[r]	0.75	0.62

## DISCUSSION

Though there are number of studies available on correlation existing between palm length and stature. The study envisages the particular parameter i.e. understudy in a specific population of native Gujarat. This have shown significant results in concurrence with previous results, which were outcome of research work in various other part of India such as Estimation of Stature from Hand and Phalange Length in Punjab population by Dr. O.P.Jasuja etal 2004, Estimation of stature from palm length in Karnataka population by Dr. Rajesh babu 2003. Estimation of stature from the foot and its segments in a sub-adult female population of North India by Kewal Krishna etal 2011, Estimation of Stature from Measurements of Long Bones, Hand and Foot Dimensions in Mumbai population by Chikhalkar B.G etal 2009. There exists a highest significant level of 99.9% for this particular parameter; this is in perfect concurrence with most of the previous studies. It is evident from the table, that the mean stature among the males is higher as compared to that of the females. It is also evident from the table, that the mean palm length in males is higher as compared to that of females. In case of palm length, a similar result has been arrived. The perfect correlation between palm length and stature has been established

with higher significance of 99.9%. This is also in perfect concurrence with the results obtained in previous research done on various other population of India. Bollar et al (2000) has studied the Punjabi population in which similar results were found.

### CONCLUSION

From this research work, the following are the few possible conclusions which are arrived at. There is a perfect symmetry observed among entire population under study for the palm length

Multiplication factor for the stature estimation was found to be found to be 7.87 in boys and 8.15 in girls. Of course it may not be the exact stature. There may be an error of about + or- 2 cms (after getting them cross checked.). Correlation coefficient is 0.75 in boys and 0.62 in girls was found to be more reliable and significant after the cross verification has been done.

In any scientific study there would be an existence of probable errors. In this study also, there may be minor discrepancies which would be properly nullified by the future researchers so that more accurate results are possible. The study could be extended to other part of the geographical areas of the country for the specific and more accurate results.

### Limitations

1. In the present study, age range of only 21 to 25 years is considered.
2. Measurements of only healthy individuals are considered. Hence the data may not be applicable to individuals who are malnourished &/or suffering from congenital malformations.
3. Sex variation is not taken into consideration.
4. Applicability of anthropometric measurements in living & deceased individuals may practically differ.
5. The present study is a preliminary one & would be followed up by other studies to redress the above limitations

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**Conflict of Interest:** There is absolutely no conflict of interest in this present study.

**Sources of Funding:** There is no source of funding for this specific study.

**Ethical Clearance:** Not applicable.

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# An Autopsy Based Study of Socio-Etiological Aspects of Unnatural Female Deaths

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## ABSTRACT

The death of a female poses a major challenge in the fields of Forensic Medicine and Judiciaries. Determining the reasons behind the unnatural female deaths helps the governments in framing the laws from time to time to maintain peace and harmony in the society. The study was conducted on 100 females who died of unnatural causes, at Guntur Medical College, Guntur. An unemployed female in the first 3 years of marital life was the major victim in our study. Framing of new rules and acts with time helps to decrease the incidence of crime against women, thereby morbidity and mortality.

**Keywords:** Unnatural Death, Dowry, Burns

## INTRODUCTION

The death of a female from womb to tomb poses major challenge in the field of Forensic Medicine in determining the cause and manner of death. In the society, the police and courts also pose the same problem. Increasing westernization with loss of morals and ethics in the society has become a great threat to the life of females. Different causes of killing a female include unwanted female child in the womb, poor socioeconomic status of parents, love failures, failure in exams, dowry, domestic violence, male alcoholism, post marital life pressures like in-laws dominance, unemployment, financial dependence of married woman on husband or in-laws, pregnancy related issues, sexual offences, extramarital affairs, property disputes etc. The death of a female after marriage may lead to a broken family thereby leading the children to antisocial activities. In Indian society, no socio-economic group is an exemption to offences against women which may finally lead to death.

## MATERIALS & METHOD

The study aims to know the prevalence of unnatural deaths of women relating to some socio etioloical factors like the age, literacy, employment, socioeconomic status, marital status, number of years

after marriage, family type, rural to urban areas, factors leading to fatal harassment, types of harassment, harassment by spouse and others, place and time of occurrence, hospitalized or not, period of survival, place of death, cause and manner of death. The present study was conducted in Department of Forensic Medicine and Toxicology, Guntur Medical College, Guntur, Andhra Pradesh. A total number of 100 autopsied cases were studied out of 1846 cases from January 2009 to December 2010 prospectively using a standard proforma. Details of medico - legal aspects, socio-cultural, economic and other factors were obtained from the investigating officer, friends, relatives, parents, husband or in-laws of the deceased. Females who died as a result of road traffic accidents and natural causes were excluded from the study.

## OBSERVATIONS AND DISCUSSION

In the present study, maximum (48%) numbers of cases were recorded in the age group between 21 – 30 years (Table 1). Women deaths were more in 21 – 40<sup>1</sup> years can be explained by dowry, infidelity, love failures, disobedience to parents and in – laws, sexual harassment, low socioeconomic status, extramarital affairs and infertility problems. The number of female deaths were more (82% vs 18%) in rural areas<sup>3</sup> can be

explained by illiteracy, unemployment, low socioeconomic status, early marriages, dowry, alcohol addiction of spouse, infidelity and giving birth to female child twice or thrice. Rural areas must be provided with more female children education and employment after completion of graduate education.

Tables 1: Age distribution of unnatural female deaths

Age group (yrs)	Percentage
14 – 20	20
21 – 30	48
31 – 40	22
41 – 60	10

Table 2: Profile of different factors of unnatural female deaths

Factor	Percentage
Rural Vs Urban	82 Vs 18
Married Vs Unmarried	90 Vs 10
Nuclear vs Joint family	60 vs 40
Lower Economic Group vs Others	76 vs 24
Illiterate vs literate	56 vs 44
Unemployed vs employed	84 vs 16

Table 3 : Individual causing fatal harassment

Individual	Percentage
Husband alone	46%
Spouse & In-laws	24%
Paramour	12%
In-laws alone	6%
Parents alone	6%
Neighbours	6%

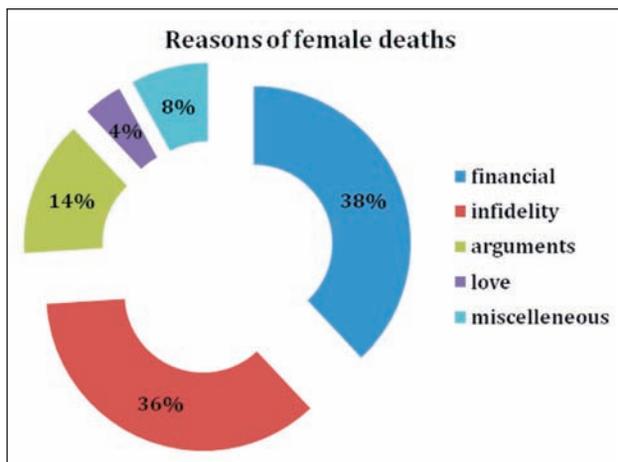


Fig. 1.

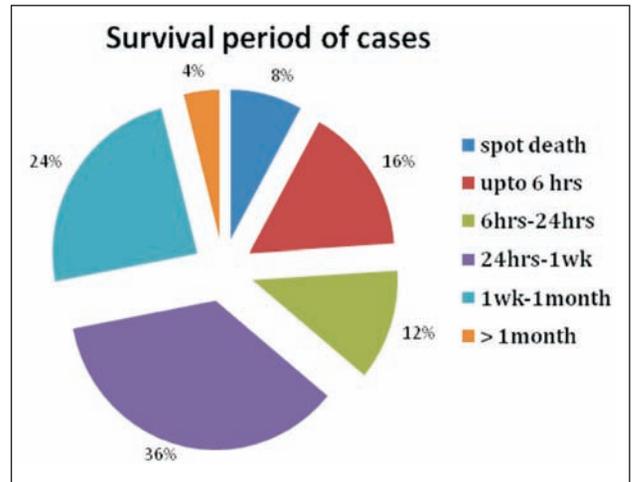


Fig. 2.

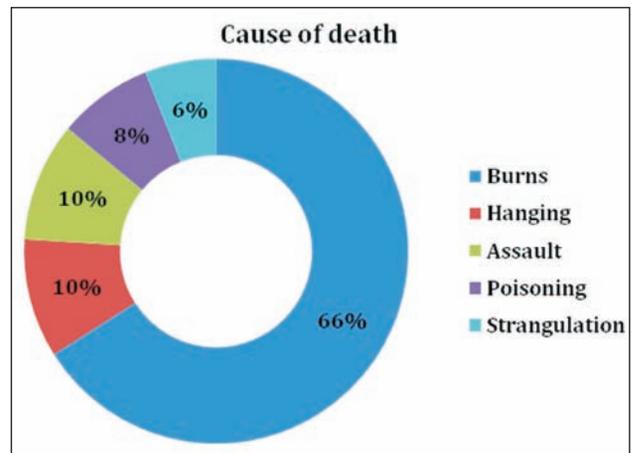


Fig. 3.

In the first three years of marital life (60%)<sup>4</sup>, women were much more prone to harassment deaths<sup>3,5</sup> (90%). More number of deaths in early married years can be explained by lack of awareness about marital life like adjustment to new atmosphere, sex related problems between couple, post marital issues like dowry, demand for extra money, pregnancy related issues like female foeticide, sexual harassment by in - laws, extramarital affairs of either spouse and unemployment of husband, leading to quarrels in a peak time. Less number of unmarried female deaths can be explained by comfortable homely atmosphere with parents, no economic burdens and low marriage age. Nuclear families in present days pose more number of female deaths<sup>4</sup> (60%) can be explained by

staying alone leading to repeated thinking, flight of ideas and no one for assurance leading to committing suicide at a bad moment. Illiterate <sup>3, 4</sup> (56%), Unemployed housewives <sup>4</sup>(84%) and the low socioeconomic status<sup>4</sup> (76%) females died more when compared to their counterparts. These findings speak about the importance of female education and employment in our society, which helps to cope up with the pre and post marital pressure situations, economic burdens thereby helping the family and the society.

Spouse and other housemates like in-laws<sup>6,7</sup> are responsible for harassment and death in 82% of cases can be explained by persons living in and around her does not support her in any way finally causing bad incident. An alcoholic husband was responsible for fatal harassment in 38% of cases indicating the effect of alcohol, drugs etc. on the society. Physical and psychological harassment (78%) together was much more common than others. Financial problems including dowry (38%) <sup>4</sup>, infidelity including extramarital affairs (36%) were the major factors leading to death in this study. Even though the Government of India has passed the Dowry Prohibition Act in 1961<sup>8</sup>, till today this social evil was not totally eradicated from our society and has become a major issue of unnatural female deaths.

Occurrence of incident was more in the couple's home (44%) than in in-laws home (24%) <sup>4</sup>. This can be explained by different types of post marital pressures like ill - adaptation to the new family, sudden separation from parents, emotions and sentiments between new couple, unemployment, dowry, sex related problems, stress during pregnancy, child care and regular domestic work. Staying with elders for some time after marriage may prevent quarrels and decrease issues between new couple. Most of the incidents which ended in female fatality occurred during evening or night time (56%) after 5PM. People staying at home after job discuss more regarding daily domestic problems which may cause a heated argument.

Burns was the cause of death in majority (66%) <sup>3,5</sup> followed by hanging (10%), assault related head injuries (10%), poisoning (8%) and strangulation (6%). Kitchen burns were more common due to easy access to inflammable materials. The survival period of the victims was less than one day in 28%, one day to one

week in 36% and one week to one month in 24%. The less survival period in 28% of cases can be explained by late arrival to the hospital, severity of the injuries and complications like neurogenic shock and hypovolemia. <sup>9</sup> Development of complications like septicemia, renal damage, curling's ulcers<sup>9</sup> along with other socioeconomic factors like inability to afford medical expenditure; lack of health insurance policies for most of the people in our country explains more fatality during first week. Even less percentage (40%) <sup>10</sup>of superficial burns can be fatal due to loss of skin resulting in decreased resistance of the body to the microorganisms leading to septicemia, shock, multiple organ failure etc., which explains burns as predominant cause of death. Manner of death was suicidal in majority of cases (64%), homicidal (16%) and doubtful/inconclusive in rest of the cases. Females generally are more sensitive, staying alone at home after heated arguments committed suicides.

## CONCLUSIONS

- The present study identifies that the female has more risk of death in the following situations:
  1. Married, illiterate, unemployed, with a low socioeconomic status living in a rural area in the age group of 21-40 years.
  2. Facing financial problems like dowry.
  3. Staying in a nuclear family with an alcoholic husband.
  4. In the first three years of marital life.
  5. Involved in extra-marital affairs.
  6. Arguments in house in evening or nights.
- Suicidal burns were the common cause of death with fatality rate more in first week.

## LEGAL ASPECTS

The different legislations to protect females include Dowry Prohibition Act, 1961; Sec.375 IPC and Sec.354 IPC <sup>11</sup>; Sec. 304 (B) IPC, Sec. 498 (A) IPC, Sec. 113 (A) and 113(B) of IEA<sup>12</sup> etc. Constitutionally, women were provided special protection under Article 21 and Article 14 <sup>11</sup>. Supreme Court of India extended the ambit of Article 21 and held that mere existence is not the right to live, it is the right to live with dignity. The

Criminal Law (Amendment) Act, 2013<sup>13</sup> is an Indian legislation passed by both houses of Parliament of India in March 2013, which provides for amendment of Indian Penal Code, Indian Evidence Act, and Code of Criminal Procedure 1973 on laws related to sexual offences, in light of the protests in the 2012 Delhi gang rape case.

### SUGGESTIONS

The above conclusions suggest that a female will be in a better position when she gets education, employment, living in semi urban / urban areas. An educated, employed male living with parents generally will be away from bad habits will give more security to female life.

1. Marriage registrations must be made mandatory seeking the employment/business of at least one partner, health status, age, criminal background of person and family. If the couple is not having financial support, it is better to postpone marriage until one of them gets employment/business opportunity.
2. If any previous married female unnatural death in family is reported, the male should not be allowed to go for next marriage unless the judiciary gives a clean chit.
3. Staying in a joint family at least for a period of 3 – 5 years after marriage can save quite good number of female lives.
4. Newly married couples staying away from parents must be under vigilance when family disharmony has been observed/ reported in police stations/ panchayats.
5. Awareness programmes about Dowry Prohibition Acts, punishments for crime against women, female or male child births in mass media systems like television, movie theatres may help society in bringing down crime rate.
6. Introduction of syllabus regarding Indian marriage traditions, different problems that may come across in post marital life, acts and laws regarding marital life problems in graduate education may bring awareness in the society.

7. Pre and post marital counseling regarding different aspects of marital life by establishment of family counseling centers at villages/rural/ urban areas helps people to get out of death at a bad moment.

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**Conflict of Interest:** None

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**Ethical Clearance:** Taken from Ethical Committee, Guntur medical college, Guntur.

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# The Pattern of Lightning Injuries in Telangana District

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## ABSTRACT

Lightning strikes killed many people throughout world, especially in tropical countries, yet their effects are capricious, unpredictable in rainy season, that they demand recognition of by a medico legal expert. The death to no signs to be expected in connection with bizarre presentations of victims, torn clothing further arouse suspicions of foul play and sometime person at a considerable distance from the spot lightning, is killed with no marks of injury due to 'return shock'. Thirty Eight victims of lightning fatalities were identified from emergency dept. of MGH, Dept. of Forensic Medicine, for a period of 3 years Males are the most common victims when working in the open field afternoon with peak incidence in June to September. Lightening victims found different types of burns over body which are unique arborescent burns injuries, linear and surface burns injuries with singed hairs, torn clothes. Magnetization of the metal worn noted. Study of pattern of injuries due to lightning reveals occupation, factors are indirectly related to such deaths. High incidence of lightning strikes in the region and calls for a more systemic and detailed investigative protocol in lightning related deaths. Rapid death occurs due to anoxia, respiratory paralysis and preventable by precautionary measures.

**Keywords:** *Pattern of Lightning Injuries, Incidence, Death, Lightning*

## INTRODUCTION

When there is discharge of electricity between clouds lightning occurs, when the charge jumps between cloud and earth, it is called Lightning strike<sup>1</sup>. Their effects are capricious, unpredictable in rainy season, demand recognition of by a medico legal expert for foul play of the deaths due to lightning without any external injuries. In lightning, the discharge may be from cloud or from cloud to the earth through some object, usually the tallest object in contact with the earth. Lightning chooses the easiest path, not the shortest, i.e. the path with least electrical restrike instance. The electric current is direct, of about 20.000 amperes phenomenal voltage operating over an

average period of 30 microseconds takes a wandering, zigzag path<sup>2</sup>.

Lightning deaths provide no real problems for the forensic pathologist. The injuries with or without the burns on the body associated with tearing off of the wearing apparels, may closely resemble those produced by criminal violence. But the history of thunderstorm in the locality, effects of lightning with characteristic burns on the body and the vicinity, fusion or magnetization of metallic objects on the body or nearby, will all suggest death due to lightning stroke<sup>2</sup>

The effects of lighting are due to passage of very high potential electricity that liberates tremendous energy in the form of heat, responsible for producing various burns that are usually superficial owing to the very short duration of the flash and blast effects of the rapidly expanding air that may tear the clothing and impart suspension of the foul play.<sup>3</sup>

Lightning causes human injury by four distinct mechanisms: the direct effect of electric current,

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burning by super-heated air; effects of expanded and repelled air around flash and the sledge hammer blow death by compressed air pushed before the current<sup>8</sup>. The distribution pattern of injuries depends on the type of strike, direct strike, splash, ground strike and electromagnetic pulse.

An estimated 24,000 people are killed by lightning strikes around the world each year and about 240,000 are injured. Estimated death rate 0.3 per 1 lack people per year in developed nations and 6 per 1 lack people per year in developing nations. In India, according to NCRB, 2550[0.7%] lightning fatalities accounting for 2011, 2263[0.6%] for 2012 and 2013, 2833[7%] respectively. The incidence rate is 0.2<sup>4</sup>

### AIMS AND OBJECTIVES

To study of pattern of injuries and the prevalence of lightning fatalities.

To determine the various conditions associated with deaths and various conditions responsible for fatalities due to lightning strike.

### MATERIAL AND METHOD

The present study was carried out from Jan 2011 to Dec 2013 in the Dept. of Forensic Medicine at Mamata Medical College & Hospital, Khammam; Telangana. Proforma specially designed for this purpose was used and filled in each case after examination. Detailed data collected from victims, relatives accompanied deceased, hospital records, inquest, autopsy reports etc., to gather information

### RESULTS

A total of 38 cases of lightening were recorded during 3 year period of study[2011 -2013] with maximum incidence 16 cases in 2013 ,most of the cases occurred during the months of May to September with peak incidence during June – July[76.31%].Results are tabulated.

A total 2262 autopsies done, out of which 38 victims due to lightning during the study period. The incidence of lightening has increased from [2011] 10 cases [1.39%] to [2012] 12cases [1.59%] & [2013] 16 cases [2.02%].

Maximum number of cases 16 [47.52%] were from 31- 40 years age group ,followed by 12 cases [31.57%] in 21-30 years,5cases [13.15%] in 41-50 and no cases at

both extremities. The minimum age of the victim is 13 years and maximum was 60 years.

In our study 30 cases [78.94%] were of males whereas females amounted to 08 [21.05%] and ratio of female to male is being 26:66.

Majority of victims 29 [76.31%] cases were from rural population and 09[23.68%] cases were from urban population

Farmers were top among the occupations, maximum 28 cases [73.68%] were farmers followed by 06[15.78%] laborers and 03 [7.89%] students.

Also Maximum lightening [94.73%] cases occurred during June to September months which is the rainy season in our region.

Open field is the most vulnerable place for lightning strikes accounting for 27[71.05%] cases. Persons standing beneath a tree or under a shade comprised 9 [23.68%] of the victims.2 [5.26%] cases were recorded near house

Maximum cases 34[89.47%] were brought dead and did not receive the treatment, followed by 2cases [5.26%] who died after 1 day and 2[5.26%] victims were survived after hospitalization

The pattern of injuries are noted as burns over body in 36[94.73%] cases with maximum cases having arborescent burns or Lichtenberg figures or filigree burns 26[68.42%],followed by linear burns 8[21.05%] next surface burns 2[5.26%]cases and burns injuries are not seen in 2[5.26%] cases as depicted in table no.2

As per the distribution of burns over the body, majority of 17[44.73%] victims found burns over the thorax front & back, followed by both upper limbs 8[21.05%],next front &back of abdomen & both lower limbs 6 [15.78%],least2[5.21%] face & head are involved. Majority of the burn injuries 26[68.42%] are superficial burns and followed by mixed degree burns 7[18.42%].

Magnetization of the metal worn noted in 15 [39.47%] cases. Metallic objects marks such as tooth fillings, spectacles, belts, buckles and coins are observed.

Singed hair were noted in 18[47.36%] cases. There is often a smell of singeing or burning about the body and its clothing observed in 12[34.28%] cases

We found head injury, caused either by the lightning strike itself or by falling to ground observed in 10[28.57%] cases.

In 16[42.0%] cases bleeding was noted either from one or both ears. Evidence of blast effect also found in 11 [31.42%] cases.

Post mortem findings were nonspecific and majority showed evidence of severe congestion of all internal organs and pulmonary edema are also common. Petechial hemorrhage seen in the brain and the spinal cord.

In present study cardio –pulmonary arrest following lightning was most common in 28 [77.77%] cases which leads to immediate death of the victim followed by burns 6[16.66%] and 1[2.77%] each one by head injury and pulmonary infarct.

**Table No.1 The Pattern distribution of injuries in lightning**

Pattern distribution of injuries	No. of cases	%
Arborescent Buns	26	68.48
Linear burns	8	21.05
Surface burns	2	5.26
Associated injuries	12	31.57
Singed hair	18	47.36
Magnetization of metal	15	39.47
No injuries	2	5.26
Blast effect	12	31.57

**Table no.2 Causes of death**

Cause	No.Cases	%
Cardio-pulmonary arrest	28	77.77
Burns	6	16.66
Head injury	1	2.77
Pulmonary infarct	1	2.77
Total	36	

## DISCUSSION

The incidence of lightening has increased from [2011] 10 cases [1.39%] to [2012] 12cases [1.59%] & [2013] 16 cases [2.02%].This is evident that the incidence of lightening and the fatalities are much higher in this region

Maximum number of cases 16 [47.52%] were from 31- 40 years age group ,followed by 12 cases [31.57%] in 21-30 years,5cases [13.15%] in 41-50 and no cases at both extremities. The minimum age of the victim is 13 years and maximum was 60 years. These are consistent with authors<sup>3,5</sup>.This is due to fact that adults are

involved in outdoor activities in spite of bad weather and working class people belong to this age group.

In our study 30 cases [78.94. %] were of males whereas females amounted to 08 [21.05%] and ratio of female to male is being 26:66.Males are involved in occupations which are mostly involved in outdoor activities and hence more prone for lightening. Similar findings are observed by other studies<sup>5</sup>.

Rural victims 29 [76.31%] were outnumbered urban population 09[23.68%]. This might be due to victims were working at open field even during high risk period of lightening. Similar results were noted by authors<sup>5,6</sup>

Farmers were top among the occupations, maximum 28 cases [73.68%] were farmers followed by 06[15.78%] laborers and 03 [7.89%] students. This might be due to agriculture, this group of people working in open field as farmers, more prone to lightning. Similar findings are made by authors<sup>5-7</sup>.

Maximum cases of lightening 19[50.00%] were occurred during the month of June, followed by July 10 cases [26.31%] and 5[13.15%] during August .These are similar to authors<sup>6,7</sup>. The most probable reason is agriculture rain dependent in this region

Also highest frequencies of lightening [94.73%] cases encountered during June to September months which is the rainy season in our region .The most probable reason might be more number of lightening during this period resulting in more number of cases. These are consistent with other authors<sup>8,9</sup>.

Open field is the most vulnerable place for lightning strikes accounting for 27[71.05] cases. Persons standing beneath a tree or under a shade comprised 9 [23.68%] of the victims.2 [5.26%] cases were recorded near house. Similar findings are observed by authors<sup>10</sup>. The tendency of lightning striking a tall object in an open space and shelter under a tree is by no means safe, particularly if they are carrying or wearing something that may attract lightning.

Most of the cases 24 [63.15%] occurred in the afternoon between 12noon and 3 pm.10 of the incidents occurred in the late afternoon and evening between 3pm and 6pm. Storms and lightning occur during monsoon the period of the day being late afternoon and evening. This is the time for most of the people engaged in their work more susceptible to striking. These are consistent with authors<sup>7,9</sup>.

Maximum cases 34[89.47%] were brought dead and did not receive the treatment, followed by 2 cases [5.26%] who died after 1 day and [5.26%] are survived after hospitalization. The reason for this might be that after lightening, ventricular arrhythmias are most common effect on the body. Similar findings are observed by author.<sup>10</sup>

We found burns over body in 36[94.73%] cases. A superficial or deep burn marks are the point of discharge from the body to the earth. The track of the discharge can be traced by these skin burns and damage to the clothing. These are consistent with authors<sup>9,11</sup>

Pattern of injuries in lightning, the external lesions mostly take the form of unique arborescent injuries noted in 26[68.42%] cases. Which are due to deposition of copper on the skin because rupture of smaller blood vessels break down of red cells in the skin capillaries along the path of the electric current. This pattern when present pathognomic of lightning and indicate the path of discharge .Similar observations are made by authors<sup>10-12</sup>.

Also other Pattern of injuries in lightning, the form of linear burns in 8[21.05%] cases. They are varied from 6-25 mm in width over the victims body observed. Which are found on moist surfaces of the skin, because moist skin offers less resistance than dry skin. Similar findings are noted by authors<sup>12,14</sup>

Our study shows that the surface burns were found over body in 2[5.26%] cases and burns injuries are not seen in 2[5.26%] cases. Which are consistent with other studies<sup>10,14</sup>. A superficial or deep burn marks are the point of discharge from the body to the earth ,true burns occurring beneath the metallic objects due to heating up of metallic objects worn or carried by the person.

The primary burns in the form of bruising usually at the back of the head, which may be attributable to sledge hammer blow dealt by the compressed air pushed before the current. The passage of the charge over the body may be traced by skin burns and damage to the clothing .More intense than the skin markings between it and the point of entry. Similar observations are made by authors<sup>15,16</sup>

The strike survivors 2[5.26%] are thrown away by the struck of lightning suffered with shock found unconscious condition for 24 hours in hospital after

recovered with retrograde amnesia. Similar findings are made by authors<sup>15,16</sup>.

In 16[42.10%] cases bleeding was noted either from one or both ears. Evidence of blast effect also found in 12 [31.57%] cases. These are consistent with other studies<sup>10,11</sup>.Blast effects observed in the form of tearing of clothing, the effects also observed on the trees showing areas of scorched leaves and vegetation in the vicinity of the scene of death. Metallic objects in the area get fused or become magnetized or nylon underclothing melt and objects at a distance of 100 feet or more struck.

Majority of victims 17[44.73%] found burns over the thorax front & back, right shoulder and right upper limb ,followed by left shoulder & right upper limb 8[21.05%],next front &back of abdomen & both lower limbs 6[15.78%] , 2[5.26%]least over the face & head. Similar findings are observed by authors<sup>12,15</sup> .This is might be due to discharge of high voltage direct electricity bizarre phenomenal presentations of lightning during thundering within the short period.

Majority of the burn injuries 26[68.42%] are superficial burns and followed by mixed degree burns 7[18.42%].These are consistent with authors<sup>10,17</sup>. This is might be due rapid, short period exposure of the body to lightning

Magnetization of the metal worn noted in 15 [39.47%] cases. These are consistent with authors<sup>10,11</sup> .Metal objects may burn the underlying skin mark due to heat of electrical arcing which are true burns. This is due to high voltage of direct current and usual finding in lightening. Metallic objects marks such as tooth fillings, spectacles, belts, buckles, wrist watches, metal hooks or zip and coins are observed.

Singed hair were noted in 18[47.36%] cases and the clothing get burnt or torn wide apart observed in 18[47.36%] cases. These are similar to authors<sup>17</sup>

We found head injury, caused either by the lightning strike itself or by falling to ground observed in 12[31.57%] cases. Which are consistent with studies by others<sup>16,17</sup>

Post mortem findings were nonspecific, showed evidence of severe congestion of all internal organs. These are consistent with authors<sup>17,18</sup>

Cardio -pulmonary arrest following lightning was most common in 28 [77.77%] cases which leads to

immediate death of the victim followed by burns 6[16.66%] and 1[2.77%] each one by head injury and pulmonary infarct. Similar findings are observed by other studies<sup>19,20</sup>

### CONCLUSION

Pattern distribution of injuries like Arborescent, linear burns, and surface burns injuries were found over the body

Singed hair were noted

Magnetization of the metal worn noted

Unpredictable but preventable with proper precautions

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# Fingerprint Patterns: a Study on Genetic Influence of Fingerprint Patterns among Gujarati Population in Western India

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## ABSTRACT

Fingerprints patterns are the most useful tool for personal identification<sup>2</sup>. This technique is though conventional, it is reliable, and robust of all others. This technique is useful or establishing the identification of individuals both living and dead<sup>5</sup>. It is being widely used for criminal identification. The genetic influence of DNA has been well established<sup>2,3,4,9</sup>. In this an effort has been made to establish the influence of genetic factors in the occurrence of fingerprint patterns. Total number of samples considered in this study is 144. After a thorough systematic examination, it is found that there is a significant level of transmission of fingerprint patterns from parents to children. In this particular work, the incidence of the genetic influence of the fingerprint patterns has been studied in a small group of native Gujarati population.

*Keywords:* Fingerprint Patterns, Genetic Factors, Parents, Offspring, Inheritance

## INTRODUCTION

Forensic science is the most integral part of criminal justice system<sup>5</sup>. Fingerprints are still considered to be more reliable in criminal identification. Fingerprint technique is more simple, robust and non-duplicating<sup>2,6</sup>. This method is also easy for collection, analyze, and conclude. This makes the technique more suitable for perfect identification of individuals. Though there are many biometric methods available for identification, fingerprints are the best among all.<sup>1</sup> There is a possibility of the influence of genetic factors in fingerprint patterns also<sup>4,6</sup>. An advantage of this method is of non invasive one. The study has been done on the homologous population of Gujarat.

## MATERIALS AND METHOD

In the field of fingerprints, there is an involvement of ink and glass plate method<sup>2,5</sup>. This method of obtaining the prints is simple and cost effective. This is not only easy but also a standard method for procuring the prints. Fingerprints have been collected

from the study groups which are classified according to their ages. The conventional method (Cummins & Midlo) has been followed for the collection of fingerprints and palm prints<sup>7</sup>. In this method, a drop of printers ink has been applied over a glass plate and a thin film has been formed by rubbing over the glass plate constantly and gently. This results in the formation of a thin layer of the ink. After explaining about the details of the study to the subjects, the consent was obtained from them. The fingertips were cleaned thoroughly with spirit to remove any dirt or dust. Then the subject was given a uniform application of this thin film of ink over the finger tips. The fingerprints have been obtained by pressing the fingers from lateral to medial side to get rolled impressions of the fingers. This was taken in the standard proforma in a form of fingerprints card (used in any system of collection of fingerprint impressions for the purpose of identification) which has ten square spaces for individual fingers. 36 families with a total size of 144 subjects' prints were obtained. The significant transmission of patterns is considered only when the

pattern in the particular finger either in the father or the mother is noted in the corresponding fingers among the children. Results have been listed in tables according to the family numbers. Every family has been represented with the fingerprint patterns of entire family members.

## RESULTS AND DISCUSSION

The tabulations are made corresponding to the family members. The details of the pattern distribution among the family members have been considered for the study are tabulated as under.

**Table 1: Inheritance of patterns from father to son**

Sl.no.	Family no	From	To	No.of Whorls	No. of Ulnar Loops	Total
1	2	Father	1 <sup>st</sup> son	-	6	6
2			2 <sup>nd</sup> son	-	4	4
3	3	Father	son	1	6	7
4	4	Father	son	-	4	4
5	5	Father	1 <sup>st</sup> son	-	7	7
6			2 <sup>nd</sup> son	1	3	4
7	6	Father	son	6	-	6
8	7	Father	1 <sup>st</sup> son	-	6	6
9			2 <sup>nd</sup> son	-	7	7
10	8	Father	1 <sup>st</sup> son	-	7	7
11			2 <sup>nd</sup> son	1	3	4
12	9	Father	1 <sup>st</sup> son	-	5	5
13			2 <sup>nd</sup> son	-	5	5
14	10	Father	son		7	7
15	11	Father	son	4		4
16	12	Father	son	-	5	5
17	13	Father	1 <sup>st</sup> son	2	4	6
18			2 <sup>nd</sup> son	2	4	6
19	14	Father	1 <sup>st</sup> son	1	6	7
20			2 <sup>nd</sup> son	2	7	9
21			3 <sup>rd</sup> son	2	7	9
22	15	Father	1 <sup>st</sup> son	1	2	3
23			2 <sup>nd</sup> son	1	-	1
24			3 <sup>rd</sup> son	1	3	4
26	17	Father	1 <sup>st</sup> son	3	2	5
27			2 <sup>nd</sup> son	2	5	7
28	18	Father	son	-	2	2
29	19	Father	son	10		10
30	21	Father	son	-	4	4
31	22	Father	son	3	2	5
32	23	Father	1 <sup>st</sup> son	5	3	8
33			2 <sup>nd</sup> son	2	4	6
34	25	Father	1 <sup>st</sup> son	-	5	5
35			2 <sup>nd</sup> son	-	4	4
36	26	Father	son	3	5	8
37	28	Father	1 <sup>st</sup> son	1	3	4
38			2 <sup>nd</sup> son	1	2	3
39	30	Father	son	9	-	9
40	31	Father	son	1	1	2
41	32	Father	son	2	5	7
42	33	Father	1 <sup>st</sup> son	-	3	3
43			2 <sup>nd</sup> son	2	2	4
44	34	Father	1 <sup>st</sup> son	2	5	7
45			2 <sup>nd</sup> son	3	4	7
46	35	Father	son	6	3	9
47	36	Father	son	-	6	6
47	30			80	178	258

**Table 2: Inheritance of patterns from mother to son**

Sl.no..	Family no.	From	To	No.of whorls	No.of ulnar loops	Total
1	1	Mother	1 <sup>st</sup> son	-	4	4
2			2 <sup>nd</sup> son	2	4	6
3			3 <sup>rd</sup> son	2	2	4
4	2	Mother	1 <sup>st</sup> son	1	4	4
5			2 <sup>nd</sup> son	4	5	9
6	3	Mother	son	-	7	7
7	4	Mother	son	-	6	6
8	5	Mother	1 <sup>st</sup> son	-	7	7
9			2 <sup>nd</sup> son	-	3	3
10	6	Mother	son	3	-	3
11	7	Mother	1 <sup>st</sup> son	3	-	3
12			2 <sup>nd</sup> son	2	-	2
13	8	Mother	1 <sup>st</sup> son	-	9	9
14			2 <sup>nd</sup> son	-	4	4
15	9	Mother	1 <sup>st</sup> son	1	6	7
16			2 <sup>nd</sup> son	2	5	7
17	10	Mother	son	-	7	7
18	11	Mother	son	10	-	10
19	12	Mother	son	2	6	8
20	13	Mother	1 <sup>st</sup> son	6	2	
21			2 <sup>nd</sup> son	8	2	10
22	14	Mother	1 <sup>st</sup> son	-	7	7
23			2 <sup>nd</sup> son	-	8	8
24			3 <sup>rd</sup> son	-	8	8
25	15	Mother	1 <sup>st</sup> son	8	2	10
26			2 <sup>nd</sup> son	7	-	7
27			3 <sup>rd</sup> son	7	2	9
28	17	Mother	1 <sup>st</sup> son	3	2	5
29			2 <sup>nd</sup> son	3	7	10
30	18	Mother	son	-	6	6
31	20	Mother	son	2	6	8
32	21	Mother	son	-	4	4
33	22	Mother	son	-	4	4
34	23	Mother	1 <sup>st</sup> son	4	1	5
35			2 <sup>nd</sup> son	2	3	5
36	25	Mother	1 <sup>st</sup> son	-	8	8
37			2 <sup>nd</sup> son	-	7	7
38	26	Mother	son	4	3	7
39	28	Mother	1 <sup>st</sup> son	1	5	6
40			2 <sup>nd</sup> son	1	5	6
41	30	Mother	son	6	-	6
42	31	Mother	son	6	1	7
43	32	Mother	son	1	6	7
44	33	Mother	1 <sup>st</sup> son	2	3	5
45			2 <sup>nd</sup> son	5	3	8
46	34	Mother	1 <sup>st</sup> son	1	5	1
47			2 <sup>nd</sup> son	2	5	2
48	35	Mother	son	2	3	5
49	36	Mother	son	-	8	8
49	31			113	205	318

**Table 3: Inheritance of patterns from father to daughter**

Sl.no..	Family no.	From	To	No.of whorls	No.of ulnar loops	Total
1		Father	daughter	-	-	0
2	2	Father	1 <sup>st</sup> daughter	-	6	6
3			2 <sup>nd</sup> daughter	-	1	1
4	3	Father	1 <sup>st</sup> daughter	-	8	8
5			2 <sup>nd</sup> daughter	1	5	6
6	4	Father	daughter	-	5	5
7	6	Father	daughter	2	3	5
8	11	Father	daughter	-	4	4
9	15	Father	daughter	-	4	4
10	16	Father	1 <sup>st</sup> daughter	2	5	7
11			2 <sup>nd</sup> daughter	2	5	7
12	18	Father	1 <sup>st</sup> daughter	2	2	4
13			2 <sup>nd</sup> daughter	8	2	10
14			3 <sup>rd</sup> daughter	6	2	8
15	21	Father	daughter		5	5
16	22	Father	daughter	3	3	6
17	24	Father	daughter	2	2	4
18	27	Father	daughter	2	4	6
19	29	Father	daughter	-	4	4
20	30	Father	daughter	5		5
21	32	Father	daughter	-	5	5
	15			35	75	110

**Table 4: Inheritance of patterns from mother to daughter**

Sl.no.	Family no	From	To	No.of Whorls	No. of Ulnar Loops	Total
1	2	Mother	1 <sup>st</sup> daughter	1	5	6
2			2 <sup>nd</sup> daughter	4	1	5
3	3	Mother	1 <sup>st</sup> daughter	-	10	10
4			2 <sup>nd</sup> daughter	-	6	6
5	4	Mother	daughter	-	7	7
6	6	Mother	daughter	1	4	5
7	11	Mother	daughter	9	-	9
8	15	Mother	daughter	-	2	2
9	16	Mother	1 <sup>st</sup> daughter	-	6	6
10			2 <sup>nd</sup> daughter	-	5	5
11	18	Mother	1 <sup>st</sup> daughter	2	6	8
12			2 <sup>nd</sup> daughter	2	2	4
13			3 <sup>rd</sup> daughter	2	3	5
14	20	Mother	1 <sup>st</sup> daughter	-	5	5
15			2 <sup>nd</sup> daughter	2	6	8
15	21	Mother	daughter	-	5	5
17	22	Mother	daughter	-	3	3
18	24	Mother	daughter	-	4	4
19	27	Mother	daughter	2	5	7
20	29	Mother	daughter	2	5	7
21	30	Mother	daughter	3	1	4
22	32	Mother	daughter	-	6	6
22	16			30	97	127

Statistical Test for the Significance (with 5% , P<0.05)

**Table 5: Father to Son**

Relationship	Whorl	Loop	chi-square value for whorl	chi-square value for loop
FATHER	150	280	32.66	37.14
SON	80	178		

**Table 6: Mother to Son**

Relationship	Whorl	Loop	chi-square value for whorl	chi-square value for loop
MOTHER	186	288	28.65	23.93
SON	113	205		

**Table 7: Father to Daughter**

Relationship	Whorl	Loop	chi-square value for whorl	chi-square value for loop
MOTHER	92	113	35.31	12.77
SON	35	75		

**Table 8: Mother to daughter**

Relationship	Whorl	Loop	chi-square value for whorl	chi-square value for loop
MOTHER	56	134	12.07	10.21
SON	30	97		

**Table 9: Total number of patterns inherited from parents to children**

From	To	No. of whorls	No. of ulnar loop	Total	% of whorls	% of ulnar loop
FATHER	SON	80	178	258	31.00%	69%
	DAUGHTER	35	75	110	31.81%	68.81%
MOTHER	SON	113	205	318	35.53%	64.46%
	DAUGHTER	30	97	127	23.62%	76.37%

**Table 10: Inheritance of patterns in percentage from the parents to children**

From	To	Inheritance of Both Patterns (%)
Mother	Son	67.08%
Mother	Daughter	66.84%
Father	Son	60.00%
Father	Daughter	53.65%

**Table 11: Percentage of occurrence of loop and whorl patterns among all the members of family**

Pattern	No of subjects	Percentage
Loop	873	60.62%
Whorl	507	35.20%

**DISCUSSION**

In this study, an effort has been made to establish the inheritance of fingerprint patterns among the families. If the fingerprint patterns found in particular fingers of the child and either in father or mother ( in the same particular fingers ),it is considered as the perfect inheritance <sup>1,2,9</sup> The possible transmission of fingerprint patterns from the parents to the offspring

has been studied on the basis of individual to individual in every family.

There was a significant level of such an inheritance found among 21 families out of 36 families those have been taken for the study. This shows the extent of significance for the inheritance. On an average, 65% loops are seen in any individual <sup>1</sup>. There would be 25% of whorls and 7% of arches<sup>1,2</sup>.

After thorough analysis, it is possible to arrive at the following results. It is also possible to establish tentative conclusion with the possible inheritance of patterns of fingerprints from parents to children.

Each and every family is found to have a genetic inheritance of patterns either ulnar loop or whorl among the offspring. From the outcome of the results, it is possible to be learnt about the inheritance. By the statistical analysis, it is found to be more significant that there is a genetic influence of patterns from the parents to children.

The level of significance with the statistical analysis was found to be highly significant to the extent of 5% to 1% in all the categories.

- There is a significant level of inheritance among loop patterns and the whorl patterns.
- In case of mother to daughter there is significance of occurrence of patterns with more genetic influence observed. In case of ulnar loops there is more significance up to the level of 0.01%.
- In cases of whorls, significant inheritance has been observed up to 0.01 %levels.
- In case of father to daughter, the percentage is less but still there is a significant level of inheritance observed for ulnar loop and whorls patterns.
- From the study it is possible to establish that there is significance of transmission of patterns from the father to son.
- In case of mother to sons there is a significant level of inheritance observed for both ulnar loop and whorls patterns.
- Other significant observations found were that of ulnar loop patterns from the father to son up to the level of 70% with the whorl patterns being 35%.
- Among mothers, there is a significant level of transmission of loop patterns of about 71%. The whorl patterns were found to have 23.60% transmission from mother to son.
- From father to daughter there is comparatively a less significant transmission of patterns. 68% for ulnar loop and 32% for whorls.
- Most of the subjects under study showed a normal incidence of finger print patterns among them. In family number 3 there is a 100% inheritance of whorl patterns from mother to son. This is the most significant aspect of inheritance of patterns.
- Another family, No.11 was found to have an incidence of transmission of whorl patterns from mother to the son with 100%. In other words, both mother and son showed same patterns in all their fingers.
- In family No 19: there is a 100% inheritance of whorls patterns from the father to son observed.
- The following families showed significant transmission of the patterns (whorls and ulnar loops) from the father to son or mother to son with a percentage of occurrence of 80% . The family numbers are 7,8,9,10,11,13,14,15,18,34,35 and 36.
- In family No. 30, there is 80% inheritance of whorl patterns from the father to son.
- In family No 15, there is 80% inheritance of whorl patterns from the Mother to son.
- In family No. 18, there is 80% inheritance of whorl patterns from the father to daughter.
- In family No. 34, there is 80% inheritance of loop patterns from the mother to son.
- In family No. 35, there is 80% inheritance of whorl patterns from the father to son.
- In family No. 36, there is 80% inheritance of loop patterns from the father to son.
- All these above results show that among 14 families, 80% have inheritance of patterns from parents (either of the parents)
- The 14 families mentioned above have been found to have inheritance of patterns either whorl or loop.

#### SUMMARY AND CONCLUSION

- The inheritance of patterns was predominantly marked among mother to son and mother to daughter
- There is a significant transmission of patterns from father to son
- The inheritance was noted comparatively lesser among the father to daughter.
- There may be chances that the patterns available under question may give valuable information for

the purpose of identifying the paternity and maternity to some extent.

- It was also possible to find whether the inheritance was either from father or from mother

### Limitations

The obvious limitation of this study is that of the sample size. The study has been considered among the Gujarati population. This study can be extended to various geographical areas. The results are more open for discussion to the future researchers to throw more light to establish more accurate results and conclusions. The result can be probably considered as an initiative for such researchers.

The study has been confined to the pattern formations whereas ridge characteristics and the ridge counts have not been considered. Many studies have showed that the physical traits and characteristics are being genetically transmitted to the offspring<sup>1,2,3,5,6</sup>. It has to be mentioned though; the fingerprints are unique in nature and non duplicating. There is no need of any sort of confusion regarding the validity of such an established fact. After all the patterns have been found to have been inherited to certain extent but there are other parameters such as the ridge characteristics which ultimately determines the exact identity of an individual.

**Acknowledgement:** The authors are thankful to the family members who have given their fingerprints for this study.

**Conflict of Interest Statement:** It is hereby declared that there is no conflict of interest in this specific study in any ways

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**Ethical Clearance:** Not applicable

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# "Deaths due to Fall from Height" - an Autopsy Study

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## ABSTRACT

Fall from height cause serious and fatal injuries every year which add significantly to morbidity and mortality of that particular area. Fall from height are frequently encountered in accidents, suicides and rarely in homicides. Working at height remains one of the biggest causes of fatalities in urban areas. Many workers in maintenance, construction and many other people in a variety of jobs could be at risk of falling from height. This retrospective study has been undertaken to determine the frequency, cause and manner of death, factors responsible & to draw the attention towards the implementation of safety measures & building laws, for minimizing the incidences of fall from height.

**Keywords:** Fall from Height, Construction Workers, Safety Measures

## INTRODUCTION

Fall from height refers to fall from one higher level to another level involving ladder, stairs, roof, etc.<sup>1</sup> Fall from height is defined as fall from height to be a descent from upright, sitting or horizontal position, the descent height being less than or equal to 1metre.<sup>2</sup>The World Health Organization has reported that 4,24,000 fatal falls occurring each year, making it the second leading cause of accidental or unintentional injury /death, after motor vehicle accidents.<sup>3</sup>It is difficult to decide whether the death resulted due to fall is from an accident, suicide or homicide, particularly in the absence of an eye witness, suicidal notes or other indications suggesting suicide or homicide. History of mental disorders with previous attempts of suicide is the likely explanation of suicide but not a conclusive proof.<sup>4</sup>Falls remains a major cause for workplace fatalities over past years, contributing

to more than a third of total workplace fatalities yearly. Falls are examples of vertical deceleration injuries involving major weight bearing structures of the body<sup>5</sup> and the pattern of the injuries can help in the determination of causation of injuries and manner of death<sup>6</sup>. Working at height remains one of the biggest causes of fatalities in urban areas. Many workers in maintenance, construction and many other people in a variety of jobs could be at risk of falling from height, examples include painters, decorators, window cleaners and those who undertake one off jobs without proper training, planning or equipment. The highest numbers of falls-related fatalities were workers<sup>7</sup> who employ in industries of House construction, Painting and decorating services, Roofing services etc. This study has been undertaken to determine the frequency, cause and manner of death, factors responsible, & to draw the attention towards the implementation of safety measures & building laws, for minimizing the incidences of fall from height.

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## MATERIALS AND METHODOLOGY:

This Retrospective study was carried out at the Mortuary of Department of Forensic Medicine, Kempegowda Institute of Medical Sciences, Bengaluru for a period of Two years. The study was conducted by scrutinizing the Post mortem reports and other relevant documents that are suggestive of fall from height. The relevant documents considered are police inquest reports, suicide notes if available, medical

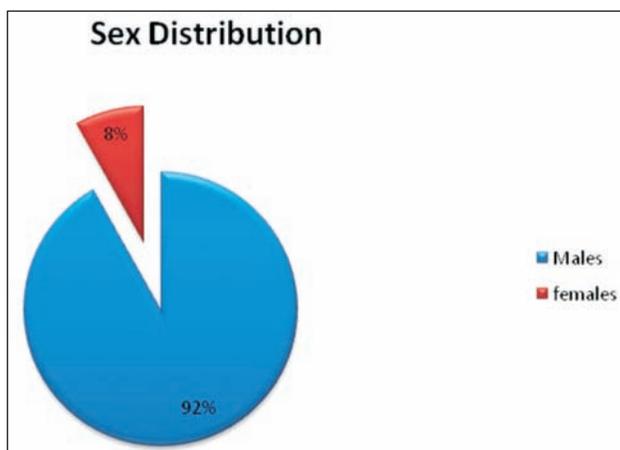
records and scene of crime photos. The age, sex, circumstances, place of fall, manner and cause of death were reviewed. Toxicological results were reviewed in available cases. The injuries were discussed according to the involvement of particular body region like Head, Head-Neck, Head-Limbs, Head-Pelvis, Head-Chest-Abdomen and any other body part.

**RESULTS**

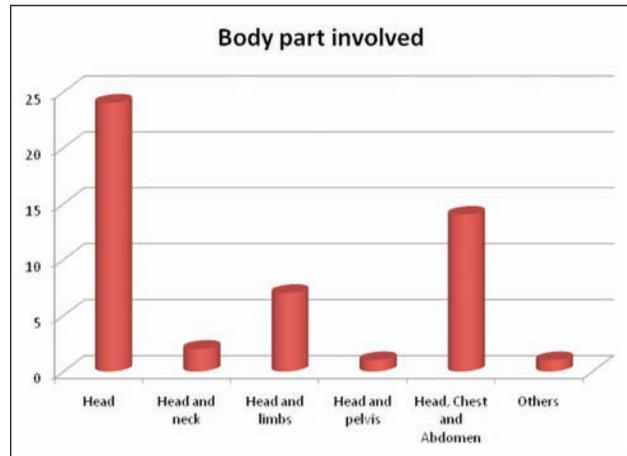
Department of Forensic Medicine, KIMS, a post graduate institute, Bengaluru conducted autopsies concerned with our study on 49 cases during a period of Two years. The 49 cases due to fall from height comprised 4.386% of autopsied conducted during the study period. Among 49 cases studied, 45 were males and 4 were females (Fig- 1), 21-30 years age group individuals outnumbered other age group of victims (Table - 1), the youngest being a baby of 16 months and oldest being 92 years old lady. Out of 49 cases 45 cases were accidental and 4 cases were suicidal. Most of the victims were construction workers by occupation (36 cases). Injury to Head region (24 cases) was the major cause of death, followed by injury to Head-Chest-Abdominal region (14 cases) (Fig - 2).

**Table 1: Age –groups involved in deaths due to fall from height**

Age in years	Male	Female	Total
0 to 10 years	5	0	5
11 to 20 years	6	1	7
21 to 30 years	13	1	14
31 to 40 years	12	0	12
41 to 50 years	3	0	3
51 to 60 years	3	1	4
>60 years	3	1	4



**Graph-1: Showing sex distribution among victims**



**Graph-2: Showing body parts (injuries) involved**

**DISCUSSION**

The fatalities resulting due to fall from height are preventable and therefore this study is carried out to assess the cause along with manner of such fatalities and evaluate the associated factors. The construction business accounts for the greatest number of labor employment in Bengaluru and thus it accounts for majority of cases of fall from height. The people from remote, backward and undeveloped areas of country come to Bengaluru for earning the bread/butter for their families. They are always ready to work at cheaper rates without considering the availability of safety /preventive measures. During the study period, the major incidences of deaths due to fall were among Construction workers. In the present study gender distribution of victim has reported male predominance with 91.83% and 08.16% of females. This is mainly because the males are involved in outdoor work like working at height and females will do indoor work of little risk at construction places. In the present study age group of 17-40 years were mainly affected individuals which comprise of around two third of the total victims of death due to fall. As this age group individuals are active with risk taking behavior and earning individuals in the family. In the present study 91.8% of deaths are accidental and only four cases were of suicidal. Present study has reported 99.30% deaths due to accident and only one case of suicide. Suicide from fall from height is less common in this region could be due to painful manner of death due to fall in comparison to availability of other painless manners of suicide and also less high rise buildings compared to other developed western countries. In the present study the body parts injured which has caused the death was mainly Head injury (49.97%) followed by injury to combined head-chest-abdominal regions (28.57%).

## CONCLUSION

The severity of injuries sustained due to fall from height depend upon height of fall, type of impact surface, rate of deceleration, position of the body when landing and other individual factors like age, weight of the body etc. Deaths due to fall from height were substantially accidental in nature, while working on heights, without safety & preventive measures, predominantly involving males and young age group. The Head was the leading part of the body involved in majority of cases, indicating the necessity of the implementation of the building laws protecting, the rights of poor labor, working on heights & minimizing the fatal injuries. As work at height cannot be avoided, a risk assessment should be carried out before taking up any work at height by the employers. Identification of fall hazards, assessing the risks and situations where fall from height may occur, safety measures needed to prevent fall, implementation of fall prevention measures, keeping emergency medical services at work place should be considered.

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**Conflict of Interest:** Nil

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**Ethical Clearance:** Nil

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# Profile of Road Traffic Accidents in Rural Area of South-West Madhya Pradesh

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## ABSTRACT

Road traffic accidents (RTA) are among the leading cause of morbidity and mortality worldwide and will be the second most common cause of disability-adjusted life years in developing countries by the year 2020. A five year retrospective study of road traffic injury cases was conducted at the newly established Index Medical College Hospital and Research Center Indore M.P. A total of 596 medicolegal cases were studied, accidents 484(81.20%) accounted as the major cause of all incidences and road traffic accidents 362(60.7%) alone constituted the majority. Out of the 362 cases of RTA, 282(79.9%) were male and 80(22.1%) female victims with male to female ratio of 3.5:1. Highest number of victims, 120(33.2%), belonged to 21-30 years age group. Month of April recorded the maximum cases 48(13.2%), the most common time interval of accident remained 1601-2000 hours and included 139 (38.4%) of cases. Ninety (24.9%) cases had hospital stay of under 24 hours, 243(67.1%) were discharged after satisfactory management. Two-wheelers use was the most common mode of injury 217(59.9%) and also the most common means of victim being hit 123(34%). Head and neck region with 140 (38.7%) cases, was the most common part of the body involved in road traffic injury; 47% of the males and 23.8% of females in the study suffered fracture and 53% of all fractures involved the lower-limb.

**Keywords:** Profile, Injury, Road Traffic Accident, Victim, Motorized Two Wheeler, Indore

## INTRODUCTION

The expanding burden of disease in India is also undergoing a transition with the rise in caseload of chronic conditions as well as injury. In Indian scenario major cause of preventable unintentional injury is road traffic accidents as shown by various studies.<sup>1-3</sup> According to WHO, Road Traffic Injuries are the sixth leading cause of death in India with a greater share of hospitalization, disabilities and socioeconomic losses in young and middle aged population. One accident occurs every five minutes, with the accident rate of 45 per 1,00,000 population. The number of road accident fatalities and the number of persons injured in road accidents in our country, between 2001 and 2011, increased by 5.8 per cent and 2.4 per cent respectively<sup>4</sup>. Moreover researchers also feel that Injury is a neglected epidemic in India as only few resources are dedicated towards injury prevention and treatment.

To lessen this burden, information on injury pattern, nature and outcome is required; which is limited in India as trauma registries and hospital based research have not developed systematically.<sup>5</sup>

Regional monitoring of injury mortality and morbidity can enable development of evidence based locally effective injury prevention programs. The present retrospective study was undertaken to understand the magnitude and pattern of road traffic accident cases at a newly established teaching medical college hospital which was setup in late 2007 in the rural area of central India. The purpose of the present study was to describe the demographic and injury profile in admitted cases with an alleged history of Road Traffic Accidents, thereby drawing public attention and awareness in order to prevent/control Road traffic accidents.

### MATERIALS AND METHODOLOGY

The study was retrospective analysis of all road traffic accident cases admitted to the emergency department of Index Medical College Hospital and Research Center, Indore (MP); during the five year study period extending from 1<sup>st</sup> January 2008 to 31<sup>st</sup> December 2012. Information regarding age, gender, demography, mode of injury, time of occurrence, length of stay in hospital, mode, means and site of injury and the final outcome was recorded. The road users were classified as occupants of two wheeler, three wheeler, light motor vehicle (cars, jeeps etc.), heavy motor vehicles (trucks, buses etc.), pedestrians and others (animal drawn vehicles like bullock carts, etc.). The collected data was analyzed, observations discussed and compared with other studies.

### OBJECTIVES

1. To document the profile of road traffic accident cases admitted at Index Medical College Hospital and Research Center Indore M.P.

2. To highlight the vulnerable gender, age, mode and manner of injury, time and seasonal frequency, injury pattern of road traffic accident cases in this rural area.
3. To suggest preventive measures that possibly could reduce the incidence of such cases.

### OBSERVATIONS

During the study period, out of all 596 medicolegal cases reported to the casualty department of our institute, 362 (60.7%) cases were of RTA. The yearly trend during the five year study period showed a gradual increase in RTA cases from just 7 in 2008 to 121 in 2012. There were 282 (79.9%) male and 80 (22.1%) female cases with the overall male to female ratio of 3.5:1. (Table 1)

The highest number of victims, 120 (33.2%), belonged to 21-30 years age group and the young age 21-40 years recorded 203 (56.1%) of the caseload. Maximum sex differentiation was observed in the age group 21-30 years with a male to female ratio of 9:1. (Table 2)

**Table 1 : Year and Gender wise distribution of cases**

Column1	2008	2009	2010	2011	2012	TOTAL	%
MALE	7	29	66	35	145	282	79.9%
FEMALE	0	14	22	9	35	80	22.1%
TOTAL	7	43	88	43	121	362	100%
%	1.9%	11.9%	24.3%	11.9%	33.4%	100%	

**Table 2: Age and gender wise distribution of cases**

Age Group	Male (n=282)	Female (n=80)	Total (n=362)	Male : Female Ratio
				Overall 3.5:1
0-10 yrs	10 (3.6%)	8 (10.0%)	18 (4.9%)	1.3:1
11-20 yrs	52 (17.7%)	19 (23.8%)	71 (19.6%)	2.6:1
21-30 yrs	<b>108 (38.2%)</b>	12 (15.0%)	120 (33.2%)	<b>9.0:1</b>
31-40 yrs	62 (21.9%)	<b>21 (26.3%)</b>	83 (22.9%)	2.9:1
41-50 yrs	27 (9.6%)	11 (13.6%)	38 (10.5%)	2.4:1
51-60 yrs	15 (5.4%)	5 (6.3%)	20 (5.5%)	3:1:1
>60 yrs	8 (2.8%)	4 (5.0%)	12 (3.3%)	2.1:1

In our study 286(79%) cases belonged to rural background and 221(61%) were married. Month wise trends showed that April recorded the maximum cases at 48(13.2%) closely followed by December 47(12.9%).

Seasonal trends showed that summer season (Mar-June) recorded 151(41.7%) cases followed by winter (Nov- Feb) 146(40.3%) and 65(17.9%) in rainy season. (Figure 1)

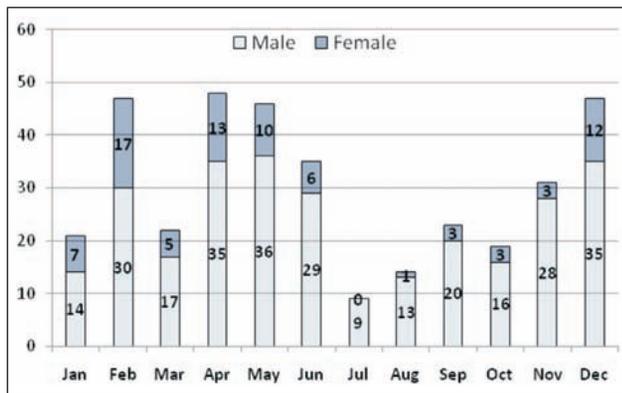


Fig. 1. Month wise distribution of RTA cases

Maximum RTA cases 139 (38.4%) reported in the evening time between 1601-2000 hours followed by 90 (24.9%) in 1201-1600 hours time slot. (Figure 2) Majority of the cases 90 (24.9%) had hospital stay of under 24 hours and another 69 (19.6%) between 24-48 hours; 249 (68.8%) cases were discharged between 48 hours to a week, 76 (20.9%) 1 week to 2 weeks, 32 (8.8%) 2 weeks to 4 weeks and only 5 (1.4%) had a hospital stay of over 4 weeks. (Figure 3)

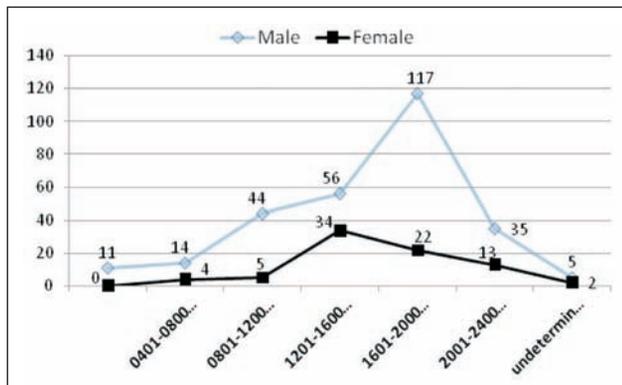


Fig. 2. Time of Incident

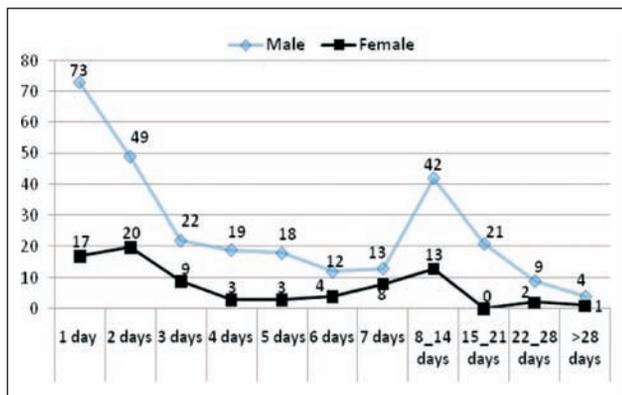


Fig. 3. Length of stay in hospital

Patient outcome showed that 243(67.1%) were discharged after satisfactory management, 9(2.5%) required referral to higher centres in Indore city, 86 (23.8%) left against medical advice (LAMA). Death reported in 2 (0.5%) victims of RTA, both male with head injury, during the five year study period. (Figure 4)

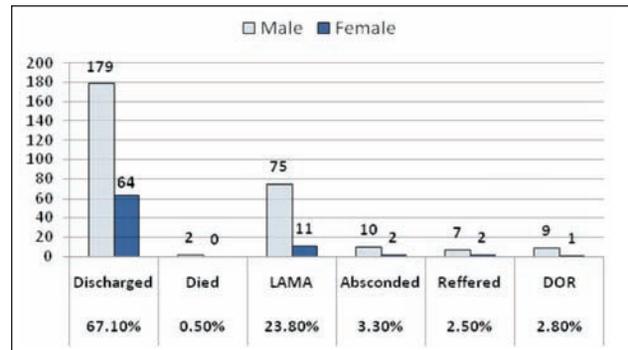


Fig. 4. Outcome of RTA cases

Two-wheelers use was the most common mode of injury with 217(59.9%) cases and involved 186 male victims (66% of the males) and 31 female victims (38.8% of the females). (Figure 5) Most common means of injury was the victims being hit by two-wheeler with 123 (34%) cases followed by 84 (23.2%) cases of skidding. (Figure 6)

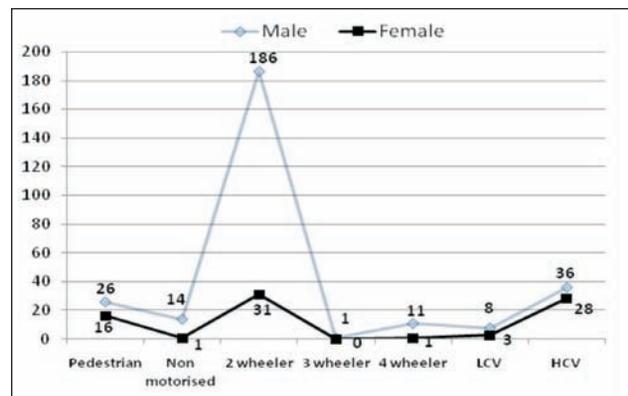


Fig. 5. Mode of RTA

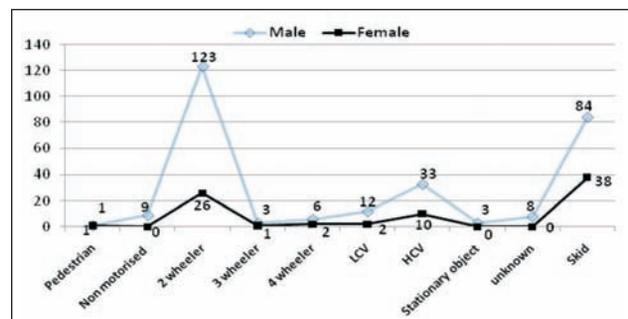


Fig. 6. Means of RTA

Head and face was the most common part of the body involved in road traffic injury with 140(38.7%) of the caseload followed by Lower Limb with 109(30.1%) and 28(7.7%) cases had poly-trauma

involving more than one body region. Abdominal injuries were the least common with just 2(0.6%) cases. (Table 3)

**Table 3: Anatomical region involved in Road Traffic Injury**

Anatomical Region	Malen=282	Femalen=80	Totaln=362
Head & Face	110 (39.0%)	30 (37.5%)	140 (38.7%)
Trunk & Spine	15 (5.3%)	9 (11.3%)	24 (6.6%)
Upper Limb	40 (14.2%)	13 (16.3%)	53 (14.6%)
Lower Limb	93 (32.9%)	16 (20.0%)	109 (30.1%)
Pelvis	4 (1.4%)	2 (2.5%)	6 (1.7%)
Abdomen	1 (0.4%)	1 (1.3%)	2 (0.6%)
Polytrauma	19 (6.7%)	9 (11.3%)	28 (7.7%)

Major injuries which required admission and 12 hour supervision were noted; there were 156 (43.1%) cases with Soft Tissue Injury, 139(38.4%) cases with fracture, 21(5.8%) cases with E.N.T. bleed, 22(6.1%) with loss of consciousness and 17(4.7%) cases with multiple type of injury. The percentage of fracture incidence was 47% for the male victims with 133 cases and 23.8% for female victims with 19 cases. Most common site of fracture was the lower-limb with 81 cases which was over 53% of all fractures, followed by 23(15.1%) with upper limb fractures and 14(9.2%) with fractures of skull (Figure 7).

In the present study, 79.9% were male and 22.1% were female cases. The male-to-female ratio was 5.5:1. Similar findings of higher male preponderance have been reported in other studies<sup>1,2,7-9</sup>. This gender difference could probably be related to both increased exposure and risk taking behaviour of males. The highest percent (33.2%) of victims were from the age group of 21-30 years and cumulated 56.1% in 21-40 years; thereby indicating that the people in the productive age groups are most commonly involved in road traffic accidents. Similar findings have been reported by many workers<sup>7, 9-13</sup>.

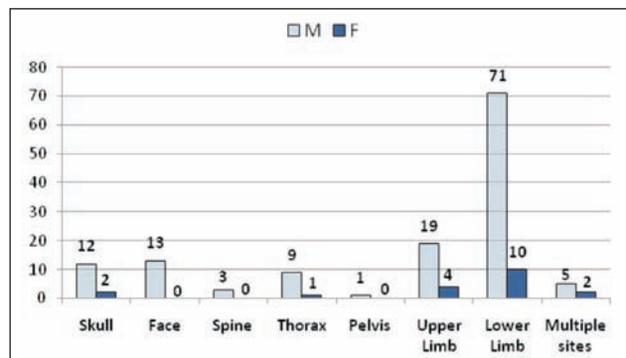


Fig. 7. Fractures recorded by site

## DISCUSSION

Index Medical College Hospital is situated in a rural area but it's close to the industrial rich part of Indore so more travel is done by people to reach their factories, school, colleges, educational institutes; moreover, the conditions of the roads is not good in the areas which make the travellers susceptible to accidents contributing to the higher number of RTA cases recorded.

Seasonal trends showed that summer season recorded 151(41.7%) cases, closely followed by winter 146(40.3%) and 65(17.9%) in rainy season. This finding is in agreement with those of Adhya et al<sup>8</sup> but not with others which recorded higher cases in rainy<sup>12</sup> or winter season<sup>14</sup>. This highlights that regional variations affect the expected seasonal case load. Maximum 139 (38.4%) cases were recorded in the evening between 1601-2000 hours, which is consistent with other Indian studies.<sup>9,14-15</sup>

Users of motorised two wheelers constituted 59.9% of the injured and involved 66% of the male victims and 38.8% of the female victims. In 123 (34%) cases the most common means of injury was the victim being hit by a motorised two-wheeler. Moreover, 54.8% of motorised two wheelers were hit by another such vehicle. In the present study motorised two wheeler users contributed to the majority of the collisions; similar results have been reported in other studies carried out in other cities of the country.<sup>7,10</sup> Among the 42 pedestrians injured, 47.6% were hit by motorized two wheelers followed by 26.2% by a bus, this is consistent with the findings of Rao et al.<sup>10</sup>

Drivers recorded the highest percent of road traffic accident victims with 45% of the total cases; moreover 88.3% of the drivers were driving a motorized two-wheeler. Two wheeler male drivers constituted 50% of the male victims of the study. Similar findings were also reported by Bayan et al.<sup>9</sup> The reason may be the easy accessibility of the two wheeler vehicles, the higher speed which can be achieved over short distance with these vehicles and also less stability of these vehicles.

Majority of 67% victims were completely cured, the fatality rate was only 0.5%. The most common body region involved in RTI was head and face (38.7%), then lower limb (30%). The least to be affected was the abdomen (0.6%). The commonest injury was fracture of bones with most common site being lower limb (53%) followed by upper limb (15%) and skull (9%). Similar injury patterns were reported in various studies.<sup>7-10,12-13</sup> The extremities are more vulnerable to injuries and are commonly involved due to direct trauma, especially in motorcyclists.

#### CONCLUSIONS AND RECOMMENDATION

The study concludes that several factors such as age, sex, type of the vehicle used, bad road condition and avoidance of safety measures all are responsible for increased occurrence of road traffic injuries. The present study revealed that non fatal road traffic injuries were more frequent in this area and most of the victims were young males driving a motorised two wheeler. These young male victims, who constitute the valuable manpower and source of potential economic growth, either sustain some deformity or lose their lives in road traffic accidents.

Trauma research has shown that investment in primary and secondary prevention can address a large proportion of avoidable road traffic injury incidents, therefore it is recommended to:

1. Improve of road surface, infrastructure using the advances in infrastructure technology to construct roads meeting all safety standards including road dividers, sign boards even in remote and rural areas with sidewalks space for pedestrians,.
2. Strict enforcing of traffic laws with zero tolerance towards traffic rule violations. Repeat offenders and rash drivers should be identified and be rigorously punished.

3. Initiation of road safety training campaigns, creating public awareness by involving local residents, schools and school teachers and community leaders in educating the people to follow traffic rules and also to train them in basic life saving first aid skills.
4. Improving pre-hospital emergency care and establishing more regional trauma care centres to handle the increasing RTI caseloads.
5. A National Injury Surveillance system is essential to study the vulnerable road users and to coordinate the nation-wide hospital based research. This can enable the efficient utilisation of available resources to prevent road traffic injuries.

#### Limitations

Some of the aspects like occupation, stress, drunkenness, road condition at accident site and use of leg guard on the motorised two-wheelers etc could not be observed, since it was a record based study.

**Ethical Clearance:** taken from Institutional Ethical Committee Index Medical College Hospital and Research Centre, Indore

**Conflict-of-Interest :** The authors declare no conflict of interests.

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# Metrical Study on Femur - Length and Popliteal Index

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## ABSTRACT

The present study is done on 81 adult normal male femora in the Department of Anatomy, SS Institute of Medical Sciences, Davangere. The length of the femur in cms is measured using Osteometric board and the mean femur length is found to be 42.05cms. Using Vernier calipers, the lower maximum mean transverse diameter is measured as 3.3cms and the lower maximum mean sagittal diameter as 2.62cm. Then, the mean popliteal index is calculated to be 79.6. When the length of the femur is correlated with all the above measurements, it is found that the length of the femur showed highly significant correlation with the lower maximum sagittal diameter of the femur ('p' value- 0.000), the maximum transverse diameter of the femur ('p'-value- 0.001) and the popliteal index ('p' value- 0.008).

**Keywords:** Anthropometry, Femur, Popliteal Index, Lower Maximum Transverse Diameter, Lower Maximum Sagittal Diameter, Medicolegal

## INTRODUCTION

Determination of height, sex from skeletal remains has got very much significance medicolegally and anthropologically. The metrical study of skeleton will provide accurate results with respect to stature and sex. According to Krogman and Iscan, standards of morphological and morphometrical attributes in skeleton may differ with the population samples and it is true with the reference to dimension and indices (average and range).<sup>1</sup>

In our present study, 81 male femora in Karnataka region are studied for measuring the length of femur and it is correlated with the calculated popliteal index.

## MATERIAL AND METHOD

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The present study is done on 81 male femora in the Department of Anatomy, SSIMS & RC, Davangere, Karnataka, after getting the approval of Local Ethical Clearance Committee, S S I M C & RC, Davangere, Karnataka. Following Anthropometric measurements are taken on each femur:

1. **Maximum length:** Using Osteometric board, straight distance between the highest point of the head and the deepest point on the lateral medial condyle is taken.<sup>2</sup>
2. **Maximum Lower Transverse diameter:** Using Vernier calipers, the minimum distance between the anterior & posterior part of the lower end of the shaft, approximately 4cms above the cartilaginous border of the condyles taken in the mid sagittal plane.<sup>2</sup>
3. **Maximum Lower Sagittal Breadth:** The measurement between the lateral margins of the shaft at right angle to the sagittal diameter of the lower part of the shaft using Vernier calipers.<sup>2</sup>

Later, Popliteal Index was calculated using the formula<sup>2</sup>,  $(\text{Lower Sagittal Diameter} / \text{Lower Transverse Diameter}) \times 100$

## RESULTS

**Table.1 Statistical Analysis of Parameters**

Parameter	Range	Mean	Standard deviation( SD)
Length	36 - 47	42.05	2.45
Maximum Sagittal diameter	2 – 3.2	2.62	0.3
Maximum Transverse diameter	2.6 – 4.0	3.3	0.33
Popliteal Index	57 – 93.75	79.60	7.91

Correlation\* with Length femur

**Table 2. Coefficient of correlation**

Parameter	Coefficient of correlation	'P' value	Significance
Maximum Sagittal diameter	0.646	0.000	Significant
Maximum Transverse diameter	0.369	0.001	Significant
Popliteal Index	0.292	0.008	Significant

\* Pearson's product moment correlation coefficient.

In present study, the mean length of the Femur is 42.05cms (SD-2.45), mean lower maximum sagittal diameter is 2.62cms (SD – 0.3) and the mean lower maximum diameter of femur is found to be 3.3cms (SD-0.33).

The Mean Popliteal index is calculated as 79.60 (SD-7.91) with the varying range of 57.0 to 93.75.

Lower maximum sagittal diameter, maximum transverse diameter and popliteal index positively correlated with the length of femur i.e. maximum lower sagittal diameter, lower maximum transverse diameter and popliteal index varied in the same direction as the length of femur. All the parameters in

the study are found to be statistically highly significant when correlated with the length of femur.

## DISCUSSION

In the present study, the length of the femur is measured with Osteometric board. The mean femur length is 42.05cms compared to previous studies done.

In our study, the length of the femur is statistically highly significant when correlated with the lower maximum sagittal diameter of the femur (p value- 0.000), maximum transverse diameter of the femur (p-value 0.001) and the popliteal index (p value 0.008)

**Table 3. Comparison of present study with previous studies.**

Study	Mean Length of femur ( in cms)	
	Male	Female
Gargu Soni, usha Dhal, Sudha Chhabra <sup>3</sup>	43.9cms (439.57mm)	—
Rajeshwari S.Bhosale,Zambare B R <sup>4</sup>	45cms (450.82mm)	41cms (416.49mm)
Shithal S Maske. Prathamesh Kamble Joshi <sup>5</sup>	45.1cms (451.81mm)	41.78cms (417.48mm)
Pandy A M et.al <sup>6</sup>	40.6±2.053cms	38.8±1.2cms
Present study	42.05cms	—

## SUMMARY

This study is done on 81 Adult Male Femora in Karnataka region and found that the Mean length is 42.05cms, and Mean Maximum Lower Transverse

diameter is 3.3cms and Maximum Sagittal diameter as 2.62cms. The Mean Popliteal index is 79.60 and the parameters measured showed highly significant Correlation with the length of the femur.

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**Source of Support:** After the approval of the Local Ethical Committee in SSIMS & RC, Davangere, Karnataka. a total of 81 adult male femora in Karnataka region, belonging to both the right and left side, in the Dept. of Anatomy, SSIMS & RC, Davangere, Karnataka.

**Conflict of Interest:** Nil

**Ethical Committee Clearance:** Permission of the Local Ethical Committee of SSIMS & RC, Davangere, Karnataka has been obtained for the present study.

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# Pattern of Injuries in Non-Fatal Victims of Two Wheeler Accidents at Salem, Tamilnadu- a Cross-Sectional Study

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## ABSTRACT

This study was aimed to determine the demographic profile and pattern of injuries in nonfatal victims of two wheeler accidents at Salem. 120 cases admitted to Vinayaga Mission Hospital and Annapoorana Medical college hospital, Salem, Tamilnadu, India during the period of 2012-2014 were studied. Among them, 99 cases (82.5%) were males, 87 cases (72.5%) were in the age group of 21-50 yrs. Most of the accidents took place during the rainy season 73 cases (60.82%), during weekends 60 cases (50%), during evening hours 57 cases (47%), and in city limits 65 cases (54.16%). The commonest type of accident in 36 cases (30%) was skid and fall and the colliding vehicle in 27 cases (22.5%) was light motor vehicle. The commonest site of injury is Head and face 66 cases (55%) and 90 cases (75%) were unconscious when they reached hospital. None of the riders/pillion riders has worn helmet at the time of accident. This study emphasizes that; with the combined effort of the road users, traffic wardens, and policy makers most of the two wheeler accidents are preventable.

**Keywords:** Accident, Non-Fatal, Victims, Two-Wheelers

## INTRODUCTION

Two wheelers are the main components of Indian traffic and they are also considered to be one of the most vulnerable road users.<sup>2</sup> Two wheeler accidents have also been shown to have maximum case fatality as they are directly exposed and come in direct contact with the impacting vehicle or obstacle during a collision, resulting in severe injuries and fatality.<sup>3,4</sup> Injuries caused in such accidents depend on the number of factors like type of colliding vehicle, site of impact, protection used, etc. Regional differences exist in the pattern of injury sustained by road user that can have significant implications in the development of prevention policies.<sup>5</sup> Although two wheelers comprise a major share of Indian traffic, there is a paucity of literature of pattern of injuries in non-fatal accident victims in the Indian cities. Hence, this study is undertaken to get an insight into the pattern of injuries in two wheeler accidents at Salem, Tamilnadu.

## MATERIAL AND METHOD

After obtaining institutional ethical clearance, 120 cases of non-fatal victims of two wheeler accidents admitted during the year 2012- 2014 to Vinayaga Mission Hospital and Annapoorana Medical college hospital at Salem, Tamilnadu, India were studied. Both the rider and the pillion rider of the two wheelers of all age group were included. Vehicular accidents, not involving the two wheelers and spot dead cases were excluded. The information regarding demographic profile of the victim, colliding agent/ vehicle, time and place of accident, condition of the road at the spot, type of injuries sustained, protective measures used if any, etc were collected in a proforma which was specially designed for this study from the case sheets, wherever possible from patients and the relatives if the condition of the patient did not warrant the interview. At the end of the study, data was compiled and analyzed by suitable statistical methods.

## RESULTS

A total of 120 cases of non-fatal two wheeler accident were observed in the present study. Among them 99 cases (82.5%) were males and 21 cases (17.5%) were females. Majority of the injured were in the age group of 21-50 yrs, 87 cases (72.5%). Most of the accidents took place during the rainy season 73 cases (60.82%), during weekends 60 cases (50%) and during evening hours 57 cases (47%) (Table.1)

**Table 1: Time of accident**

Time	Frequency	Percentage
Morning	26	21.67
Afternoon	28	23.33
Evening	57	47.50
Night	09	7.50
Total	120	100

Considering the place of accident, 65 cases (54.16%) took place in city limits and the condition of the road was good in 44 cases (36.66%) and fairly good in 53 cases (44.17%). Rider was involved in 106 cases (88.33%). The commonest type of accident in 36 cases (30%) was skid and fall and the colliding vehicle in 27 cases (22.5%) was light motor vehicle (Table.2).

**Table 2: Type of colliding vehicle/ object**

Vehicle/ object	Frequency	Percentage
Bicycle	04	3.33
Two-wheeler	17	14.17
Auto-rickshaw	03	2.50
Light motor vehicle	27	22.50
Heavy motor vehicle	12	10.00
Skid and fall	36	30.00
Animal	07	5.83
Tree	09	7.50
Pedestrian	05	4.17
Total	120	100

Type of collision in 52 cases (61.91%) was head on collision, 20 cases (23.80%) were side ways and in 12 cases (14.29%) it was from behind. The commonest site of injury is Head and face, 66 cases (55%) and 90 cases (75%) were unconscious when they reached hospital (Table. 3). None of the riders/pillion riders has worn helmet at the time of accident.

**Table 3: Site of Injury**

Site of Injury	Frequency	Percentage
Head and Face injury	66	55.00
Spine injury	05	4.16
Injury to Upper and lower limbs	42	35.00
Chest, abdomen and pelvis injury	03	2.50
Injury to multiple body regions	04	3.34
Total	120	100

## DISCUSSION

In the present study, males were exposed more to two wheeler accidents, 99 cases (82.5%) than females 21 cases (17.5%). Three fourths of the victims comprised of young adults and middle age persons in the age group of 21-50 yrs, 87 cases (72.5%). This shows that students and working persons, who need to travel more on road, are more vulnerable. In elders, more than 60 yrs of age, accidents were minimal, 2cases (1.67%). This is because they take fewer undue risks, are less active and remain in-door most of the time. Similar findings were observed in other studies.<sup>6,7,8,9</sup> Cases below 18yrs were also minimal and most of them were females or pillion riders.

Two wheeler accidents showed a seasonal variation; most of the accidents took place during rainy season 73 cases (60.82%) followed by winter 36 cases (29.95%). This is the time where roads are slippery due to rains, poor visibility due to fog making two wheeler riders more vulnerable for accidents. But in other studies it was found to be more during winter followed by rainy seasons.<sup>6,10</sup> During summer, though schools have vacation and traveling is more, the number of accidents was found to be insignificant 1 case (0.8%). Day-wise, two wheeler accidents were seen throughout the week but majority was seen during weekends 60 cases (50%). This is the time when people tend to travel more, especially the two wheeler riders making them more vulnerable for accidents.

With respect to the time, most of the accidents have taken place during day time and the number of accidents increased as the day progressed, maximum being in the evening 57 cases (47%). Very few accidents took place during night time, 9 cases (7.5%). Similar findings were observed in other studies.<sup>3,8,9</sup> Whereas in another study more accidents were seen during

morning hours. <sup>6</sup> The place of accident in 65 cases (54.16%) was within city limits, followed by rural limits 32 cases (26.67) and on bye-pass road 23 cases (19.17). Similar findings were reported in an other study.<sup>6</sup> In city limits, evening hours are the busiest, roads being congested with traffic jam etc. and it is the time when people return from schools and work place.

The condition of the road was good in 44 cases (36.66%), fairly good in 53 cases (44.17%) and was bad in only 23 cases (19.17%). So the condition of the road was not a major contributory factor in these accidents. It has been reported that most of the accidents have taken place while crossing the road and near speed breakers. The reason for this is poor traffic discipline especially while crossing the road or overtaking, driving at high speed especially in bye-pass roads, drunken driving, etc. The design and non-visibility of speed breakers has also been blamed to be one of the reasons for accidents in city limits.

In the present study riders were involved in 106 cases (88.33%) and pillion riders in 14 cases (11.67%). Most of the pillion riders 8 cases (6.67%) were females. The type of accident in 36 cases (30%) was skid and fall and the commonest colliding vehicle in 27 cases (22.5%) was light motor vehicle. This finding is consistent with the high incidence of accidents during rainy season. The reason for this could be speed and rash driving, ignorance and violation of traffic rules especially while overtaking, crossing the roads or speed breakers. Similar findings regarding the offending vehicle were observed in other studies.<sup>6,9</sup> In 7 cases (5.83%) animals mostly the dogs were found to be the offending objects in accidents which took place in bye-pass roads. Reckless crossing of roads and inability to assess the speed of the vehicle by the stray dogs is one of the common problems faced at Salem, especially in the bye-pass roads where vehicles come at a very high speed.

Type of collision in 52 cases (61.91%) was head on collision, 20 cases (23.80%) were side ways and in 12cases (14.29%) it was from behind. But in another study, side impact was seen to be the commonest.<sup>6</sup> As far as distribution of the injury is concerned, head and face injuries were the commonest 66 cases (55%) especially in head on collision, followed by limb injuries 42 cases (35%) seen mostly in skid and fall cases. Most of the patients 90 cases (75%) were unconscious when they reached hospital. None of the riders/pillion riders had worn helmet at the time of

accident. Various other studies have reported similar findings.<sup>6, 7, 11- 14</sup> whereas in other studies the commonest site of injury was found to be limb injuries.<sup>15- 17</sup> Careless attitude towards using safety measures like helmet and violation of traffic rules were found to be the reason for this.

## CONCLUSION

Two wheelers comprise a major share of Indian traffic and they are considered to be one of the most vulnerable road users. Ignorance and violation of traffic rules, rash driving, lack of awareness of safety measures, traffic congestion and traffic jam during peak hours in city limits, slippery roads during rainy reasons, etc were found to be the main reasons for such accidents. Intervention to prevent such accidents requires combined effect of the road users, traffic wardens, and policy makers.

## RECOMMENDATIONS:

1. Education of road safety and traffic rules in schools, through media, etc
2. Rules should be strictly adopted by the RTO's while issuing driving license
3. Violation of traffic rules should be severely punished
4. Creating public awareness regarding importance of using helmet
5. Measures to be taken by the concerned authorities to control traffic jam at peak hours in city limits by allowing use of alternative avenues
6. Vehicular conditions to be monitored by imposing periodic servicing and other checks by the concerned authorities
7. Signs boards to be kept wherever necessary
8. Zebra crossing for pedestrians with fluorescent lights and sign boards
9. Speed breakers should be laid according to the specifications with zebra lines and fluorescent lights, periodically properly maintained and repainted
10. Stray dog menace to be taken control of by the concerned authorities.

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# Evaluation of Deaths due to Burns in a Tertiary Care Hospital at Mysore - a Retrospective Study

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## ABSTRACT

Burn injuries are one of the leading causes of death and an important public health problem in a developing country like India. The etiological factors of burn injuries vary considerably in different communities and regions. The Aim of the present study was to assess the magnitude of mortality due to burns and to study the circumstances and etiological factors leading to death in burn cases in this region.

**Material and Method:** A total of 662 deaths due to burns were studied. All the information was collected from police inquests, PM reports and case files.

**Results:** Out of the 3020 autopsies done, 662 cases were due to burns and most in the age group of 21-30 years. The female: male was 2.9:1. Sixty eight percent were from rural region. Kitchen was the most common site occurrence and kerosene oil, the most common source. Accidental burns accounted to 85.95%, suicidal 4.98% and homicidal 9.06%. The Total Body Surface Area (TBSA) involved in 42% cases was more than 80%. Septicemia was the major cause of death (55.89%).

**Conclusion:** The incidence of deaths due to burns was around 22% and majority in the age group of 21-30 years with female preponderance. Major site of fire was Kitchen and the common source being kerosene. Majority of burn deaths were accidental with involvement of more than 50% of TBSA and maximum deaths occurring within a week of burn incident. Septicemia was the major cause of death. Effort to eliminate poverty & ignorance which are the significant contributors to high mortality in burns patients is the need of the hour.

**Keywords:** Burns, Mortality, Scalds, Septicemia and TBSA

## INTRODUCTION

Burn injuries are one of the leading causes of death in all medico-legal cases and burn deaths are an important public health problem in a developing country like India. The impact of severe burns is worse

in the developing countries compared to developed countries because of infections, poor facilities and a dearth of personnel to manage burn patients<sup>1</sup>. In India, as per National Crime Reports Bureau, the number of deaths due to burns in 2012 was 23,281 and in 2013, it was 22,177. During the year 2013, Karnataka contributed to 6.2% of deaths due to burns in India<sup>2</sup>.

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The etiological factors of burn injuries vary considerably in different communities and regions. The aim of the present study was 1) to assess the magnitude of mortality due to burns and 2) to study the circumstances and etiological factors leading to death in burn cases in this region.

## MATERIAL AND METHOD

A two year retrospective study from 2012-2013 was carried out on deaths due to burns, who were brought for a medico-legal post-mortem examination to department of Forensic medicine and Toxicology, MMC, Mysore from various police stations of Mysore district, Karnataka. A total of 662 cases (328 cases in the year 2012 and 334 cases in 2013) were studied. All the information regarding age, gender, address, religion, marital status, occupation, place of occurrence, source of fire were collected from police inquest papers, post mortem reports and case files. All the data was compiled, tabulated and statistical analysis done.

## RESULTS

The number of autopsies done in the department of FMT from 2012 to 2013 was 3020 (1509 in 2012 and 1511 in 2013). Out of this 662 cases (21.92%) were due to burns. Most of the deaths were in the age group of 21-30 years (42.44%), followed by 31-40 years (20.99%) and least in the age group of 61-70 years (0.6%) and 71-80 years (0.9%). The incidence was more in females (74.62%) when compared to males (25.37%). The female to male ratio of death due to burns was 2.9:1 (Table 1).

**Table 1: Age & Gender-wise distribution of deaths due to burns**

Age group	Males	Females	Total
0-10 yrs	8	24	32
11-20 yrs	21	82	103
21-30 yrs	45	236	281
31-40 yrs	48	91	139
41-50 yrs	37	32	69
51-60 yrs	09	19	28
61-70 yrs	00	04	04
71-80 yrs	00	06	06
	168 (25.37%)	494(74.62%)	662(100%)

Maximum number of deaths due to burns was seen in married people (82.77%). Among these married people, the incidence was more in females (79.19%) compared to males (20.8%)(Table: 2).

**Table 2: Marital status & Gender-wise distribution of deaths due to burns**

Marital Status	Males	Females	Total
Married	114(67.85%)	434(87.85%)	548(82.77%)
Unmarried	54(32.14%)	60(12.14%)	114(17.22%)

Sixty eight percent of deaths due to burns were from rural region (451 cases, 68.12%) and the

remaining were from urban slum area (211 cases, 31.87%). Most of the victims were Hindus (577 cases, 87.16%). Maximum numbers of male victims were employed (130 cases, 77.38%) and maximum numbers of female victims were housewives. Of the 434 married female victims, 366 cases (84.33%) were unemployed and financially dependent on husband.

Kitchen was the most common site of fire incidence (490 cases, 74.01%) and the remaining occurring in the living room, store room, courtyard and place of work (Table 3).

**Table 3: Distribution of cases based on the Site of fire incident**

Site of Fire	No. of Cases	Percentage
Kitchen	490	74.01
Living room	25	3.77
Store room	30	4.53
Courtyard	14	2.11
Place of work	103	15.55

The source of fire in most of the cases was kerosene oil or kerosene stove (69.48%), while LPG Gas cylinders accounted to only 6.49%. The other causes were fireworks/crackers, electrical burns, chemical burns and scalds (Table 4).

**Table 4: Distribution of cases based on the Source of fire**

Source of Fire	No. of Cases	Percentage
Kerosene	466	69.48
LPG Gas	43	6.49
Fireworks/Crackers	61	9.21
Electrical Burns	39	5.89
Chemical Burns	37	5.58
Scalds	22	3.32

When the cause of burns was analyzed from the case-sheet and post-mortem report, 85.95% (569 cases) were accidental burns, 4.98% (33 cases) were suicidal and 9.06% (60 cases) were homicidal. The numbers of deaths were more in females in suicidal (31 cases, 93.93%) and homicidal cases (54 cases, 90%)(Table 5).

**Table 5: Distribution of cases based on the Cause of fire**

Cause of Fire	No. of Cases (M:F)	Percentage
Accidental Burns	569(160:409)	85.95
Suicidal Burns	33(2:31)	4.98
Homicidal	60(6:54)	9.06

Considering the Total Body Surface Area (TBSA) involved, 42% cases had more than 80% and less than

50% in 6.5% cases (Table 6). When the survival period after burns was analyzed from the case sheet, we found that 69.63% of patients died within a week of admission and only 2.87% survived for more than a month before succumbing to the burns (Table 7). When the cause of death was analyzed, the major cause was septicemia (55.89%). The other causes were Burns shock, toxemia and acute renal failure (Table 8).

**Table 6: Distribution of cases based on TBSA involved**

Percentage of Burns(TBSA)	No. of Cases	Percentage
00-50%	43	6.5
51-60%	70	10.57
61-70%	120	18.12
71-80%	151	22.80
>80%	278	41.99

**Table 7: Distribution of cases based on the Survival Period after burns**

Survival Period	No. of Cases	Percentage
< 24 hours	139	20.99
1-7 days	461	69.63
1 week-1 month	43	6.49
>1 Month	19	2.87

**Table 8: Distribution of cases based on the Cause of Death**

Cause of Death	No. of Cases	Percentage
Septicemic Shock	370	55.89
Burn Shock	198	29.90
Toxemia	63	9.51
Acute Renal Failure	31	4.68

## DISCUSSION

Burns are one of the most important causes of disability and mortality throughout the world. The incidence of death due to burns in the present study was 21.7% in 2012 and 22.1% in 2013. It was marginally more when compared to other studies. Virendra kumar et al<sup>3</sup> reported a incidence of 19.40% and Gonnade et al<sup>4</sup> reported a incidence of 16.70%.

Our study showed that the deaths due to burns was common in younger age group (21-30 years) accounting to 42.44%. This was similar to the study conducted by Tapse SP et al<sup>5</sup>. Richa Gupta et al<sup>6</sup> reported 59.6% cases in the age group of 16-30 years. Harish D et al<sup>7</sup> reported 39% of cases in the age group of 21-30 years. Similarly Singh et al<sup>8</sup> from Chandigarh reported two thirds of fatal burn cases in the young age group (21-40 years). In contrary, studies from Jordan<sup>9</sup> and Angola<sup>10</sup>, Children were the commonest

victims and in Spain<sup>11</sup> 61.5% of patients were over 40 years of age.

The female to male ratio of death due to burns in our study was 2.9:1. Similarly Gonnade et al<sup>4</sup> showed the female to male ratio as 3:1. Richa Gupta et al<sup>6</sup> also showed female predominance and analyzed that females were more prone to the burn incidences because of their domestic activities which required an association with fire sources. Moreover Indian women wore dresses like the sari and the salwar-kameez with dupatta, which are often of synthetic material which almost cover the whole body. Such clothes favored aggravation of the burn injuries in India. Burn is the only unnatural cause of death in which females not only outnumbered the males and the sex ratio is almost three times higher in females in India<sup>12</sup>. In contrast, Mostafa M et al<sup>13</sup> reported higher incidence of burn deaths among males throughout the study period and in Spain<sup>11</sup> burn cases were observed to be more common among males in all age groups except in the elderly.

Of the 662 cases, 548 cases (82.77%) were married. Of these 548 married cases, 434 cases (87.85%) were females. These results are consistent with the findings of other researchers.<sup>6,14,15</sup> In developing countries like India, the preponderance of the married victims is probably because of the increasing familial stress due to day to day problems like unemployment, illiteracy and poverty, which together give rise to greater issues like marital disharmony and dowry<sup>6</sup>.

Rural region accounted to 68% of burn deaths in our study. This was in accordance with other studies<sup>6,7,14</sup>. Whereas Dasgupta S M et al<sup>16</sup> reported nearly equal number of victims from the rural (54%) and the urban area (46.7%).

Our study showed that 87.16% (577 cases) were Hindus. This was in accordance with other studies<sup>6,7,16</sup>. When location of burn incident was considered, Kitchen was the major site of fire accident followed by place of work, which was similar to other studies<sup>6,7,13</sup>. In contrary to this, a study from Cambridge<sup>17</sup> reported 57% of the burns to occur at place of work.

When the source of fire was analyzed, Kerosene was the predominant cause of the victims catching fire. This could be because of its easy availability. Similar findings were reported by other researchers<sup>3,8,14</sup>. In contrast to this, scalds were reported to be major cause of fatality from Jordan<sup>9</sup> and Angola<sup>10</sup>.

Our study showed that accidental burning was the commonest manner of death, followed by suicidal and homicidal burning. This was similar to other studies<sup>7, 13, 14</sup>. Considering the TBSA of burns, only 6.5 % had <50% and rest of them had >50% TBSA burns. This indicates that >50% involvement of TBSA burns is incompatible with life even at a tertiary care hospital. These findings were similar to other studies<sup>3, 4, 5, 6, 13</sup>.

In our study 70% of the burn patients died within a week, indicating that burns are rapidly fatal. Virendra et al<sup>3</sup> reported death from burns within a week in 60.8% victims. Septicemia was the major cause of death in burns patients accounting to 55.89%. This was in accordance with other authors<sup>6, 8, 10</sup>. In contrast, in a study by Mostafa et al<sup>13</sup>, major cause of death was neurogenic shock in 54.7% cases followed by septicemia and pneumonia (23.5%).

### CONCLUSION

#### To conclude, our study showed that

- The incidence of deaths due to burns was around 22%.
- Most of them were in the age group of 21-30 years and also most of them were married, unemployed females.
- Majority of them were from rural region and were Hindus.
- Major site of fire incidence was Kitchen and the common source being kerosene.
- Majority of burn deaths were accidental with involvement of more than 50% of TBSA and maximum deaths occurring within a week of burn incident.
- Septicemia was the major cause of death.
- Efforts should be made to provide improved facilities and better trained personnel to manage burns patients.
- Every effort should be made to eliminate poverty & ignorance which are the significant contributors to high mortality among burns patients.
- The results of this study & similar studies from different regions of India will provide the necessary information to plan & implement Burns prevention Programs, thereby reducing the frequency of burns and burn related deaths.

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# Sec 498A IPC- Will a Boon Turn in Legal Terrorism ? a Review

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## ABSTRACT

Instances of cruelty to women have been brought to the spotlight like never before in the recent past. But what goes mostly unnoticed is the plight of a section of men folk, who undergo mental torture and lose the best years of their life and even their careers fighting false allegations charged by their spouses.<sup>(1)</sup>

With an approximately 60,000 such accusations per year, about 2,00,000 people are directly affected by these false accusations. The number of such cases has increased by about 100% in the last 10 year and by more than 15% in just the last two years.<sup>(2)</sup>

Unless urgent amendments are made to prevent the misuse of these laws, credibility of women will be lost. In addition to lost credibility, an overload of false cases will worsen the delays in the judicial process and deny timely justice to women who are genuinely aggrieved.<sup>(3)</sup>

**Keywords:** Sec 498A IPC , Legal Terrorism, Amendments , Domestic harmony

## INTRODUCTION

Nowadays, the educated urban Indian women have turned the tables. They have discovered several loopholes in the existing Indian judicial system and are using the dowry laws to harass all or most of the husband's family that includes mothers, sisters, sisters-in-law, elderly grandparents, disabled individuals and even very young children. Unfortunately, this law has been misused to harass men and their families rather than protect genuine female victims of harassment. The Supreme Court of India itself has labeled the misuse of section 498a as "legal terrorism" .<sup>(3)</sup>

### What is 498A of the IPC

Section 498A<sup>(4)</sup> was inserted into the Indian Penal Code in 1983 via an amendment. The section reads:

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Whoever, being the husband or the relative of the husband of a woman, subjects such woman to cruelty shall be punished with imprisonment for a term which may extend to three years and shall also be liable to fine.

Cruelty has been defined as any willful conduct which drives the woman to commit suicide or grave mental or physical injury to her or harassment of the woman with a view to coerce her for dowry. <sup>(5)</sup>

Section 498a of the IPC is a criminal law in which the wife and her family can charge any or all of the husband's family of physical or mental cruelty. This law is unique to India as it not only discriminates based on gender (man Vs. woman), but also discriminates against women based on their relationship with the husband.

#### IPC-498a is

- Cognizable – The accused can be arrested and jailed without warrant or investigation
- Non-Compoundable – The complaint cannot be withdrawn by the petitioner

- Non-Bailable – The accused must appear in the court to request bail.<sup>(3)</sup>

The accused are presumed guilty, and for all practical purposes, the burden is on the accused to prove innocence in the courts. The FIR is typically an imaginary story, running into many pages, with

absolutely no supporting evidence. It typically takes about 7 to 8 years for the accused to prove their innocence in the courts. Due to the overwhelmingly large number of false cases, the conviction rate in these cases is close to zero. The delay in the provision of justice amounts to the denial of justice.<sup>(3)</sup>

Fig. 1: Disposal of 498 A cases by Police <sup>(6)</sup>

Year	498a Cases							
	Disposal of Cases by Police							
	Cases Reported during the Year	% increase to previous year	False Charge / Mistaken of Fact / Law	% to cases reported	% increase to previous year	Cases Charge Sheeted + Final Report Submitted	% to cases reported	% increase to previous year
2005	58319		6141	10.53		50568	86.70	
2006	63128	8.24	6365	10.08	3.64	53012	83.97	4.83
2007	75930	20.27	8215	10.81	29.06	65156	85.81	81.36
2008	81344	7.13	7616	9.36	-8.3	69176	85.04	6.16
2009	89546	10.08	8392	9.37	10.18	76697	85.65	10.87
2010	94041	5.01	9227	9.81	9.94	83422	88.70	8.76
2011	99135	5.41	10193	10.28	10.46	82417	83.13	-1.31
2012	106527	7.45	10235	9.60	0.41	93613	87.87	13.58
2013	162238	52.29	10864	6.69	6.14	101194	62.37	8.09

From the Fig.1 its very much clear that there is consistent increase in reported, cases of False Charge / Mistaken of Fact /Law and chargesheeted cases too. While cases of false charge/Mistaken of fact /Law are

accounting for 9-10% of reported cases on the other hand chargesheeted are near about 83-85% of reported cases.

Fig. 2: Disposal of 498 A cases by Hon'ble Courts <sup>(6)</sup>

Year	498a Cases							
	Disposal of Cases by Courts							
	Total cases for trial during the year	Cases in which trials were completed	No. of Cases in which trials were completed					
			Convicted	% increase to previous year	% To total trial completed	Acquitted/ Discharged	% increase to previous year	% To total trial completed
2005	228525	29866	5739		19.21	24127		80.79
2006	243371	31261	6857	19.48	21.93	24404	1.14	78.07
2007	267600	32622	6831	-0.38	20.93	25791	5.68	79.07
2008	293416	34347	7710	12.86	22.44	26637	3.28	77.56
2009	323355	37323	7380	-4.29	19.77	29943	12.41	80.23
2010	357343	40751	7764	05.20	19.05	32987	10.16	80.95
2011	387690	40338	8167	05.19	20.24	32171	-2.48	79.76
2012	426922	46054	6916	-15.32	15.01	39138	21.65	84.99
2013	466079	45423	7258	4.94	15.97	38165	-2.49	84.03

From the Fig 2 its clear that though there is increase in registration of these cases but the cases in which the persons are convicted are declining over period of

time while acquittal is increasing .The conviction rate is mere 15-16% since last two year of total trials completed over the lengthy period of time.

### **Why do people misuse IPC 498a? <sup>(3)</sup>**

- Legal Extortion
- Prior Relationship
- Adultery
- Dominating personality
- Custody of kids
- Fraudulent Marriages

### **What does misuse of 498A do to society? <sup>(3)</sup>**

- Abuse of the Criminal Judicial System
- Abuse of entire extended family
- Cruelty towards Children
- Unequal rights (not only women vs. men but also women vs. women)
- The divorce that ensues is another mode of harassment for the already impoverished husband because he is forced to pay a hefty alimony/maintenance demanded by his wife
- Disintegration of families
- Suicides of innocent people

### **What do the courts, and Non-Government Organizations (NGO) say ?<sup>(3)</sup>**

Right to life and liberty of every citizen is guaranteed under Article 21 of the Constitution of India. Section 498A was inserted in the Indian Penal Code in 1984 with a view to protect women against dowry harassment. From the very beginning of this law there has been reaction from the society including legal luminaries that this law could be misused and its effects on the society would be deleterious. The Supreme Court and High Courts have acknowledged this 'misuse' as a growing menace in the society and have recommended the legislature to amend the law. Many women's organizations, including several State Commissions for Women, have acknowledged the misuse of these laws and have recommended similar protection for men.

### **What do International Agencies and Govts. say ? <sup>(3)</sup>**

The WHO has explicitly mentioned that 498A is one of biggest reasons for elder abuse in India. The US State Department has issued a travel warning

regarding the misuse of dowry laws in India, and highlighted the fact that Indian courts require large sums of money to settle such cases. The Canadian Government has issued a similar warning.

### **Vimochanna Report<sup>(7)</sup>**

One of the leading voluntary organization, Vimochana pointed out that introspection is now essential on several matters. How effective has the law been and why has it not succeeded? Was it a mistake to lobby for fresh laws instead of creating methods of enforcing existing penal provisions and working to alter the attitudes of policemen, judges and of society itself? Can we say that the law is being "misused" when unnatural deaths are increasing and convictions are decreasing? And if the law is indeed being misused, is it also because the law and the judiciary do not protect women and their families from extortion and harassment?

### **Report of Centre for Social Research (CSR)<sup>(8)</sup>**

Centre for Social Research discussed the issue and came out with the findings on the study carried out in Delhi, Karnataka (Banglore, Mysore) , Rajasthan (Jaipur, Ajmer) and West Bengal (Kolkata, 24 Pargana south) that

- The collateral relatives of the husband should not be put behind bars because a lot of the relatives, who are accused of the crime, are sometimes not even in town at the time of reported harassment.
- Since simple injury to another person can lead to being jailed under non-bailable offence, hitting one's wife should also be followed by an arrest that is non-bailable. Legal punishment is necessary and not social punishment only.
- Section 498A is necessary for safeguarding the woman's rights. But, it should be made bailable and compoundable so that the family is not broken.
- Making the section compoundable does not mean that the woman is forced to compromise. She still has the right to decide not to arrive at a settlement.

### **Why supreme court calls 498A as "Legal Terrorism"?/Reasons "Why IPC 498A is Anti-Social ?"<sup>(3)</sup>**

- It is handled under the Criminal law for marriage related matters and not under Civil Laws.
- Non-bailable warrant does not require proof before

arrest. No investigation necessary. This exposes the vulnerability of the accused taking away their basic human rights.

- Even those who were not part of the 'day-to-day' family life could be named and arrested on one complaint, which can also include pregnant women and children.
- Accused is presumed guilty until proven innocent. Nowhere in the world it is so.
- Gifts are sometimes misunderstood as dowry. Who decides that the gift exchanged were 'gifts or dowry'?
- It is non-compoundable which means that the complaint can't be taken back that hinders any scope of reconciliation between the couple.
- Groom's relatives don't find a suitable bride after they are accused under 498A.
- Most of the cases are filed because the husband refuses to throw his parents out of the house at the wife's demands.
- Some even commit suicide for not able to withstand the depression and frustration of been falsely accused.
- The family ends up paying a very high price to settle the case, the money that was saved for the parent's health.
- A woman tries to get divorce proceedings faster by filing a 498a case even if no dowry was demanded.
- Some women marry an NRI and slap a 498A case only to extort large sum of money.
- Even after knowing that the complaint can be false, police tend to support the woman and asks the man to settle the case with a financial compensation.
- The case can easily linger in the court for years and only the groom's family has to pay the price.
- 498A case can be filed even after the divorce, which only means that the accuser wants to demand money legally apart from maintenance.
- There is no prohibition clause in the 498A law that would stop women to misuse it.

- It is nearly impossible to file a case of defamation on the accuser as it would be hard to prove it.

### **Salient Points From Report No.243 Of Law Commission Of India on Section 498A IPC in August 2012 <sup>(9)</sup>**

- Misuse of Section 498-A in many cases has been judicially noticed by the apex court as well as various High Courts. However, misuse (the extent of which is not established by any empirical study) by itself is not a ground to abolish S,498-A or to denude the Section of its teeth. The social objective behind the Section and the need for deterrence should be kept in view while at the same time ensuring that the complaints filed with false or exaggerated allegations out of ulterior motives or in a fit of emotion should be curbed.
- The need to spread awareness of the provision and available remedies especially in rural areas both among women and men is necessary and in this regard the District and Taluka Legal Services Authorities, the media, the NGO and law students can play a meaningful role.
- All endeavors shall be made for effecting reconciliation at the earliest with the help of professional counselors, mediation and legal aid centres, retired officials/medical and legal professionals or friends and relations in whom the parties have faith. The I.O. should refrain from participating in the conciliation process.
- The law on the question whether registration of FIR could be postponed for a reasonable time in a state of uncertainty. Some High Courts have been directing that FIR shall not be registered under S 498A (except in cases of visible violence, and the like) till the preliminary investigation is done and reconciliation process is completed.
- The offence under S 498-A shall be made compoundable, with the permission of Court and subject to cooling off period of 3 months, as already recommended by this Commission in 237<sup>th</sup> Report.
- The offence should remain non-bailable. However, the safeguard against arbitrary and unwarranted arrests lies in strictly observing the letter and spirit of the conditions laid down in Sections 41 and 41-A of Cr. PC relating to power of arrest and sensitizing the Police on the modalities to be observed in cases of this nature. The need for custodial interrogation should be carefully assessed.

- The Home Ministry's Advisory dated 20th October 2009 on the subject of "Misuse of Section 498-A of IPC" as well as the guidelines / additional precautions set out in para 14 of this Report should be compiled . There should be a monitoring mechanism in the police Dept. to keep track of S, 498A cases and the observance of guidelines.
- Without prejudice to the above suggestions, it has been recommended that as set out in para 16 above, sub-section (3) shall be added to Section 41 Cr. PC to prevent arbitrary and unnecessary arrests.
- The compensation amount in Section 358 of Cr. PC shall be increased from one thousand rupees to fifteen thousand rupees
- The women police stations (under the nomenclature of Crimes Against Women Cell) should be strengthened both quantitatively and qualitatively. Well trained and educated lady police officers of the rank of Inspector or above shall head such police stations. CWCs should be established in every district with adequate trained personnel. Panels of competent professional counselors and respected elders / professionals who can counsel and conciliate should be maintained by SP/SSP for every district. There shall be separate room in the police stations for women complainants and the accused women in S, 498-A related cases.
- Hostels or shelter homes for the benefit of women who would not like to go back to marital homes should be maintained in cities and District headquarters with necessary facilities.
- The passport of non-resident Indians involved in Section 498-A cases should not be impounded mechanically and instead of that, bonds and sureties for heavy amounts can be insisted upon.
- Need for expeditious disposal of cases under section 498A

### CONCLUSION

The Government and women's organizations can also lend support for rehabilitation of abused women and protect them from further harassment without doing injustice to innocent men. It would behoove the Government and women's organizations to work in collaboration with social scientists and psychologists to understand human behavior in the context of changing social conditions and standards in India and think about workable solutions to deal with Domestic

Violence and other forms of abuse instead of criminalizing ordinary citizens. Positive measures that can bring about domestic harmony are the only way to ensure family stability and long-term social stability.<sup>(3)</sup>

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# A Retrospective Autopsy Study of Pattern of Injuries Sustained by Pedestrians of Fatal Road Traffic Accidents

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## ABSTRACT

As per the commission for Global Road Safety (2009), Road Traffic Accidents (RTAs) kill an estimated 1.3 million and injure 15 million people every year globally. In Asia, it is about 700,000 per year which is more than 50% of world's fatalities. As per 2009 statistics of India, RTA was around 4.9 lakhs, killing 1, 25,660 persons and injuring more than 5 lakhs. This can be deduced as one RTA occurring every minute and a fatality every 4 minutes. More than 50% of these fatalities are in the age group of 25-65 years, a productive wage earning and child raising age group, thus snatching the bread earner.

The top five States in RTA are Maharashtra, Tamil Nadu, Madhya Pradesh, Karnataka and Andhra Pradesh.

As per 2009 statistics, Bangalore stands second to Ahmadabad in fatal RTAs. The pedestrian fatalities are maximum due to non availability of safe foot paths; erratic and reckless movement of traffic in busy lanes. Many cosmopolitan cities of India have become death traps for pedestrians (67.9%).<sup>1</sup> The roads are poorly constructed with least importance given to pedestrian. The vehicle drivers in peak hours often use foot path too, if available! This study was conducted in IT hub of Bangalore, Whitefield. The movement of traffic is at its peak in morning (8AM-10AM) and evening (4PM- 6PM), being office going and leaving hours. This study is undertaken to evaluate the factors responsible to study the pattern of injuries to the pedestrians & also to suggest measures to prevent pedestrian accidents & thereby preventing morbidity & mortality.

**Keywords:** RTA, Pedestrian, Traffic Rules, Fatal injuries

## INTRODUCTION

The invention of machine has made a valuable contribution to our society & economy but also brought its misery, suffering & death. Between rapid urbanization & industrialization enormous improvement in economic & social standards of people has resulted in change of lifestyle - like increased vehicle users, use of Mobile phones, alcohol & addictive drugs, encroachment of foot paths by hawkers. Blood Alcohol concentration (BAC) 100-200 mg%, there is a severe impairment of driving ability with increased liability to accident<sup>2</sup>.

The first death due to a motor vehicle was registered in 1896 in UK & second in USA in 1899, since then incidences are steadily increasing & have reached a state of major public health problem, which thus justifies a very close examination of factors which influence such accidents. Road accidents to pedestrians have become a serious health hazard throughout the world by killing & crippling thousands of people each year. Condition is so grave in our country.

Traffic deaths are next to deaths following cardiac diseases & cancer in numbers. Injuries sustained by pedestrian require careful interpretation & recording

for various reasons like – compensation, insurance claims, civil action & criminal prosecution of offenders. For these purposes RTAs should be investigated by team of experts like police officer, automobile expert and medico-legal expert.<sup>3</sup>

Autopsy surgeons play a major role in establishing link between crime vehicle and pedestrian by noting trace evidences and pattern of injuries in RTA.

**MATERIALS & METHOD**

Materials utilized for this study was obtained from RTA cases brought to Department of Forensic Medicine Vydehi Institute of Medical Sciences Bangalore for Post mortem examination. The cases involving pedestrians were included. The other types of RTA cases were excluded.

Jurisdictional police provided case details; study was conducted over 55 cases for a period from January 2005 to December 2009. A detailed information & data pertaining to cases were collected from -

1. Police inquest
2. Post mortem reports
3. Relatives and friends of deceased
4. Hospital case sheets in treated cases.

Every case was autopsied after legal formalities and injuries were noted in detail. An attempt was made to find out the mechanism of infliction of injuries (reconstruction).

**OBSERVATIONS**

**Table 1: Sex wise distribution of Pedestrians**

Sex	No. of Victims	Percentage
Male	46	84
Female	09	16
Total	55	100

**Table- 2: Age Wise Distribution**

Age Group(years)	No. of Victims	Percentage
0 – 10	04	7
11 – 20	07	13
21 – 30	09	16
31 – 40	10	18
41 – 50	09	16
51 – 60	09	16
61 – 70	04	7
> 70	03	6
Total	55	100

**Table 3: Time of RTA**

Time	No. of Victims	Percentage
6 AM – 12 Noon	12	22
12 Noon – 4 PM	06	11
4 PM – 8 PM	14	25
8 PM – 6 AM	23	42
	55	100

**Table 4: Activity of Pedestrian**

Activity	No. of Victims	Percentage
Walking on the Road side	22	40
Crossing the Road	25	45
Standing on Road side	08	15
Total	55	100

**Table 5: Type of vehicle injured the Pedestrian**

Vehicle	No. of Victims	Percentage
Heavy Goods	17	31
Heavy Passenger	07	13
Light Passenger	13	23
Two Wheeler	10	18
Unknown	08	15
Total	55	100

**Table 6: Duration of survival of Pedestrian**

Duration of Survival	No. of Victims	Percentage
Few minutes	24	43
Less than 1 Hour	16	29
1 Hr to 12 Hrs	07	13
12 to 24 Hrs	02	04
In days	2Days-02, 6days-01, 9days-01, 12days-02	11
	55	100

**Table 7: Distribution of fatal injuries - Region wise**

Regions involved	No of victims	Percentage
Head & Neck	09	16
Vertebral column	02	04
Chest, Abdomen & Pelvis	03	5.5
Extremities ( All Four)	04	7.5
Two or more of above Areas	37	67
Total	55	100

**Table 8: Distribution of skeletal injuries**

Site of Fracture	No of Victims
Skull & Spine	31
Clavicle, Sternum & Ribs	26
Pelvic bones	08
Long bones	23

**Table 9: Distribution of visceral injuries**

Viscera Injured	No of Victims
Brain	30
Spinal cord	07
Lungs	28
Diaphragm	02
Liver	23
Spleen	04
Heart & Major Vessels	02
Stomach & Intestines	06
Kidneys/ Bladder/Testes/Ovaries	07

Sex wise analysis showed male predominance of 46 cases (84%) and female 09 cases (14%) Table -1

Age wise analysis showed maximum number of victims were in the age group of 31-40 yrs with 10 cases (18%) followed by 09 cases each (16%) in the age group of 21-30yrs, 41-50yrs and 51-60 yrs, and 7 cases ( 13%) in 11-20 yrs. Table -2

This study showed highest deaths occurring between 8PM to 6AM with 23 cases (42%), followed by 14 cases (25%) between 4PM to 8PM, 12 cases (22%) between 6AM-12Noon and 6 cases(11%) between 12Noon to 4PM. Table -3.

The maximum number of fatal pedestrian accidents occurred while crossing the road in 25 cases (45%), followed by while walking on road side in 22 cases (40%) and in 8 cases (15%) while standing on road side. Table -4

The data showed that type of vehicles responsible for the death of pedestrians were heavy goods vehicles in 17 cases (31%). Light passengers motor vehicles like cars and autos in 13 cases (23%), two wheelers in 10 cases (18%). Heavy passenger vehicles such as buses had fatally knocked pedestrians in 7 cases (13%). The nature of the vehicles involved was not known in 8 cases (15%). Table -5

The duration of survival of victim varied from few minutes to 12 days. The maximum deaths occurred within few minutes in 24 cases (43%); in 16 cases (29%) within 1 hour of accident; 7 cases (13%) died between 1-24 hours and 2 cases (4%) survived for 2 days, 1 case each for 6 & 9 days survival, and 2 cases survived for 12 days with various serious injuries and their complications. Table -6

Analysis of region wise distribution of fatal injuries on the body of pedestrians show that in majority of cases 37 (67%) sustained injuries in combination of two

or more regions. Injuries in head & neck region alone in 09 cases ( 16%) followed by only on Extremities 04 cases (7.5%), on Chest, abdomen & pelvis 03 cases ( 5.5%) and only on vertebral column and spinal cord 02 cases (4%). Table -7

Analysis of skeletal injuries only showed that injuries on skull and spine in 31 cases followed by Clavicle, Sternum & Ribs in 26 cases, long bones in 23 cases and Pelvic bones in 08 cases. Table -8

Analysis of injuries to vital internal organs showed that brain, lungs and liver were the most common vital organs to be injured and constituted 30, 28 and 23 cases respectively. This followed by spinal cord injuries in 07 cases, Kidneys, bladder, testes and ovaries in 07 cases, stomach and intestines in 06 cases, spleen in 04 cases and diaphragm, heart and major vessels with 02 cases each. Table -9

## DISCUSSION

The analysis of 55 cases revealed following findings.

The sex predominance of male more than female was observed. Male - 46 Cases (84 %) Female - 09 Cases (16%), this can be attributed to male often being the bread earner and thus is active to earn his lively hood using road and vehicle.<sup>4</sup>

The study showed 18 % of victims belonged to the age group of 31-40 yrs followed by 16% of victims belonging to the age group of 21-30yrs, 41-50yrs and 51-60yrs each. The high death rate in young may be due to careless road behaviors, reckless & rash driving and lack of traffic sense in them. In elderly individuals it is attributed to lack of traffic sense, locomotive disability, impaired vision and impaired hearing. The recent one, mobile phones menace with its usage observed in both drivers and pedestrians is causing lot of accidents. In our study majority of the victims are in middle age contrary to the study of Sevitt<sup>5</sup> wherein 26% of victims were above 60 yrs, followed by 18% between 0-10 yrs.

### Activity of Pedestrian

Analysis of the activity of pedestrians at the time of accident shows that maximum numbers of Pedestrians were crossing the road i.e. 45%, followed by when pedestrians were walking on road side 22 cases (40%) Table - 4. Similar findings were seen by Male K M et al<sup>6</sup> and William Gissane. et al<sup>7</sup>. Above

findings reveal that the careless road behavior of people, deficiency in traffic management, improper road marking such as zebra crossing and children playing on roads add misery to both drivers and pedestrians.

### **Time of Accident**

The study revealed many fatalities at night and early morning hours. This is probably due to active night life for work or pleasure. Early morning may be because people going to work or business, people coming & leaving the city, also children going to school may contribute. One cannot ignore alcohol, drug abuse and drowsiness playing role in these accidents.

### **Period of survival**

The maximum number of deaths occurred within few minutes, 24 cases (44%) and in 16 cases (29%) death occurred within 1 hour of accident, 7 cases (13%) died between 1-24 hours and 2 cases (4%) survived for 2 days. High percentage of death occurred within few minutes, it may be due to combination of severity and multiplicity of injuries, ignorance of first aid and delay in shifting to hospital. These findings are similar to the study of Chandra et al.<sup>8</sup>

Analysis of fatal injuries in region wise distribution on the body shows, in majority of cases 37 (67%) it is combination of two or more regions. These findings are similar as in Series of studies by Sevitt<sup>5</sup> and Solheim<sup>9</sup> -showed injuries were multi regional 80% and 82% respectively. The involvement of multiple visceral injuries is similar to the study of Eckert, W,G: The traumatic pathology of traffic accident (review 300 autopsies ) 40% cases with visceral injuries.<sup>10</sup>

From analysis of skeletal injuries, it was observed that skull and spine were fractured in 31 cases which are comparable to the series of Gissane and Bull<sup>7</sup>. Clavicle, Sternum & Ribs fractured in 26 cases again this is comparable to studies of sevitt<sup>5</sup> and Gissane et al<sup>7</sup>. Extremities fracture in 23 cases this is comparable to the study of Solheim<sup>9</sup> and David. A. Hill<sup>11</sup>. In over 2/3<sup>rd</sup> of pedestrians victims lower extremities were severely injured, compound comminuted fractures of both bones were most common<sup>12</sup>.

Unfortunately there is no any protective gear invented for pedestrians. The skeletal injuries were to head, chest and limbs which result in often permanent deformity in survivors, crippling their life forever. Maximum number of deceased suffered head injuries

followed by lungs and liver in the current study.

The only way to protect them from fatalities is to adhere to traffic rules. Both pedestrian and vehicle users must follow traffic rules to minimize RTA mortality & morbidity.

## **CONCLUSION**

**“Safety is not just a word but it is a way of life”.**

Preventive measures of all epidemic diseases are based on the cause. Similarly it is essential to study the cause of road traffic accidents, which revolve around certain factors like- human, vehicle errors and road. The main culprit being human and is mainly responsible for fatal road traffic accidents. Sincere efforts made in this direction can reduce the mortality and morbidity. Pedestrian accidents often result in serious life-altering injuries because the cyclists and pedestrians are not protected by the iron, steel, cushions, seat belts and airbags that protect automobile drivers.

The following preventive aspects, if followed may help to control human errors involved in fatal road traffic accidents.

1. Educating road users regarding zebra crossing and using footpaths.
2. Teaching road sense to school children.
3. Strict enforcement of traffic rules & regulations, punishing offenders.
4. Educating vehicle users and public about first aid techniques.
5. Use of infra red night vision system and night goggles to reduce glare.
6. Luminous clothes for cyclist, people at work on road.
7. Strengthening High way patrolling, ambulance and hospital services.

### **Tips for Pedestrians**

1. Use sky walks, subways when available.
2. Look at all directions before crossing roads .
3. Do not talk, text, game or search for a song on gadgets while crossing road.

### Tips for Drivers

1. Decrease speed to give you more time to stop when you are in a busy area.
2. Be aware of what others are doing around you.
3. Wait until the pedestrian has completely cleared the road before proceeding.

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**Declaration of Conflict of Interest:** Nil

**Ethical Clearance:** Since this was a retrospective study of PM Reports, clearance from Institutional Ethical committee was not required. Also we confirm that no monetary benefits were required and were not availed from any source.

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# Analysis of Suspected Seized Sample of NDPS Drugs (Benzodiazepines) through GLC & TLC using Different Solvent System

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## ABSTRACT

The benzodiazepines are a class of psychoactive drugs which act as CNS depressant. These NDPS substance were seized by law enforcement agency and they were sent to FSL for the purpose of identification. In the present work, 10 suspected seized samples of benzodiazepines were analyzed through TLC & GLC for its identification. For the analysis of these suspected sample 18 solvent systems were prepared out of which 5 solvent system showed good result of separation. TLC spots were identified on the basis of Rf. values. These samples were also analyzed through GLC After analysis and comparison with control sample of benzodiazepines. It was found that out of 10 sample (DS1, DS2, LS4, LS5, LS6, NS7, NS8, NS9, AS10) except DS3 all sample showed the +ve presence of benzodiazepines.

**Keywords:** Retention time, Benzodiazepines, TLC, Solvent system

## INTRODUCTION

"Narcotics is derived from the Greek word "Narkotikos" which implies as state of lethargy or sluggishness". Narcotics is an addictive drug, that reduces pain, alters mood and behavior, and usually induces sleep or stupor. The benzodiazepines are a class of psychoactive drugs that act as a central nervous system depressant. These are the CNS depressants most prescribed and have largely used. Benzodiazepine group of drugs like diazepam, lorazepam, nitrazepam are prescribed for insomnia patients as sedative and tranquilizers. The benzodiazepine family of depressants is used therapeutically to produce sedation, induce sleep, relieve anxiety and muscle spasms and to prevent seizures. In general, benzodiazepines act as hypnotics

in high doses, anxiolytics in moderate doses and sedatives in low doses. It was described that determination of lorazepam plasma levels involving extraction from the sample and analysis of the intact lorazepam by electron capture gas-liquid chromatography<sup>1</sup>. Extraction and analysis procedure for detection of benzodiazepines in bloodstains<sup>2</sup>. The use of gas-liquid chromatography (GLC) with electron capture detection (ECD) enables therapeutic levels of diazepam, desmethyldiazepam, chlordiazepoxide, nitrazepam, desalkylflurazepam and temazepam to be detected in stains<sup>7</sup>. Nineteen benzodiazepine samples were also studied including diazepam, by subjecting it to TLC, GLC, high-resolution GLC and HPLC analysis and the results were compared with literated data<sup>3</sup>. Analysis of mixture of psychotropic drugs aminazine, barbamyllum and nitrazepam using ultraviolet (UV) spectrophotometer was also suggested<sup>4&8</sup>. It was reported that hypnotic/sedative used in drug related offences is one of the common cause of rise in offence rate, as evidenced from the trend of cases encountered in forensic science laboratories<sup>5</sup>. The benzodiazepine group of drugs is most commonly encountered in such forensic cases presented<sup>6</sup> a technique for the separation, identification

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and measurement of nitrazepam in biological materials. The method has been applied to two cases of fatal ingestion of nitrazepam.

### MATERIAL AND METHOD

#### Collection of samples

The sample were provided by Chemistry division of State Forensic Science Laboratory, Mahanagar, Lucknow. U.P, India

#### Analysis of Suspected Samples of Benzodiazepines drugs through TLC

##### Plates

Silica gel G plates.

##### Method

Ascending

##### Extraction

Some tablets of benzodiazepines drugs was crushed and dissolved in chloroform for extraction.

##### Identification

For chromatographic separation various binary & tertiary solvent system (18 solvent system) were used.

Comparison of the Rf value of unknown benzodiazepines drugs to standards benzodiazepines drugs samples was carried out, after location of spots using Dragendroff spraying reagent.

#### Analysis of Suspected Sample of Benzodiazepines drugs through GLC

##### Operating condition of GLC

Solvent	Chloroform
Detector	FID
Column	Capillary
Carrier gas	Nitrogen, Hydrogen, Air
Carrier gas temperature	30°C
Flow rate	30 ml, 30 ml, 300 ml
Column temperature	260°C
Injector temperature	280°C
Detector temperature	280°C

### RESULTS

10 suspected seized samples of benzodiazepines were analysed through TLC. Analysis was carried out using 18 different solvent system. Out of which five solvent system showed best result as shown in table 1 to 4. The solvent system are namely Chloroform : Acetone (90:10), Ethyl acetate (100), Chloroform : Methanol : Ammonia (90:9.5:0.5), Chloroform : Methanol (90:10), Methanol : Ammonia (95:5).

Table 1: Rf values of Benzodiazepines drugs (i.e Suspected Alprazolam) using different solvent system.

S.no	Solvent system	Standard (Rf value)	Suspected (Rf value)	Spraying reagent
1.	Chloroform : Acetone(90:10)	83	83	Dragendroff
2.	Ethyl acetate(100)	89	89	Dragendroff
3.	Chloroform: Methanol(90:10)	83	83	Dragendroff
4.	Chloroform:Methanol:Ammonia(90:9.5:0.5)	87	87	Dragendroff
5.	Methanol:Ammonia(95:5)	77	77	Dragendroff
6.	Methanol:Chloroform(80:20)	93	93	Dragendroff
7.	Cyclohexane:Diethylamine(60:40)	86	86	Dragendroff
8.	Acetone:Chloroform(60:40)	88	88	Dragendroff
9.	Cyclohexane:Toluene:Diethylamine(80:10:10)	91	91	Dragendroff
10.	Chloroform:Acetone(70:30)	89	89	Dragendroff
11.	Cyclohexane:Diethylamine(70:30)	96	96	Dragendroff
12.	Methanol(100)	84	84	Dragendroff
13.	Toluene:Cyclohexane(60:40)	79	79	Dragendroff
14.	Chloroform:Acetone:Ammonia(90:9.5:0.5)	93	93	Dragendroff
15.	Cyclohexane:Toluene:Diethylamine(70:20:10)	97	97	Dragendroff
16.	Diethylamine:Toluene(60:40)	78	78	Dragendroff
17.	Cyclohexane:Toluene(70:30)	96	96	Dragendroff
18.	Chloroform:Ammonia(95:5)	86	86	Dragendroff

**Table 2: Rf values of Benzodiazepines drugs (i.e Suspected Diazepam) by using different solvent system.**

S.no	Solvent system	Standard (Rf value)	Suspected (Rf value)	Spraying reagent
1.	Chloroform:Acetone(90:10)	75	75	Dragendroff
2.	Ethyl acetate(100)	83	83	Dragendroff
3.	Chloroform:Methanol(90:10)	91	91	Dragendroff
4.	Chloroform:Methanol:Ammonia(90:9.5:0.5)	89	89	Dragendroff
5.	Methanol:Ammonia(95:5)	94	94	Dragendroff
6.	Methanol:Chloroform(80:20)	88	88	Dragendroff
7.	Cyclohexane:Diethylamine(60:40)	93	93	Dragendroff
8.	Acetone:Chloroform(60:40)	96	96	Dragendroff
9.	Cyclohexane:Toluene:Diethylamine(80:10:10)	97	97	Dragendroff
10.	Chloroform:Acetone(70:30)	86	86	Dragendroff
11.	Cyclohexane:Diethylamine(70:30)	84	84	Dragendroff
12.	Methanol(100)	79	79	Dragendroff
13.	Toluene:Cyclohexane(60:40)	86	86	Dragendroff
14.	Chloroform:Acetone:Ammonia(90:9.5:0.5)	88	88	Dragendroff
15.	Cyclohexane:Toluene:Diethylamine(70:20:10)	79	79	Dragendroff
16.	Diethylamine:Toluene(60:40)	83	83	Dragendroff
17.	Cyclohexane:Toluene(70:30)	87	87	Dragendroff
18.	Chloroform:Ammonia(95:5)	98	98	Dragendroff

**Table 3: Rf values of Benzodiazepines drugs (i.e Suspected Lorazepam) by using different solvent system.**

S.no	Solvent system	Standard (Rf value)	Suspected (Rf value)	Spraying reagent
1.	Chloroform:Acetone(90:10)	89	89	Dragendroff
2.	Ethyl acetate(100)	91	91	Dragendroff
3.	Chloroform:Methanol(90:10)	84	84	Dragendroff
4.	Chloroform:Methanol:Ammonia(90:9.5:0.5)	77	77	Dragendroff
5.	Methanol:Ammonia(95:5)	87	87	Dragendroff
6.	Methanol:Chloroform(80:20)	96	96	Dragendroff
7.	Cyclohexane:Diethylamine(60:40)	79	79	Dragendroff
8.	Acetone:Chloroform(60:40)	88	88	Dragendroff
9.	Cyclohexane:Diethylamine:Ammonia(80:10:10)	94	94	Dragendroff
10.	Chloroform:Acetone(70:30)	86	86	Dragendroff
11.	Cyclohexane:Toluene:Diethylamine(70:30)	97	97	Dragendroff
12.	Methanol(100)	83	83	Dragendroff
13.	Toluene:Cyclohexane(60:40)	76	76	Dragendroff
14.	Chloroform:Acetone:Ammonia(90:9.5:0.5)	93	93	Dragendroff
15.	Cyclohexane:Toluene:Diethylamine(70:20:10)	87	87	Dragendroff
16.	Diethylamine:Toluene(60:40)	85	85	Dragendroff
17.	Cyclohexane:Toluene(70:30)	96	96	Dragendroff
18.	Chloroform:Ammonia(95:5)	89	89	Dragendroff

**Table 4: Rf values of Benzodiazepines drugs (i.e Suspected Nitrazepam) by using different solvent system.**

S.no	Solvent system	Standard (Rf value)	Suspected (Rf value)	Spraying reagent
1.	Chloroform:Acetone(90:10)	88	88	Dragendroff
2.	Ethyl acetate(100)	84	84	Dragendroff
3.	Chloroform:Methanol(90:10)	86	86	Dragendroff
4.	Chloroform:Methanol:Ammonia(90:9.5:0.5)	81	81	Dragendroff
5.	Methanol:Ammonia(95:5)	93	93	Dragendroff

**Table 4: Rf values of Benzodiazepines drugs (i.e Suspected Nitrazepam) by using different solvent system. (Contd.)**

S.no	Solvent system	Standard (Rf value)	Suspected (Rf value)	Spraying reagent
6.	Methanol:Chloroform(80:20)	89	89	Dragendroff
7.	Cyclo hexane:Diethylamine(60:40)	91	91	Dragendroff
8.	Acetone:Chloroform(60:40)	87	87	Dragendroff
9.	Cyclohexane:Toluene:Diethylamine(80:10:10)	79	79	Dragendroff
10.	Chloroform:Acetone(70:30)	88	88	Dragendroff
11.	Cyclohexane:Diethylamine(70:30)	93	93	Dragendroff
12.	Methanol(100)	86	86	Dragendroff
13.	Toluene:Cyclohexane(60:40)	84	84	Dragendroff
14.	Chloroform:Acetone:Ammonia(90:9.5:0.5)	96	96	Dragendroff
15.	Cyclohexane:Toluene:Diethylamine(70:20:10)	83	83	Dragendroff
16.	Diethylamine:Toluene(60:40)	87	87	Dragendroff
17.	Cyclohexane:Toluene(70:30)	94	94	Dragendroff
18.	Chloroform:Ammonia(95:5)	86	86	Dragendroff

**Table 5: Comparison of retention time of standard and suspected seized samples of benzodiazepines drugs.**

Sample No.	Sample Name	Retention Time
1.	Diazepam (Standard)	4.59
2.	DS1	4.70
3.	DS2	4.59
4.	DS3	3.76
5.	Lorazepam (Standard)	4.34
6.	LS4	4.38
7.	LS5	4.34
8.	LS6	4.35
9.	Nitrazepam (Standard)	8.34
10.	NS7	8.33
11.	NS8	8.47
12.	NS9	8.77
13.	Alprazolam (Standard)	2.47
14.	AS10	2.47

In the present work, 10 suspected seized samples of benzodiazepines were analyzed through GLC instrument<sup>9</sup>. After comparison of retention time of suspected and standard samples of benzodiazepines drugs. It was found that out of 10 sample (DS<sub>1</sub>, DS<sub>2</sub>, DS<sub>3</sub>, LS<sub>4</sub>, LS<sub>5</sub>, LS<sub>6</sub>, NS<sub>7</sub>, NS<sub>8</sub>, NS<sub>9</sub>, AS<sub>10</sub>) except DS<sub>3</sub> all sample showed the presence of benzodiazepines.

## DISCUSSION

Work on the benzodiazepines drugs (eg. Alprazolam, Diazepam, Nitrazepam, Lorazepam) were performed using different solvent system in TLC technique. And it was found that Chloroform:Acetone (90:10), Ethyl acetate (100), Chloroform :Methanol : Ammonia (90:9.5:0.5), Chloroform : Methanol (90:10), Methanol : Ammonia (95:5) had showed best

result of separation after visualization of spots with spraying reagent. Work<sup>5</sup> on identification of Lorazepam samples in biological Samples through TLC & found that Chloroform :Methanol : Ammonia (90:10:1) given best result for the analysis of benzodiazepines so the result obtained here are similar with the result of Jayashankar(2006) Analysis and detection of benzodiazepines drugs in blood stain through GLC using electron capture detector(ECD), good levels of diazepam, nitrazepam, & Lorazepam was detected by comparing the retention time these drug with standard samples of drugs<sup>2</sup>. In this study also analysis of suspected benzodiazepines drug samples was performed through GLC using flame ionization detector (FID) & retention time was compared the with standard samples of these drugs. So the result are similar with the result of Hammonda(1978).

## CONCLUSION

10 suspected seized sample were analyzed for the presence of benzodiazepines through TLC & GLC. Thin layer chromatography of suspected samples of benzodiazepines drugs were performed using 18 different solvent system or mobile phases used for spot separation. After observation it found that 5 solvent system namely Chloroform : Acetone (90:10), Ethyl acetate (100), Chloroform : Methanol : Ammonia (90:9.5:0.5), Chloroform : Methanol (90:10), Methanol : Ammonia (95:5) had given best result. In instrumental analysis of suspected seized sample of benzodiazepines through GLC for the comparison of standard & suspected samples. After analysis and comparison with standard sample of benzodiazepines. It was found that out of 10 sample (DS<sub>1</sub>, DS<sub>2</sub>, LS<sub>4</sub>, LS<sub>5</sub>, LS<sub>6</sub>, NS<sub>7</sub>, NS<sub>8</sub>, NS<sub>9</sub>, AS<sub>10</sub>) except DS<sub>3</sub> all sample showed the presence of benzodiazepines.

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**Conflict of Interest** This work was especially taken with an objective to develop a solvent system which can be more precisely used for separation of benzodiazepines when TLC was performed.

**Ethical Clearance** As no animal or human model was being used for this study at any stage of work therefore no ethical clearance was required.

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# Successful Treatment of Dapsone Induced Methemoglobinemia with Ascorbic Acid : Two Case Reports

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## ABSTRACT

Acute dapsone poisoning is uncommon in childhood. The most frequent side effects are dose-related methemoglobinemia and hemolytic anemia, and rarely, can cause an idiosyncratic reaction, called dapsone hypersensitivity syndrome (DHS). Methemoglobinemia is a potentially life-threatening disorder characterized by the presence of >1% methemoglobin (metHb) in the blood. Symptoms produced depends upon methemoglobin levels. Methylene blue (MB) is the mainstay of treatment in severe cases. Other modalities used in less severe cases are activated charcoal and ascorbic acid. We hereby report two pediatric cases of accidental dapsone poisoning induced methemoglobinemia with severe symptoms, treated successfully with supportive therapy and ascorbic acid.

**Keywords:** Ascorbic Acid, Children, Charcoal, Dapsone, Methemoglobinemia

## INTRODUCTION

Acquired type is the most common form of methemoglobinemia. Dapsone has been reported to be one of the major causes of acquired methemoglobinemia.<sup>[1,2]</sup> Dapsone has anti-inflammatory and antiparasitic properties and is used in the treatment of leprosy, dermatitis herpetiformis, bullous dermatosis and infections caused by pneumocystis carinii, toxoplasma gondii.<sup>[3,4]</sup> Life-threatening adverse effects of dapsone include dapsone hypersensitivity syndrome, dose-dependent hemolytic anemia, and methemoglobinemia.<sup>[1,4]</sup> With the drug being used in so many conditions, reports related to its toxicity have also increased. We report two cases of accidental dapsone poisoning in children and their management with ascorbic acid.

## CASE REPORT

### Case 1

A 3 year-old female child was admitted to the pediatric intensive care unit with a history of accidental ingestion of 5 tablets of dapsone (100 mg). She developed symptoms after 1.5 hours in the form of increased activity, agitated behavior, progressive breathlessness and cyanosis. In past history, she was diagnosed as a case of tuberculids and was on anti tubercular therapy along with steroids and dapsone. She was off dapsone for the past 3 months. Her clinical and laboratory parameters are given in [Table 1]. During sampling, her blood was noticed to be of chocolate brown and the color did not change when oxygen was bubbled through it. A provisional diagnosis of "dapsone induced methemoglobinemia" was made. Methaemoglobin levels could not be done because of non availability. Clinical correlation with percentage of methhemoglobin has been shown in [Table 2]. The patient was managed supportively with intravenous fluids, oxygen inhalation and gastric lavage. Activated charcoal was given at a dose of 1gm/kg 4 times a day through nasogastric tube. Administration of methylene blue was planned but

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unfortunately, could not be procured. So the child was given intravenous ascorbic acid. [Table 1] The response was dramatic, with the patient showing marked symptomatic improvement within an hour. The cyanosis, though persisted for 3 days. The SpO<sub>2</sub> varied between 82-85% and normalized on the 5<sup>th</sup> day. At discharge, the child was playful, with normal oxygen saturation, urine output and liver function.

## Case 2

A 3.5-year old female child admitted in PICU the very next day with complaints of vomiting for one day, acute onset, non projectile, containing whitish material. The parents noticed the child to be cyanosed since then. There was no history of any illness prior to this episode. Urinary and bowel habits were normal. There was a doubtful history of ingestion of some substance by the child. Her clinical and laboratory profile is given in [Table 1]. Again, we noticed that her blood had chocolate brown color and the color did not change when oxygen was bubbled through. A provisional diagnosis of methemoglobinemia was made. We could not do methaemoglobin levels because of unavailability. She was managed with intravenous fluids, continuous oxygen by face mask and gastric lavage was done. Activated charcoal was not started as the cause of methemoglobinemia was not known. MB could not be procured. The child was given intravenous ascorbic acid. [Table 2] She also improved symptomatically within an hour, though cyanosis, with SpO<sub>2</sub> of 78-80% persisted for 2 days. Ingestion of dapsone by the child was confirmed on the 3<sup>rd</sup> day of admission, a bottle with 50mg dapsone tablets was brought to the hospital. Exact number of tablets ingested were not known. The child was discharged on the 5<sup>th</sup> day with normal oxygen saturation, urine output, and liver function.

On follow up, both children were normal with no cyanosis.

## DISCUSSION

Children develop methemoglobinemia either from exogenous exposure, such as drugs, or due to a serious illness, such as gastrointestinal infection with dehydration.<sup>[1]</sup> Acquired methemoglobinemia is not infrequent in children,<sup>[2]</sup> accidental ingestion of dapsone being one of the causes. Methemoglobin is an aberrant form of hemoglobin in which the original ferrous (Fe<sup>2+</sup>) atom is oxidized to a ferric (Fe<sup>3+</sup>) atom. The ferric atom then causes an allosteric change in the heme portion of the oxidized hemoglobin molecule,

resulting in an increase in its oxygen affinity but a decrease in its oxygen binding capacity.<sup>[4]</sup>

The drug can be detected in tissues upto three weeks after ingestion. The half life normally varies from 9-45 hrs (mean 30 hrs) but in toxic doses, may be prolonged to two to four days.<sup>[5]</sup> Clinical presentation can give us the clue regarding methemoglobin concentrations in blood.<sup>[5]</sup> [Table 2]

The standard treatment for symptomatic methemoglobinemia is intravenous infusion of methylene blue (MB) in a dose of 1-2 mg/kg. MB at 1 to 2%, acts by providing an artificial electron acceptor for NADPH methemoglobin reductase. NADPH-erythrocyte methemoglobin reductase converts MB into leukomethylene blue, which then reduces methemoglobin to hemoglobin. Multiple doses of activated charcoal have also been used with success, especially when the levels are less than 30%, either alone or in combination with MB.<sup>[2]</sup> There are reports of successful use of ascorbic acid in combination with methylene blue.<sup>[6,7,8]</sup> Documented use of ascorbic acid alone for methemoglobinemia is scarce.<sup>[5]</sup> Known or suspected glucose 6 phosphate dehydrogenase (G6PD) deficiency is a relative contraindication to the use of MB. Moreover, high-dose MB can itself initiate methemoglobin formation.<sup>[7,8]</sup> The use of expensive, more invasive methods, such as exchange transfusion, plasmapheresis and hemodialysis have been reported for isolated cases of severe acute dapsone intoxication in adults, with recurrent methemoglobinemia and hemolysis.<sup>[2]</sup> In our cases, both children had deep central and peripheral cyanosis, tachycardia, tachypnoea, hypertension, altered behavior suggestive of 45-70% level of methemoglobin in blood.[Table 2] In the first child, we administered activated charcoal and ascorbic acid while the second one was given ascorbic acid alone along with supportive treatment. We observed significant improvement in both of our patients within an hour of ascorbic acid administration.

## Key message

Any child presenting with sudden onset of cyanosis, diagnosis of methemoglobinemia should be considered, as early intervention with antidote can prevent fatal outcome. The efficacy of ascorbic acid along with supportive measures in preventing death due to methemoglobinemia has been highlighted in our cases. Further studies can be planned to document use of ascorbic acid alone in the management of methemoglobinemia, especially when MB is contraindicated, as in G6PD deficiency.

**Table 1 : Showing the clinical, laboratory profile along with details of the treatment used and outcome of both patients.**

Profile	Case 1	Case 2
<b>Clinical Parameters</b>		
Heart rate (tachycardia)	158/min	178/min
Respiratory rate (tachypnoea)	42/min	46/min
Blood Pressure (hypertension)	140/100mm of Hg	136/98 mmHg
SpO <sub>2</sub>	84%,	78%
Cyanosis	Deep central and peripheral	Deep central and peripheral
Respiratory system	Normal	Normal
Cardiovascular system	Normal	Normal
Central nervous system	Agitated , restless and irritable. No signs of raised intracranial tension	Confused, restless, agitated with no signs of raised intracranial tension
Gastro -intestinal system	Normal	Normal
<b>Laboratory Parameters</b>		
Colour of blood	Chocolate brown	Chocolate brown
Hemoglobin( Hb)	9g/dl	8g/dl
Peripheral blood film	No evidence of haemolysis	No evidence of haemolysis
Serum bilirubin	1.1mg %	1.4mg %
Liver enzymes	SGOT-66 IUSGPT-42 IU	SGOT-50 IUSGPT-58 IU
Renal function tests	Normal	Normal
Arterial blood gas	Normal oxygenation (PaO <sub>2</sub> ) and metabolic acidosis	Normal oxygenation (PaO <sub>2</sub> ) and metabolic acidosis
Urine	2+ ketones	3+ ketones
Chest X-ray	Normal	Normal
<b>Treatment</b>		
Ascorbic acid	Intravenous ascorbic acid 300 mg stat followed by 100 mg intravenous for 3 days and oral for next 4 days	Intravenous ascorbic acid 300 mg stat followed by 100 mg intravenous for 3 days and oral for next 4 days
<b>Outcome</b>		
Decline in agitation and irritability	Within half an hour	Within an hour
Playful	24 hours	24 hours
Normal vitals	24 hours	24 hours
Normotensive	48 hours	36 hours

**Table 2: Showing clinical symptoms in correlation with methemoglobin concentration in blood.<sup>[5]</sup>**

Methemoglobin concentration in blood	Clinical Symptoms
<15%	Mostly no symptoms.
15-20%	Cyanosis, headache, drowsiness.
20-45%	Marked cyanosis, nausea.
45-70%	Severe cyanosis, vomiting, dizziness, fatigue, tachycardia, convulsions.
>70%	Acidosis, cardiac arrhythmia, dyspnea, death.

**Abbreviations :** MB (methylene blue), NADPH (nicotinamide adenine dinucleotide phosphate), G6PD ( glucose 6 phosphate dehydrogenase ).

**Contributors:** Nivedita Sharma, Seema Sharma and Amar Singh managed the case. Piyush Gautam and Nivedita Sharma did the literature search. Piyush Gautam prepared the draft of the manuscript. All authors edited and checked the final manuscript.

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**Conflict of Interest :** nil

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**Ethical clearance :** not required.



Fig. 1. Showing chocolate color of the blood in both children.

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# Indian Red Scorpion Stings Your Heart More than Your Skin: an Interesting Study

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## ABSTRACT

**Objective:** To study the various cases of scorpion sting caused by Indian red scorpion and its effect on left ventricular ejection fraction and to establish prazosine as drug of choice.

**Type of study:** Longitudinal observational study

Here we discuss a few cases of scorpion bite which are complicated by severe heart failure and treated successfully in intensive care unit of Vadilal Sarabhai General Hospital during July 2013 to October 2014.

**Keywords:** *Methobulus Tumulus*(Indian Red Scorpion), Prazosin, 2D Echo, Pulmonary Oedema, Cardiotoxicity

## INTRODUCTION

Scorpion sting is very common in India. There are more than 1250 species of scorpion in the world and more than 100 of them are found in India<sup>[1]</sup>. The Indian red scorpion (*Mesobuthus tumulus*) produces neurotoxin and cardiotoxin while *Palamnaeus gravimanus* inflicts painful sting without systemic envenoming<sup>[1]</sup>. Identification of the species is very useful and key to management. Clinical scenario ranges from just mild irritation at local sites to very severe life threatening heart failure<sup>[2]</sup>.

### Case 1

A 14 year old young Hindu male school student residing at Gandhinagar presented to casualty with complain of nausea, vomiting and breathlessness. He gave history of scorpion sting 2 hours back. Patient was very apprehensive and restless. He was also tachypneic with respiratory rate of 34 per minute. Blood Pressure was 90/60 mm of mercury. On respiratory system examination patient was having severe crepitations all over the chest (even in upper zones). Considering the criticality of the situation and

restless of the patient, he was sedated and intubated urgently. It was found that from the endotracheal tube froth was coming out continuously. Severe pulmonary oedema was diagnosed and patient was put on volume assisted control mode of ventilator and vigorous suctioning done. Ryle's tube was inserted and during the attempt of urinary catheterization priapism (persistent painful penile erection) was noted which is very unusual in mildly sedated patients. Hence it was concluded that the patient was in parasympathetic autonomic storm phase of scorpion venom toxicity. Sting was on right upper extremity and there was only one hole in the reddened area. There were no local signs like oedema. Immediate help from cardiology department was sought. Portable 2-D echocardiography was performed by cardiologist. Ejection fraction was only 18% and on cardiologist's advice inotropes were started. Once BP had reached 100/70 mm of mercury, patient was given 250 micrograms of Prazosine through Ryle's tube and 1 ampule of furosemide stat. Patient was shifted to intensive care unit where further treatment was given as a case of severe heart failure. Eventually patient improved and after 3 days he was extubated and

shifted to general medical ward. On day 5 of admission, follow up detailed echo was performed and ejection fraction was found to be 69%. Further recovery was uneventful and patient was discharged.

### Case 2

A 16 year old male Hindu farmer from Rajkot presented to casualty with complain of breathlessness and he also gave history that he was bitten by approximately 6 cm long brightly red brown coloured scorpion 12 hours back(?Indian Red Scorpion).Patient's BP was 156/96 mm Hg and pulse rate was 120/min.Patient was tachypneic with respiratory rate 24/min.On auscultation patient had crepitation in bilateral lower lung fields(triangle of auscultation) and severe spasms in bilateral upper and mid zones of auscultation.Routine investigations were normal except for the elevation of cardiac trop I and pulmonary edema on chest X-ray film.Patient was given injectable deriphyline and furosemide stat and sodium nitropruside 5microgram per kg per minute of body weight till next 36 hours. Patient was also given 500 microgram of Prazosine orally. Patient was shifted to intensive care unit where he improved dramatically and discharged to home.

### Case 3

A 13 year old hindu female from well to do family of Jamanagar came to casualty with complaint of severe breathlessness , nausea, vomiting and profuse sweating. She also informed that very early in the morning while she was still in the bed in her farmhouse an orange coloured scorpion fell down from the ceiling of the room and bitten her on her left forearm. however she did not have any complain pertaining to that except for mild redness and itching at the site of sting.On examination BP was 96/68 mm of mercury and pulse rate was 100 per minute and she had crepitations and spasms all over the chest. All routine blood investigations were normal but patient had elevated cardiac troponin I and Chest X-ray film showed marked diffuse haziness of pulmonary edema. Patient was given Bi-PAP support,inj lasix and inj aminophyline and prazosine tablet 500 micrograms orally along with nursing care in intensive care unit of the hospital.On admission 2D echo showed ejection fraction 28% which was 65%in follow up 2D echo after 3 days. Patient was discharged on 4<sup>th</sup> day.



Fig. A. Scorpion bite mark in a 13 year old female who presented to the Emergency Department of Vadilal Sarabhai General Hospital with breathlessness, nausea , vomiting and profuse sweating.

### Case 4

A 15 year old male hindu patient from Veraval presented to VSGH in intubated state.Patient's relative informed that patient was admitted to private hospital for the management of severe breathlessness followed by a scorpion sting.Patient's BP was 70 systolic.So,immediately ionotrops started and when BP crossed 100/60 mm of mercury ,we started Lasix and Prazosine .Patient improved dramatically over next 24 hours. Further recovery was uneventful and patient was sent back home.Patient's 2D echo report in private hospital was showing left ventricular ejection fraction 23% which was 67% on follow up 2Decho after clinical improvement.

### Case5

An 18 year old male patient presented to VSGH with complain of severe breathlessness and pink coloured frothy sputum and cough.On examination patient was tachypneic with respiratory rate being 34/

min. Severe crepitations were present all over the chest field. BP was 80/60 mmHg. Patient was put on inotropic support and immediate intubation done. Case is referred to cardiologist and portable 2D Echo performed, which showed ejection fraction only 22%. As blood pressure did not improve initially on inotropic support, in the fear of aggravating hypotension prazosine could not be given. Patient remained intubated for about a week then after extubation done and he was put on Bi-PAP support for 4 more days after which he was shifted to ward and discharged after 15 days with ejection fraction 50%. Relatives give history that around 2 inch long bright red coloured scorpion has bitten him on right upper extremity which on examination showed only a minor sting mark but no other local signs.

### DISCUSSION

Scorpions are arachnids (a subgroup of the eight legged arthropods) and have a hollow sting in the last joint of their tail, which communicates by means of a duct with the poisonous glands, which secretes poison on stinging. The venom is clear and colourless mixture of various proteins. These proteins act mainly on sodium, potassium and calcium channels. (15 such proteins are recognized in *Centruoides* spp and 22 in *Mesobuthus* spp)<sup>[3]</sup>.

So, in short it causes cardiotoxicity by changing permeability of sodium and calcium in heart, neurotoxicity by inhibiting effective transmission of sodium and potassium across nerve cell membrane. Sodium also affects homeostasis by kidney and calcium affects the muscle and is an important secondary messenger. Some species (*Heterometrus scaber*) contains phospholipase. Thus they possess haemolytic activity. The other contents are acid phosphatase, ribonuclease, acetylcholinesterase and other proteolytic enzymes. However, there is a peculiar absence of DNase activity in venom studies so far<sup>[3]</sup>.

Toxicity of scorpion venom is more than snake venom but normally much smaller quantity is injected. Considering the composition it shares many similarities with snake envenomation and haemolytic toxin containing species causes local reaction as seen with viper bite and neurotoxin containing species causes effects like cobra bite.

The lethality of scorpion venom depends on the factors such as species of the scorpion, site of the sting, dose of the venom injected, season during which bite

has occurred.<sup>[1],[2]</sup>

The most common species in India is *Mesobuthus tumulus* and its toxins such as iberiotoxin and tamsulotoxin are selective inhibitors of potassium channels and that's why causes intense and persistent depolarization of autonomic nerves which is characterised by transient parasympathetic activity (vomiting, profuse sweating, ropy salivation, bradycardia, priapism and hypotension) and prolonged sympathetic (cold extremities, hypertension, tachycardia, pulmonary edema and shock)<sup>[3]</sup>.

### CONCLUSION

Apart from the cases mentioned here we have seen many patients of scorpion sting where patients have only local discomfort and when probed in detail most of them told that the scorpion was black coloured. These type of patients were managed by local anaesthetic injection and other supportive treatment either on OPD basis or in the general medical ward and we have also observed few cases of severe neurotoxicity and haemolytic toxicity (necrotising fasciitis) which are out of the scope of this article.

Anti venoms available commercially in many countries including India. They claim to reverse the cranial nerve dysfunction and myopathy but pain, paresthesia and cardiac side effects are not reversed by them<sup>[2]</sup>. Recently it is proved that they are no better than a placebo<sup>[4]</sup> and even author's personal experience suggests that it should better not to be used as use is associated with anaphylaxis and it can not prevent life threatening autonomic storm nor heart failure caused by venom. It will just add an economical burden to the patient.

Prazosine is proved to be the wonder drug for the treatment as its pharmacological properties (selective alpha-one blocker) can reverse the haemodynamic, hormonal and metabolic toxic effects of scorpion venom. Unlike western literature where nifedipine, hydralazine, nitroprusside and prazosine are considered as treatment options<sup>[3]</sup> Indian textbooks clearly indicates prazosine as a drug of choice over other options<sup>[4]</sup> (at least for Indian Red Scorpion). However, it needs further confirmation by large scale study. In our opinion prazosine should be given to all the patients (even if they are hypotensive) to improve the morbidity in terms of ICU stay as well as total duration of admission. It is very clear from the

cases discussed here that in case no 5 where prazosine was not given ,the ICU stay was longer and the ultimate ejection fraction on follow up was some what on lower side as compared to other cases.

Before concluding it is important to consider several limitations of the study. The results derived from this study may not be representative of the larger picture (As number of case are few) but will definitely serve an important benchmark for further studies in this neglected yet very important area of emergency medicine. In our set up because of financial background of our patients we could not perform brain natriuretic peptide to confirm cardiac lesion, which is very useful tool apart from 2D echo to assess and guide the therapy. Other author's have explored this subject in great depth<sup>[5]</sup>. We recommend that a large scale sponsored studies are needed to derive conclusion.

Despite of limitations we conclude that most of the scorpion bites which are complicated by heart failure are caused by Indian Red scorpion and with aggressive and early management lives can be saved and echocardiography can be used to guide therapy<sup>[5][6]</sup>. Our findings and observations are quite consistent with other scientific data published in India, in particular with Dr. Suresh V Sagarad's work.

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**Ethical Clearance:** As this was an observational study, ethical clearance was not taken because it was not required. No interventional procedure was done in any of the patient. Identity of patients was not revealed during conduct of study or anytime after the study.

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# Hemolysis Caused by Accidental Exposure to Dichlorvos: a Rare Manifestation

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## ABSTRACT

Dichlorvos, an organophosphate, is an insecticide used on crops, animals, and in pest-strips. Acute (short-term) and chronic (long-term) exposures of humans to dichlorvos results in the inhibition of an enzyme, acetylcholinesterase, with neurotoxic effects including perspiration, vomiting, diarrhea, drowsiness, fatigue, headache, and at high concentrations, convulsions, and coma. Dichlorvos should therefore be added to the list of toxins known to cause acute hemolysis. We present a rare case of a 45 year old male patient of Dichlorvos poisoning presenting as acute hemolysis.

**Keywords:** *Dichlorvos, Hemolysis, Organophosphate*

## INTRODUCTION

Dichlorvos is used as an agricultural insecticide on crops, stored products, and animals. It is also used as an insecticide for slow release on pest-strips for pest control in homes. Dichlorvos is used as an anthelmintic (worming agent) for dogs, swine, and horses, as a boticide (agent that kills fly larvae) for horses, and in flea collars for dogs.<sup>1,2</sup> In 1995, the US Environmental Protection Agency (EPA) proposed cancellation of dichlorvos for all home uses, and for many commercial and industrial uses.<sup>2</sup> The EPA requires cautionary warning labels on products containing dichlorvos.<sup>2</sup> Individuals involved in the manufacture, formulation, and application of dichlorvos in agricultural, household, and public health uses are most likely to be exposed to this insecticide.<sup>3,2</sup> Individuals may be exposed to dichlorvos from indoor air in buildings where it is used in pest strips or sprays for insect control.<sup>4,2</sup> Small amounts of residues of dichlorvos have been detected in food.<sup>5,2</sup> Tests are available that measure the activity of two enzymes, serum cholinesterase and erythrocyte acetylcholinesterase, that are affected by dichlorvos.<sup>3</sup>

## Case Report

A 45 year male accidentally consumed dichlorvos instead of his cough syrup. Later on, he developed severe nausea, vomiting, high fever with chills. On

admission to hospital the patient's laboratory work-up disclosed a picture of acute hemolysis, jaundice, renal function impairment. However, there were no clinical features of organophosphate poisoning except gastrointestinal symptoms, and blood cholinesterase activities were also normal. He eventually had a full recovery.

## MATERIALS & METHOD

The patient was thoroughly investigated, viz a viz

Complete Blood Count: Hemoglobin 7 g/dl, Total Leukocyte Count 11240/cmm, Differential leukocyte count : Neutrophils 82 %, Lymphocytes 10 %, Monocytes 4 %, Eosinophils 4%. Platelets 160,000/cmm. Corrected Reticulocyte count 4.5 %.

Peripheral Blood Smear Findings : Red cells show anisopoikilocytosis in the form of few schistocytes, nucleated red cells, microcytes, few polychromatophilic cells. Platelets are adequate on smear and there is neutrophilic leukocytosis. [ Figure 1 ]

Blood urea 51 mg/dl. Creatinine 2 mg/dl.

Total bilirubin 4.2 mg/dl, Unconjugated 3.2mg/dl, Conjugated 1 mg/dl

Serum LDH ( lactic dehydrogenase ) : 345 U/L

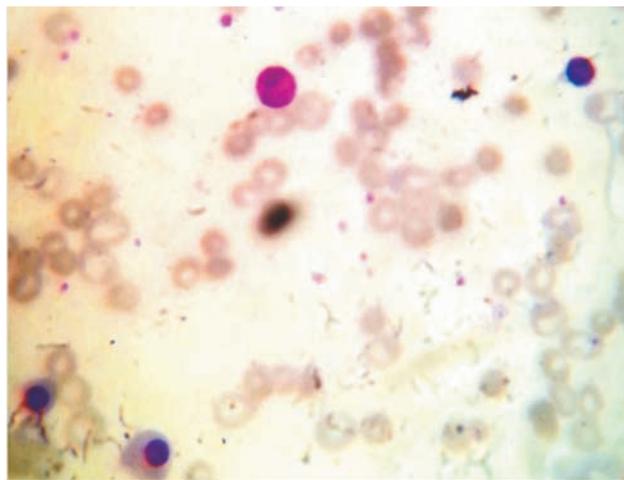


Fig. 1. Peripheral Blood smear showing evidence of hemolysis.

### Findings

The complete investigative work up revealed a definitive evidence of hemolysis.

### DISCUSSION

Organophosphate pesticides are widely used in Kashmir, and the incidence of organophosphate poisoning is high. Organophosphate decreases activity of the cholinesterase enzyme which is necessary for normal nervous system function. Organophosphate poisoning is characterized by typical manifestations of cholinergic excess. Signs and symptoms of acute exposure can be divided into three broad categories. Muscarinic effects include bradycardia, bronchospasm, salivation, lacrimation, diaphoresis, vomiting, diarrhea, urination, and miosis. Nicotinic effects include tachycardia, hypertension, mydriasis, muscle fasciculations, muscle cramps, weakness, and diaphragmatic failure. Central effects include central nervous system depression, headache, giddiness, agitation, confusion, delirium, coma, and seizures. Trichlorfon is primarily an indirect inhibitor of acetylcholinesterase; it is converted in the body to the active chemical inhibitor Dichlorvos. Trichlorfon has been associated with induction of delayed polyneuropathy after large exposures, causing severe cholinergic toxicity.<sup>6</sup> Like other organophosphates, the clinical presentations of acute Dichlorvos poisoning are typical cholinergic syndrome; however, the severity of poisoning is mild compared with that of other organophosphates.

### CONCLUSION

Our patient did not have the presentation of anticholinesterase poisoning except gastrointestinal symptoms, but he did have acute hemolysis. It is important for physicians to be aware of these unusual presentations of trichlorfon poisoning. Therefore differential diagnosis of intravascular hemolysis should include trichlorfon poisoning.

**Conflict of Interest Statement:** The authors declare no conflict of interest.

**Acknowledgement:** Nil

**Ethical Clearance:** Cleared by the Sheri Kashmir Institute of Medical Science.

**Source of Finding:** Self

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# Determination of Age from the Length of Clavicle using Digital X-Ray in Adolescent Subjects: a Preliminary Study in Indian Bengali

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## ABSTRACT

The ossification of the medial end of clavicle has been extensively studied for estimation of age. Variations in skeletal morphometry and maturation have been attributed to racial/ethnic differences. This study was designed to investigate the correlation of clavicular length with age in adolescent age group and to derive a mathematical model to determine age from length of clavicle in Indian Bengali population. The following regression equation was obtained

**Age in adolescents = 1.65\* left clavicle length -4.11**

Sex -specific regression equations were also obtained from the present investigation

It is concluded that age of an adolescent subject can be estimated from length of clavicle (left in this study) measured by digital x-ray using this population specific regression equation with reasonable accuracy and objectivity

*Keywords: Digital X Ray, Age, Adolescent, Clavicle, Length, Bengali*

## INTRODUCTION

The ossification of the medial end of clavicle has been extensively studied for estimation of age<sup>1,2,3,4,5</sup>. The medial clavicular epiphysis has been accepted as a reliable parameter in determining the age of young adults.<sup>6</sup>

Earlier works have shown that the growth of the clavicle follows a definite pattern and chronology. Anthropometric studies of the clavicles using radiographs have been reported earlier. Basing their work on measurement of the length of the clavicle on chest radiographs in children, researchers<sup>7</sup> found that

females achieved 80% of their clavicular length by the age of 9 years while that of the boys was at 12 years. That observation helped explain the longer lengths in adult males.

Variations in skeletal morphometry and maturation have been attributed to racial/ethnic differences. Studies<sup>8</sup> on Nigerian sample showed the mean value for the length of the clavicle in males was  $15.28 \pm 1.3$  cm while that of the females was  $14.50 \pm 0.5$  cm.

Previous studies on North Indians<sup>9</sup> have shown that Length of the adult left clavicle is more than that of the right side. It was noted that the left clavicle which was  $74.89 \pm 7.91$  mm in males and  $76.71 \pm 9.32$  mm in females in the 1- 5 years age group increased to  $135.67 \pm 7.00$  mm in males and  $132.20 \pm 5.84$  mm in females in the age group of 16-17 years. This difference was not present in fetuses, newborns and children. In this age group the bone of any side may be longer than that of the other. The researchers postulated that with the use of right hand, the curve of the right clavicle in adults became greater than that of left side that lead to

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a shorter right bone as compared to the left. The study established that sexual difference in length; angle and curves of the clavicle were statistically significant.

The use of digital x ray with its added advantages has contributed to extensive morphometric studies in osteology. Apart from clinical importance<sup>10</sup>, those studies have consistently added to the corpus of literature in forensic and anthropological investigation.

Length of clavicle has never been studied earlier to estimate age. There is no reported study from India on this aspect. Therefore, in the present investigation, we attempted to study the correlation of clavicular length with age in adolescent age group and to derive a mathematical model to determine age from length of clavicle in Indian Bengali population. This was aimed to supplement methods to estimate age in the living especially in the context of juvenile justice delivery system.

## MATERIALS AND METHOD

Fifty healthy subjects between the age of 10 and 20 years were included in the present investigation. The following sampling method was used. Digital x ray measurement of Fifty consecutive subjects in the age group 10-20 years who attended the department of Radiology of IPGMER, Kolkata, WB for chest x ray without any obvious deformity /injury of clavicle or shoulder girdle were taken. The subjects had come for chest radiograph for some ailment through the outpatient department.

Informed consent was obtained to use their data (demographic information and digital measurement) for the research. As the subjects had come for their routine investigation, no additional exposure was involved or required for the present study.

A cross-sectional descriptive study was conducted. The age of the subjects were recorded and digital measurements of clavicle were performed from chest Post-anterior view using Digital x-ray (AGFA Computerized Radiography machine) and software.

**Parameters studied: Length of clavicle by digital x ray.**

**Length of clavicle:** maximum distance between the most extreme ends of the clavicle that is the distance between the lateral-most point of the clavicle in the acromioclavicular joint and the medial most point of the clavicle in the sternoclavicular joint.[figure 1]

**Analysis:** Data was analyzed using SPSS 17.0 for windows. Correlation and regression equation was developed from the data using length of clavicle as the predictor variable. P- value of less than .05 was considered significant.

## OBSERVATIONS /RESULTS

In the present series of fifty subjects in the age group of 10-20 years, the descriptive statistics of the variable is seen in table 1.

The left clavicular length (LCL) was more than that of the right side. This difference was however, not statistically significant (paired t-test with  $t = 1.816$   $df = 49$   $p = 0.076$ )

Bivariate correlation between age and length of left clavicle (pooled sample of both sexes) was examined. It was seen that the Pearson correlation coefficient was 0.724 ( $df = 2$  tailed significant at .001).

Linear Regression analysis was carried out using age as the dependent variable and length of clavicle as the independent ( predictor) variable. Similarly sex specific linear regression was examined on the present series. The summary of the model is depicted in Table number 2.

**Table 1: Descriptive Statistics**

Variable	Number	Minimum	Maximum	Mean	Std. Deviation
Age in years [pooled sample ]	50	10.00	20.00	15.5400	3.56977
Left clavicle length in cm [pooled sample]	50	8.61	15.29	11.9104	1.56637
Age in years [ female ]	27	10.00	20.00	15.8148	3.07642
Age in years [male]	23	10.00	20.00	15.2174	4.12263
Left clavicle length in cm [female]	27	9.17	13.75	12.0519	1.24711
Left clavicle length in cm [male ]	23	8.61	15.29	11.7443	1.89029

**Table 2: Showing model summary of regression analysis**

Table -2Sex	R	R Square	Std. Error of the Estimate
Female	.542	.294	2.64
Male	.828	.686	2.37
Pooled data	.724	.524	2.49

The regression equation for the present sample pooled data of both male and female adolescent subjects) was as follows:

$$\text{Age in adolescents} = 1.65 * \text{left clavicle length} - 4.11$$

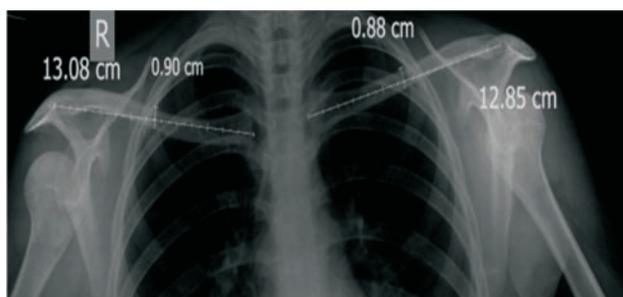


Fig. 1. showing the measurements used in the study

The following sex –specific regression equations were also obtained from the present investigation.

Figure 1 . Shows the scatter plot with the best-fit line while figure 2 depicts the analysis of residuals (normal P-P Plot of regression standardized residual).

- A. Age in male adolescents =  $1.81 * \text{left clavicle length} - 5.99$
- B. Age in female adolescents =  $1.34 * \text{left clavicle length} - 0.31$

The standard error of estimate for the male, female and pooled sample was 2.37, 2.64, and 2.49 respectively.

## DISCUSSION

The present study was designed as a pilot project to derive a model to estimate age of the individual from the length of the clavicle measured by digital x-ray in Indian Bengali adolescents. Sex specific regression equations were derived and it was found that in male subjects 68.6% of the variance in age could be explained by the independent variable (length of clavicle). This estimate was 29.4% and 52.4 % in females and pooled data respectively.

In the present series, the left clavicle length was greater than the right, a feature that is consistent with previous published works <sup>7, 9</sup>. In the present investigation however, the asymmetry in clavicle length was not statistically significant. For this reason, the length of left clavicle (LCL) was used to derive the regression model to estimate age.

Earlier published works from European has shown that clavicle morphology changes with age. This however, follows a different pattern in different age groups<sup>7</sup> Therefore while designing the present study only 10 to 20 years age group was included. Primarily this age group has legal significance in criminal as well as civil matters .The major relevant issue lies with the estimation of the age of 18 years in view of the amended Juvenile Justice Act 2000 and the Criminal Law (amendment) Act 2013 in India.

One important finding of the present investigation was that the left clavicle length (LCL) in males showed stronger correlation to age in male subjects( $R=0.828$ ) than in females ( $R=0.524$ ).This might be explained by the fact that the maximum length of clavicle is attained at different ages in the two sexes. This postulation is based on findings of earlier documented studies<sup>7,9</sup>.The sex specific regression was performed to examine this phenomenon. The result of the present study strongly established that the chance of error of estimate of age from LCL is much less in males than in females. Even when we used the poled data, the results were encouraging.

Our findings will have important bearing in deriving a model to estimate age in male Bengali subject in the adolescent age group. Males juvenile in conflict with law are often referred by the police to determine age from clinical and radiological tests (activity of ossification centers) No method is as such complete and precise. Therefore the present investigation (regression analysis using clavicle length from digital x ray) will help supplement the existing clinical and radiological methods .This objective method would be easy, affordable and reproducible for further validation studies.

The present original work however has certain shortcomings. Firstly, the sample size was only fifty. Secondly, only the age group of 10 to 20 was included in the study. Further broad based research with a larger sample (preferably multi-centric study) needs to be designed to validate the present population specific investigation. In addition, we suggest that similar

study should be designed to examine the regional variations and derive specific equations for Indian population.

The classical ossification tests are based on age-old database, often confusing, confounding and subjective findings having variable outcome. This present objective method may be applied to supplement the standard protocol for age determination in adolescents.

### CONCLUSIONS

It is concluded that age of an adolescent subject can be estimated from length of clavicle (left in this study) measured by digital x-ray using this population specific regression equation with reasonable accuracy and objectivity. This may be easily used as a clinico-radiological method to determine age in Indian Bengali subjects in view of the Juvenile Justice (Care and Protection of Children) Act, 2000 and Criminal Law (Amendment) Act 2013.

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**Ethical Clearance.** Work was conducted after applying for permission from Institutional ethical committee.

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# Carotid Tears in Suicidal Hanging - a Case Report

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## ABSTRACT

The incidence of suicide is highest in the Union Territory of Puducherry in the country as a whole. Suicide is the act of deliberately killing oneself. People may consider suicide when they are hopeless and can't see any other solution to their problems. Often it is related to serious depression, alcohol or substance abuse or a major stressful event. Hanging is a form of asphyxia, which is caused by suspension of the body by a ligature which encircles the neck, the constricting force being the weight of the body. The inner coats of the carotids are ruptured in violent cases of hanging such as long drop. Hereby, we are reporting such a case showing intimal tear of the carotid arteries.

*Keywords: Suicide, Hanging, Intimal Tear, Carotid Artery*

## INTRODUCTION

Suicide is one of the leading causes of death worldwide. Among the South East Asian countries, India holds the 2<sup>nd</sup> highest position in suicidal rates<sup>1</sup>. South India is considered as the world's suicide capital<sup>2</sup>. The choice of method depends on the accessibility and availability of the means. Suicides by hanging are now becoming a preferential mode particularly in urban population and overtake other suicidal modalities like poisoning, burning and drowning. Reasons may be attributed to the availability of ligature material, easy access to the suspension point in domestic set up. Deaths by hanging are considered as painless when compared to other modes. Many victims are of the middle age group and post marital deaths are more frequent.

Hanging is a mechanical form of asphyxia which is caused by suspension of body by a ligature which encircles the neck, the constricting force being the weight of body<sup>3</sup>. Death in hanging is caused by compression of the blood vessels of the neck such that an insufficient amount of oxygenated blood reaches the brain. Obstruction of the airway can also occur either through compression of the trachea or, when the noose is above the larynx, elevation and posterior displacement of the tongue and floor of the mouth.

A small horizontal tear in the lining of the common carotid artery with underlying haemorrhage is also common as a direct result of trauma by the noose. Some attribute these tears to traction associated with hanging. If traction were the cause, one would expect to find more such parallel tears, not necessarily limited to the level of the ligature. Horizontal intimal traction tears, scattered along the carotid arteries at different levels are sometimes found in hanging associated with a long drop and in feet first free falls from height<sup>4</sup>. Such a case of long drop suicidal hanging with parallel intimal tears of the carotids is reported and discussed.

## CASE REPORT

A 44 year old security of a reputed medical college was found hanged in the background premises of the college and was sent for post mortem examination. History revealed personal and financial problems. He was a known alcoholic, smoker and was on antidepressants for the past three months. He was working as a night duty security guard for the past one week and was apparently normal while taking over his duty on the day of incident. Next day morning his co-worker found him hanging from a tree in the premises. He intimated to the police and the body was sent for autopsy.

On autopsy, a white colored rope (ligature material) was found tied around his neck by means of a slip knot at the region of occiput. After removing the ligature, a prominent oblique ligature mark was seen around the entire circumference of the neck except over the posterior aspect. Skin beneath the ligature mark was pale and depressed. Evidence of dribbled salivary stain was seen from the angle of his mouth on the left side. Post-mortem staining was found over the limb extremities. Seminal voiding was noticed from the tip of glans penis and the inner aspect of the left thigh.

On dissection the under surface of the ligature mark showed pale, firm, whitish, glistening, parchment-like subcutaneous tissue. After removing the soft tissues and muscles, the carotids were exposed and opened up to the level of the mandible. Two parallel transverse tears were noticed within the intima of the carotid arteries along with extravasation of blood. The hyoid bone and thyroid cartilage were intact. All other visceral organs were found congested. The viscera were sent for chemical analysis and were reported as negative.

### DISCUSSION

Poisoning and hanging are the two major means of suicide among Indians. Among these two, the incidence of suicidal hanging is on the rise in recent years. Puducherry (n=408, 75.4%) share higher percentage of suicides by hanging than its national average (37%) in 2012<sup>5</sup>. Also there is an increased male preponderance.

Amussat's sign is typically a transverse laceration of the intimal layer of carotid arteries described in cases of hanging<sup>6</sup>. Carotid intimal tears have been associated with obese victims, long drops and posteriorly placed knots. Intimal tears of one or more carotid arteries were more common with complete suspension (12%) than incomplete suspension (2%). Longitudinal traction was considered the mechanism, but complete suspension was not a prerequisite<sup>7</sup>. A frictional intimal tear of the carotid arteries surrounded by subintimal dissection and haemorrhage is important supplementary evidence that the victim was alive at the time of hanging. Haemorrhage does not occur in a dead body and subintimal dissection is unlikely in the absence of blood pressure<sup>4</sup>. This shows the importance of examination of the carotids in cases of hanging. Subtotal laceration of the carotid artery is not strictly specific for hanging and can also be caused by blunt neck trauma, extreme overstretching, or whiplash-injuries. The occurrence of Amussat's sign is independent of gender, weight, completeness of the

victim's body suspension, and position of the ligature knot on the neck<sup>6</sup>.

Th.Meera et al showed transverse tear of the carotid artery in 22 cases (26.81%)<sup>8</sup>. Samanta A K et al, reported features of disruption of the tunica intima layer from the tunica media with infiltration of neutrophils, RBCs and hemosiderin laden macrophages, though there were no transverse tears of the carotid arteries<sup>9</sup>. In the case reported here, two parallel tears in the intima of the carotid arteries were noted throughout its circumference except on the posterior aspect of the lumen and was associated with extravasation of blood.

### CONCLUSION

Medico-legal examination of death is conducted so as to ascertain the cause of death. Death due to hanging may be suicidal, homicidal or accidental. The circumstances of hanging, ligature mark and the type of knot are the basic evidences collected at the scene of crime. Internal examination of the body plays a vital role in distinguishing between Post-Mortem and Ante-Mortem hanging. Post Mortem hanging is usually performed to fabricate the cause of death as due to suicide. But there are certain cardinal signs which highlight the hanging to be of ante-mortem in nature. The dribbling of saliva is usually considered as the definite sign of ante-mortem hanging. A redline of intimal rupture of the carotid artery can also be considered as a definitive sign to corroborate the evidence in favor of antemortem hanging as subintimal dissection cannot occur in postmortem.



Fig. 1. Dissection of carotid artery showing intimal tear suggestive of antemortem hanging

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# Study of Un-Natural Deaths of the Patients brought to People's Hospital, Bhopal (a Retrospective Study)

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## ABSTRACT

Unnatural deaths claim a substantial number of lives in developing countries like India. Among the various types of unnatural deaths, RTA account for majority of deaths followed by burn, poisoning, fall from height, animal bite and hanging[1]. Increasing population, urbanization, increased financial burden, educational and social stress, all may contribute to a big proportion of unnatural deaths in our country. Bhopal, the capital of Madhya Pradesh having a population of 2368145 (Bhopal district), out of 1914339 in urban and 453806 in rural areas. The male female ratio is 910 females per 1000 males. The crude death rate is 5.8/1000, out of which 5.4 of urban and 7.6 of rural [2]. In the present study which was conducted from 1st January 2011 to 31st December 2012, the total number of deaths were 794, out of them 152 (19.14%) deaths were unnatural. The females 83 (54.60%) outnumbered the males 69 (45.39%). The commonest cause of unnatural death was burn 71 cases (46.71%), out of them 63 (88.73%) were females and 8 (11.26%) were males (all are accidental). Out of total 63 female burn deaths 44 (69.84%) were homicidal, the commonest age group affected in female burn is 16-30 years (61.97%). The second commonest cause of unnatural death was RTA in 50 (32.89%) cases, out of them males were 41 (82%) and females were 9 (18%). 20 (40%) cases were in the age group of 16-30 years, out of total 50 RTA deaths. Other causes of unnatural death were poisoning 17 (11.18%), fall from height 12 (7.89%), hanging 1 (0.65%) and assault 1 (0.65%).

**Keywords:** Unnatural death, Suicide, Homicide, Accident, Rural, Urban, RTA, Burn

## INTRODUCTION

The unnatural death, is defined under section 174 of the Code of Criminal Procedure, 1973, as that a person has committed suicide, or he has been killed by another, or he has been killed by an animal or by a machinery or an accident, or the person has died under circumstances raising a suspicion that some other person has committed an offence.

The commonest causes of unnatural deaths are road traffic accident and burn, probably due to increased number of vehicles, mainly high speed bikes in former and the use of highly inflammable cooking fuels at homes in later situation.

To know the incidence of different mode, manner and cause of unnatural deaths with their age and sex

wise distribution, socio-demographic profile, and the survival period of the victims of unnatural deaths, a hospital record based retrospective study was conducted which included total 794 deaths of patients brought in people's hospital, Bhopal during a period of 2 years from 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2012.

## MATERIAL AND METHODS

This is a hospital record based retrospective study carried out in Department of Forensic Medicine & Toxicology, Peoples College of Medical Sciences and Research Centre, Bhopal. The study included total 794 deaths which occurred in the teaching hospital of the medical college i.e. Peoples Hospital during the period of two years i.e. from 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2012. Out of total 794 deaths, all 152 unnatural deaths

were included for the study and rest natural deaths were excluded from the study. The data for study was collected in well designed Proforma which included variables like mode manner and cause of unnatural deaths, age and sex, socio-demographic profile, and the survival period of the victims of unnatural deaths. This data thus collected was further analysed using SPSS software version – 20 and appropriate stastical test were applied. The results obtained were tabulised and depicted in statistical pictorial diagrams.

41 (82%) and females were 9 (18%), 19 (38%) cases were in the age group of 16-30 years, out of total 50 RTA deaths.

Other causes of unnatural death were poisoning 17 (11.18%), Fall from height 12 (7.89%), Hanging 1 (0.65%) and Assault 1 (0.65%).

**RESULTS AND OBSERVATIONS**

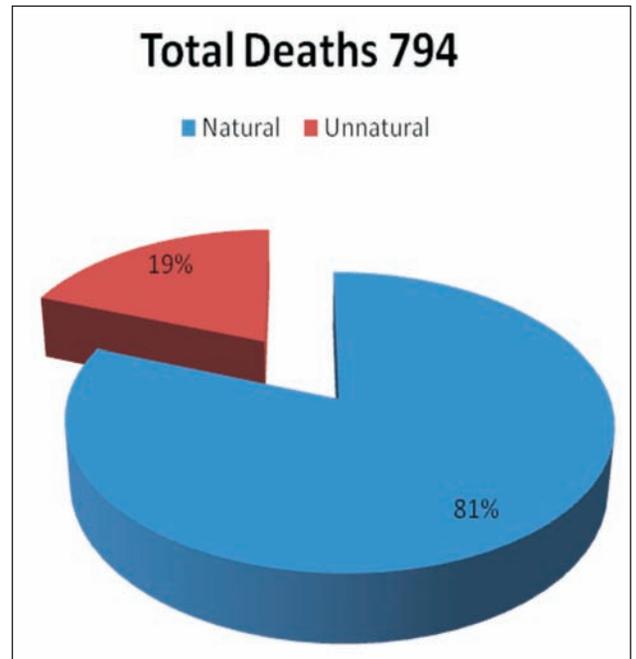
In the study period from 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2012, the total number of deaths were 794, out of them 152 (19.14%) deaths were unnatural.

The females- 83 (54.60%) outnumbered the males- 69 (45.39%) unlike the study by Islam M.N. Et al<sup>[3]</sup>, and a study by Santosh C.S., Vishwanathan K.G., Satish Babu B.S.<sup>[1]</sup> where males were the commonest victims (73% and 80.83% respectively) of unnatural death.

The commonest cause of unnatural death in our study was Burn, 71 cases (46.71%) out of which 63 (88.73%) were females and 8 (11.26%) were males (all are accidental). Out of total 63 female burn deaths 44 (69.84%) were homicidal, the commonest age group affected in female burns is 16-30 years- 47 (74.60%).

The second commonest cause of unnatural death was RTA in 50 (32.89%) cases, out of them males were

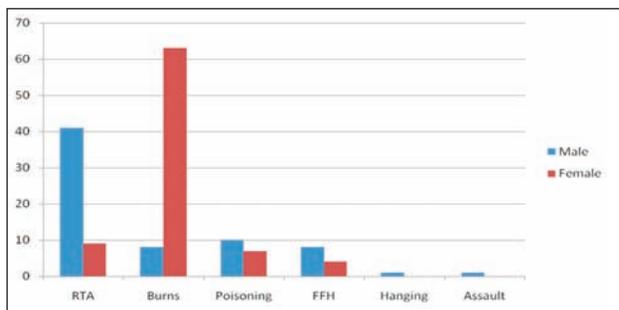
**Chart 1. Showing Proportion of Natural and Unnatural Deaths out of Total 794 Deaths**



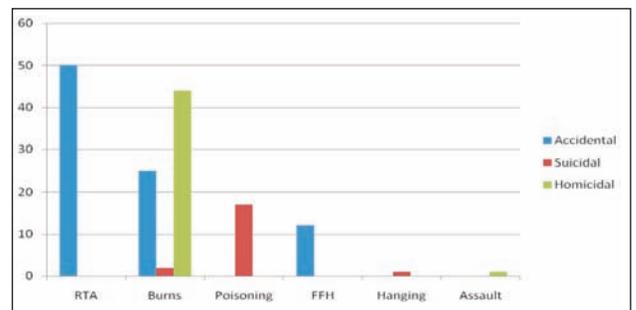
**Table No. 1: Cause of Unnatural Death Among Different Age Group**

Cause of Death	0-15 Yrs		16-30 Yrs		31-45 Yrs		46-60 Yrs		>60 Yrs		Total	
	M	F	M	F	M	F	M	F	M	F	M	F
RTA	3	1	17	2	12	5	5	1	4	0	41	9
Burn	0	4	4	47	2	11	1	1	1	0	8	63
Poison	1	0	6	6	2	1	1	0	0	0	10	7
Fall	2	1	4	1	2	1	0	0	0	1	8	4
Hanging	0	0	1	0	0	0	0	0	0	0	1	0
Assault	0	0	0	0	0	0	1	0	0	0	1	0

**Chart 2. Showing Sex Wise Distribution of Unnatural Deaths**



**Chart 3. Showing Pattern of Unnatural Deaths**



**Table No. 2: Survival Period of Victims of Unnatural Death (MSP- Mean Survival Period)**

Survival Period	RTA	Burn	Poisoning	Hanging	Fall	Assault
<24 Hours	16	6	9	0	6	0
1-3 Days	7	4	2	1	3	0
3-7 Days	12	22	3	0	1	0
>7 Days	15	39	3	0	2	1
MSP	7 days	13 days	3 days	1day	3 days	14 days

## DISCUSSION

In the present study, it was found that the total number of deaths were 794, out of which the total unnatural deaths was 152 (19.14%), as shown in chart No. 1. In the present study, table No. 1 and chart No. 2, the commonest cause of unnatural deaths was found to be burns- 71 (46.71%) , especially in females- 63 (88.73%) in the age group of 16 – 30 years- 47 (74.60%) cases out of total female deaths due to burn. Most of these deaths were homicidal in nature- 44 (69.84%), chart No. 3, reflecting the existence of dowry deaths , the most unfortunate, heinous crime still existent in a civilised developing country inspite of several legal and other efforts almost 60 yrs since independence.

It was also found that RTA is second commonest cause of unnatural deaths- 50 (32.89%), maximum with males- 41 (82%) due to obvious reasons with maximum in younger age group that is 16 – 30 years- 17 (41.46%), may be due to increasing population of people of this age group in Bhopal city as they migrate from villages to city for better education and job, as Bhopal is a developing city having lot of schools and colleges for higher study, and better job opportunities. Further failure of RTO to implement genuine necessary road traffic rules like use of helmets or proper road traffic management signalling systems contribute to this fact. But naturally maximum of road traffic accidents were accidental in nature as revealed through chart No. 3 (50).

The study also revealed that the mean survival period of the victims of unnatural deaths was on an average 13 days in case of burns followed by in Road traffic accidents 7 days, as depicted in table No. 5. Survival period in unnatural deaths depend upon many intrinsic as well as extrinsic factors and the findings were in tune with many other scientific studies<sup>[4]</sup>.

The other causes of unnatural death were negligible, especially for outdoor homicidal deaths as

Bhopal is a very pleasant and peaceful city, the green environment and lakes of Bhopal city attract the people to settle here for job and study.

## CONCLUSION

Since mankind like natural causes of death unnatural deaths also contribute equally for deaths. In the old era may be wars, mass disasters played the most important role but with civilization , modernisation advancement of technology, urbanisation now other key players have emerged like road traffic accidents, industrial accident, terrorism etc.

What needs to understand and improve is the inbuilt conscience of individuals, society which needs to adapt itself in the fast changing environment, its ability to withstand pressures of globalisation, mental flexibility to change accordingly and overall physical and mental awareness about changing scenario and due precautions to be taken accordingly.

**Acknowledgement:** The author expresses sincere thanks to all the staff members of the department of Forensic Medicine & Toxicology, PCMS & RC, Bhopal for their sincere help.

**Conflict of Interest:** There is no conflict of interest.

**Source of Support:** No financial support has been taken from any source.

**Ethical Clearance:** Ethical clearance has been obtained from Institutional Ethical Committee.

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# Study of the Patterns of Homicide in Medico-Legal Autopsies

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## ABSTRACT

Homicide is one of the oldest crimes known to mankind. Aggression, rage and violence are accompaniments of human behavior. Homicide is the outcome of aggressive instinct in human behavior. It has always fascinated mankind for various reasons but understanding the means and motivation is necessary for prevention and protection. In the present study conducted at the Gauhati Medical College, Guwahati, Assam, out of 1928 autopsies performed, 120 cases of homicidal deaths were studied during 1 year period from 1st August 2005 to 31st July 2006. In this study, 70.83% (85) of total victims were males. Most (45%) were in the age group of 21-30 years. Most common cause of death was hemorrhage and shock 44.16% followed by coma 35.83%. Blunt weapons were more commonly used 37.5%. The relationship between victim and offender was known in 51.6% cases.

**Keywords:** *Homicide, Autopsy, Blunt Force, Hemorrhage and Shock*

## INTRODUCTION

Homicide is defined as killing of a human being by another human being<sup>(8,13,14)</sup>. The word homicide is derived from latin word Homo and Cide, Homo means 'Man' and Cide means 'I Cut'<sup>(4)</sup>. It may be lawful, as killing in self defence in certain circumstances or causing death by sheer misadventure or by unlawful means<sup>(12,13)</sup>. Mankind has witnessed aggressive instincts from time immemorial. However patterns of homicide have changed overtime. In the ancient civilizations thousands of innocent people, war captives and other victims were murdered without sob or sigh. During those days sacrifice in the name of religious ceremonies were common. More recently terrorists carry out their operations in a more organized manner. Crimes are often political, more sophisticated and lethal and availability of weapons has lately revolutionized the concept of homicide. Therefore mass homicide is a common phenomenon in the current context. Defence insanity is often raised in charges of murder in order to escape capital punishment<sup>(11)</sup>. Kautilya had rightly pointed out that all kinds of sudden death centre around one or other

of the following causes- "offence to women, or Kinsmen, claiming inheritance, professional competition, hatred against rivals, and anyone of legal dispute is the cause of anger and anger is cause of death"<sup>(9)</sup>.

## MATERIALS AND METHOD

Material for the present study consists of 131 cases of homicide drawn from the medico-legal autopsies performed in the department of forensic medicine, Gauhati medical College, Guwahati, Assam during the period from 1<sup>st</sup> August 2005 to 31<sup>st</sup> July 2006. During this period a total of 1928 medico-legal autopsies were carried out in the department of which 120 cases (6.2%) were selected after considering inclusion criteria. In the present study, highly decomposed and the cases inconclusive of homicide opinion were excluded. Information was gathered from police documents, accompanying individuals, relatives and eye witnesses etc. The various epidemiological data, i.e. age, sex, marital status, place of occurrence, time of incidence, motive, and weapon used, type of injury, cause of death and defense wounds were considered. Data

collected was analyzed statistically and expressed as proportion and percentage.

**OBSERVATION AND RESULT**

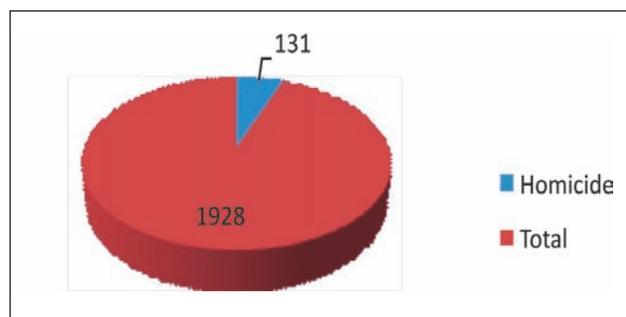


Fig. 1. Total Number of Homicide cases

A total of 1928 Medico-legal autopsies were performed in the department of Forensic Medicine, Gauhati Medical College & Hospital, Guwahati during the period from 1<sup>st</sup> August 2005 to 31<sup>st</sup> July 2006. Out of these, 131 cases were death due to homicide, constituting 6.2%% of total autopsies performed (Figure1).

**Table 1. Sex wise Distributions**

Sex	Number	Percentage
Male	85	70.83
Female	35	29.16
Total	120	99.99

It is observed that the male victims outnumbered the female victims, the number being 85 (70.83%) in the male and that in the female 35 (29.16%). The male and female ratio being 2.4:1 (Table-1).

**Table 2. Age and Sex Wise Distribution**

Age In Year	Male	Female	Total
0-10	2	3	5
11-20	8	2	10
21-30	40	14	54
31-40	18	8	26
41-50	13	5	18
51-60	2	1	3
61-70	2	2	4
Total	85	35	120

The number of victims of homicide was maximum in the age group of 21 – 30 years (54 cases) followed by 31 – 40 years (26 cases). Lowest number of cases was reported in the age group between 51- 60 years (Table-2).

**Table 3 Educational Status**

Educational status	Male	Female	Total
Illiterate	14	11	25
Primary	19	14	31
Secondary	26	06	32
Graduate	15	04	19
P.G	01	00	0
Unknown	10	00	0
Total	85	35	120

From Table-3, it is observed that maximum number of victims was educated up to Higher Secondary School 32 cases. The next group was educated up to primary level 31 cases.

**Table 4. Motive of Homicide**

Motive	Number Of Cases	Percent
Family quarrel	10	8.33
Land dispute	09	7.5
Personal Rivalry/Revenge	11	9.16
Robbery and Gain	13	10.83
Dowry death	03	2.5
Car theft	04	3.3
Love affairs	04	3.3
Extra Marital affair	08	6.66
Not Known	28	23.3
Others	30	25
Total	120	99.98

It is observed from the table 4 that the motive of homicide was known in the majority of cases. Robbery and gain was the motive in most cases (10.83%). Personal rivalry or revenge was the motive in another 11 cases.

**Table 5. Relationship of the Offender with Victim**

Relationship	No. Of Cases	Percent
Friend and acquaintances	24	20
Other Relatives	07	5.83
Family Relationship	09	7.5
Police, Military	10	8.3
Spouse	05	4.16
Others(Mob/Servant/Pr/Guard)	07	5.83
Not Known or Stranger	58	48.3
Total	120	99.99

It is seen from the table 5 that in 58 cases the offender was not known. In most cases victims were killed by their friends and acquaintances (24 cases) constituting 20% of total. The second most common group was of police and military 10 cases constituting 8.3%.

**Table 6. Types of Injury sustained by the victims in relation to the body parts involved**

Site of Injury	Type of Injury						
	Abrasion & Bruise	Laceration	Incised wound	Stab wound	Firearm	Ligature	Penetration
Head & Face	41	15	19	1	9	0	2
Neck	6	4	18	2	6	7	1
Thorax	22	3	3	10	10	0	5
Abdomen	12	1	2	8	5	0	10
Limbs	30	7	20	2	3	0	2

It is observed from the table 7 that maximum number of injuries were sustained in the region of head and face, of which abrasion and bruise was present in 41 cases, constituting 34.16%, laceration in 15 cases (12.5%), incised wound in 19 cases (15.83%), stab wound in 1 case (0.83%), and firearm in 9 cases (7.5%)

**Table 7. Types of Weapons used**

Weapon	No. of cases	Percent
Blunt	45	37.5
Piercing	25	20.83
Cutting	28	23.33
Firearm	16	13.33
Bomb blast	13	10.83
Ligature and manual strangulation	07	5.83
Burn	03	2.5
Total	120	100

It is observed from the table 8 that in the majority of the cases blunt weapons were used i.e. 45 cases constituting 37.5% of the total, followed by sharp cutting (23.33%) and pointed (20.83%) weapons. Firearm weapons were used in 16 cases (13.33%).

**Table 8. Defense Wounds**

Defence Wound	No. of Cases	Percent
Present	14	11.65
Absent	106	88.33
Total	120	99.99

It is observed from the table 9 that the defense wounds were present on the homicide victims in 14 (11.66%) cases while in majority of cases 106 (88.33%) there was no defense wound.

**Table 9. Cause of Death of Victims**

Cause of death	No. of cases	Percent
Instantaneous	13	10.83
Coma	43	35.83
Syncope	03	2.5
Asphyxia	08	6.66
Shock and haemorrhage	53	44.16
Total	120	99.98

The cause of death was shock and hemorrhage in 53 (44.16%) of cases. This was followed by coma in 43 (35.83%) of total cases. Instantaneous death occurred in 10.83% of cases.

## DISCUSSION

The various data of results and observation of the present study has been analyzed and compared with available studies of others in earlier times to bring out the similarities and variations in different aspects and discussed.

- Out of 1928 Medico-legal autopsies 120 cases were death due to homicide, constituting 6.2% of total autopsies performed. Ghosh (1981) at Kolkata<sup>(6)</sup> and Dikshit et al<sup>(5)</sup> in South Delhi in their studies found that 5.05% and 2.8% cases were homicidal in nature respectively. Our findings are almost similar to the above studies.
- Male victims outnumbered the female victims, our finding is similar to the finding of Scott in West Midlands<sup>(15)</sup> who found 54% of homicide victims were male. The preponderance of male victim may be attributed to the fact that they acquire more friends and acquaintances, get involved in political activities and adventure seeking in nature than female counterparts.
- Most of the victims were in the age group of 21 – 30 years (54 cases). The present findings are almost similar to the findings of Barbhuiyan SI<sup>(1)</sup> and Gupta et al<sup>(7)</sup> who found that highest number of homicide victims in the the age group (21-30) years in their study.
- It is observed that maximum number of victims was educated up to Higher Secondary School 32 cases. This study is in slight variance to observation of Barbhuiyan SI<sup>(1)</sup> who found maximum homicide victims had education till high school level<sup>(1)</sup>.

- The motive of homicide was known in the majority of cases. Robbery and gain was the motive in most cases (10.83%) followed by Personal rivalry or revenge. The present findings are in slight variance with the findings of the Barbhuiyan SI who found maximum number of cases occurred due to familial quarrel<sup>(1)</sup>. The present study is consistent with the observations made by Dikshit et al who found robbery and financial gain as motive for homicide in 37.1% of cases and which was the commonest<sup>(5)</sup>. The motives of homicide are observed to differ region wise depending upon the demographic, economic and political situation of different regions.
- In 58 cases the offender was not known. In most cases victims were killed by their friends and acquaintances (24 cases) constituting 20% of total. The present finding is consistent with the observations made by Barbhuiyan SI and West (1968) who found in 24% and (17.9%) cases respectively the offender was friends or acquaintances<sup>(1,16)</sup>.
- Head and face was the most common region involved. In the region of the head and face abrasion and bruise was present in 41 cases, constituting 34.16%, laceration in 15 cases (12.5%), incised wound in 19 cases (15.83%), stab wound in 1 case (0.83%), and firearm in 9 cases (7.5%). The above findings are in slight variance with that of Barbhuiyan SI who found scalp injuries in 52.8% cases, which was slightly lower than the present finding. Dikshit et al (1986) found that out of 140 cases, the head was involved in 64 cases (45.71%)<sup>(1,5)</sup>, the skull was fractured in 42.86%, laceration of brain in 41.42%, contusion of brain in 30% and intracranial hemorrhage in 39.29%. All the above findings are much higher than the present findings.
- In the majority of the cases blunt weapons were used i.e. 45 cases constituting 37.5% of the total. Gupta et al (2004) in their study found sharp weapon injuries were the most common type (34.9%) followed by blunt force injuries<sup>(6)</sup>. The finding is similar with the finding of Mohanty et al<sup>(10)</sup>. The finding is different from the finding of Chao et al<sup>(2)</sup>.
- Defense wounds were present on the homicide victims in 14 (11.66%) cases while in majority of cases 106 (88.33%) there was no defense wound.

Ghosh found defense wounds in 22.43%<sup>(7)</sup> which was almost double the finding of current study. Dikshit et al (1986) found defense wounds in 28.58%<sup>(5)</sup> which is again higher than the current study. Barbhuiyan SI found defense wounds in 13.6% which was almost similar to the present study<sup>(1)</sup>.

- The commonest cause of death was shock and hemorrhage in 53 (44.16%) of cases. This finding is similar to the findings of Barbhuiyan SI (1992), Ghosh (1981), and . Dikshit et al (1986)<sup>(1,5,7)</sup>.

## CONCLUSION

Homicide constitutes a class of offence which is difficult to suppress, even by the most ingenious of police forces. The pattern of homicide described and analyzed in this study would probably raise many problems than would provide answer, however, to address all those problems one has to study crime from biological, psychological, psychosocial and economic point of view. Primary prevention of homicide would involve community mental health centers in collaboration with all other community resources, identifying individuals, the factors which are contributory to criminal behavior. From such a study we hope to learn more about the relationship between the individuals and his peer group, impact of educational and personal profile, use and abuse of intoxicants, impulsivity and thrive for once existence. We hope that further studies in this field would answer all the queries that are unanswered. Long term prospective studies of individuals at risk are needed to provide conclusive evidence in this regards.

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**Ethical Clearance :** Thesis submitted for the PG Degree of M.D in Forensic Medicine to the Gauhati University and degree awarded in 2007.

**Source of Funding:** Self

**Conflict of Interest:** NIL

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# A Case of Fatal Accidental High Speed Diesel Ingestion

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## ABSTRACT

A fatal case of accidental diesel (high speed) ingestion was brought to Department of Forensic Medicine, North Bengal Medical College for Medico-legal autopsy with a history of accidental ingestion 12 days ago followed by hospitalisation as a case of chemical pneumonitis. The macroscopic autopsy findings supported by histopathological examination findings are being displayed in the poster presentation.

**Keywords:** *Accidental Poisoning, High Speed Diesel Ingestion, Chemical Pneumonitis, Consolidation, Tubular Necrosis, Glomerular Congestion, Hemosiderin Laden Macrophage*

## INTRODUCTION

Diesel is one of the several distillates prepared by fractionation of crude oil and is commonly used as a vehicle fuel in our country. Aspiration of diesel/petrol may occur accidentally while siphoning from fuel tanks<sup>[1-5]</sup>. It was in 1897, that Hamilton first described pneumonitis due to hydrocarbon aspiration<sup>[6]</sup>. Since then, accidental poisoning has been reported with kerosene, diesel and similar compounds. The authors described 12 cases of pneumonitis consequent to siphonage of diesel from trucks. In addition, there are two case reports published in the Russian literature<sup>[1, 5]</sup>. Siphoning of petrol leading to right middle lobe pneumonitis has been documented from United Kingdom<sup>[2]</sup> and a similar report of three patients with right middle lobe aspiration pneumonitis after siphoning petrol has been published from United States of America<sup>[3]</sup>. Although standard textbooks on medicine carry a description of pneumonitis caused by hydrocarbon aspiration, the consequences of aspiration of diesel/petrol following siphonage find no mention<sup>[7,8]</sup>. The rarity of such an account prompted this report of a 24-year-old male who developed bilateral pneumonitis and acute tubular necrosis with deposition of hemosiderin laden macrophages within the kidneys, a consequence of accidental diesel aspiration. To our knowledge, diesel aspiration leading to bilateral pneumonitis and acute tubular necrosis of kidney is yet to be documented in our country.

## CASE REPORT

A 24-year-old male subject accidentally consumed diesel while siphoning from the fuel tank of a vehicle on 03.11.13 at Purnea, Bihar. He was treated at a local hospital where he improved symptomatically. However, after three days complained of sudden onset of chest pain and breathlessness and was admitted to a hospital in Siliguri, West Bengal. Where he was ventilated by mechanical ventilator for 7 days, then his symptom was improved on 13.11.13, but again his condition deteriorated and he expired on 14.11.13.

The autopsy of the deceased was conducted at the Mortuary, NBMCH on 15.11.13. During autopsy, the lungs were congested and edematous with multiple cystic swellings with liver like consistency over the surface. On dissection of the lungs, there was consolidation with multiple pneumonic patches over all the lobes. (Photograph 1) The histopathological findings of the kidneys revealed acute tubular necrosis and glomerular congestion with presence of hemosiderin laden macrophages within glomerulus (photograph 3&4) and the histopathological examination of the lungs showed diffuse consolidation of pulmonary alveoli with pulmonary edema and focal areas of coagulative necrosis. (Photograph 2)



Fig. 1. Longitudinal section of lower lobe of lung, showing consolidation of lung parenchyma.

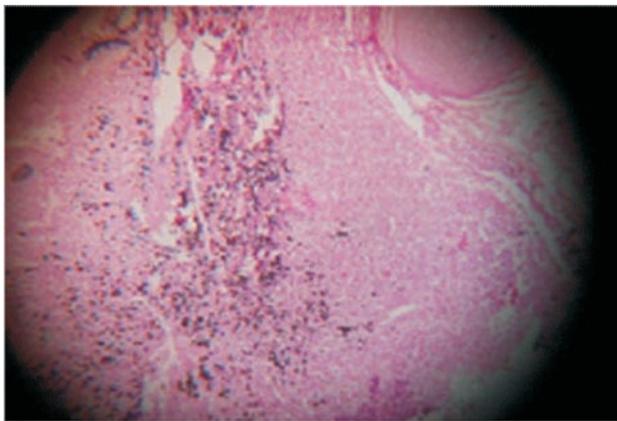


Fig. 2. Histological section of lung showing coagulative necrosis of lung parenchyma.

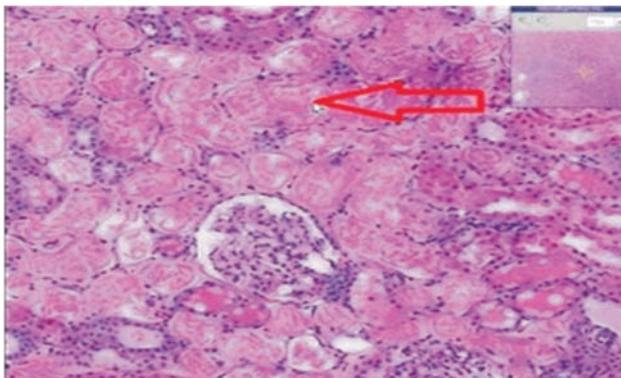


Fig. 3. Histological section of the left kidney stained in haematoxylin-eosine stain showing tubular necrosis.

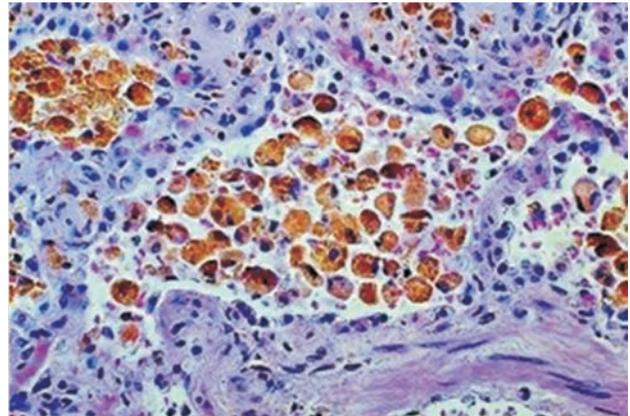


Fig. 4. Histopathological section of Kidney in Paerl stain showing haemosiderin laden macrophages within the glomerulus.

## DISCUSSION

Siphonage of fuel from the motor vehicles is a very common practice in our country. Accidental aspiration of diesel/petrol during siphoning can result as a result of direct inhalation or may follow ingestion<sup>[9]</sup>. Aspiration of diesel is known to involve the gastrointestinal and the respiratory system. Multiple cystic swellings over the surface of the lungs and infective patches over the lung parenchyma together with pulmonary Oedema and areas of coagulative necrosis in the histopathological examination is a common finding in cases of aspiration pneumonitis due to diesel poisoning and were consistent findings in this case. However, the histopathological examination of the kidneys revealed acute tubular necrosis and glomerular congestion with presence of hemosiderin laden macrophages within glomerulus which opens up a relatively unexplored avenue of diesel poisoning. The possible explanation for this observation is hypoxia produced secondarily to the changes in the lungs as noted above.<sup>[10]</sup> This finding brings to the forefront that autopsy surgeons must be careful in examination of the kidneys in addition to the examination of the lungs and GIT in order to pinpoint the cause of death. A man of Forensic should not be biased towards his observation while conducting the autopsy in a case of diesel poisoning. Doctors treating cases of such poisoning should be aware of renal complications arising as a result of hypoxia in addition to the management of respiratory symptoms in a case of diesel poisoning.

Our case highlights the fact that hydrocarbon pneumonitis and acute tubular necrosis of the kidneys can occur due to accidental diesel aspiration while

siphoning. Doctors treating such cases should be aware of such a possibility and management of hypoxia should be an important aspect so as to reduce morbidity that can arise following siphoning of motor fuel.

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**Ethical Clearance:** Ethical clearance was obtained from Ethical committee, North Bengal Medical College, Darjeeling

**Conflict of Interest:** our primary interest of the study is to find out the gross and microscopical changes in various organs in fatal high speed diesel poisoning, and secondary interest is to use this data for the improvement of our professional research work.

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# Reliability of Supramastoid Crest in Sex Determination by Logistic and Probit Regression

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## ABSTRACT

Sex determination is vital for the identification of an individual. Success in the sex determination is limited as often fragmentary remains are available for forensic identification. In the present study, 60 adult human skulls of North Indian individuals were studied to assess the reliability of the prominence of supramastoid crest (a non-metric trait) in sex determination, so that sex can be determined from fragmentary crania. The prominence of the supramastoid crest was compared with the casts prepared and standardized by Australian National University. The data was statistically analysed by Logistic and Probit regression models. Subsequent to analysis, it was found that the prominence of supramastoid crest correctly classified 75% of the sample.

**Keywords:** Sex Determination, Supramastoid Crest, Non-Metric Trait, Skulls, Logistic Regression, Probit Regression

## INTRODUCTION

Sex determination is the first and most important step in the biological identification process of skeletal remains. It is the basis of not only age and stature estimation but population affinity<sup>1</sup>. The sex is best assessed from the pelvis but it is very often damaged<sup>2</sup>. The skull is the second best area for sex determination, but the determination of the sex from the skull is not reliable until well after puberty<sup>3</sup>.

Diverse techniques for sex determination from crania have been employed with the aim of maximum accuracy. Mainly they are based either on visually determinable descriptive features of the cranium or on exact measurements of various parts of the cranium and their ratios. The observation technique is astonishingly accurate in the hands of expert, it is

inaccurate when used by the layman<sup>4</sup>. In anthropological studies, visual indicators of sex are traditionally scored on an ordinal categorical scale. Logistic and Probit regression models are commonly used statistical tools for the analysis of ordinal categorical data<sup>5</sup>.

Forensic identification often involves fragmentary remains<sup>6</sup>. Even broken parts are sufficient, if appropriate areas (pelvis, femoral heads, skull and sternum) are represented<sup>7</sup>.

The present study aims to know the reliability of prominence of supramastoid crest (a non-metric trait) in sex determination, so that sex can be determined from a fragmentary crania. The data has been analysed by logistic and probit regression models.

## MATERIAL AND METHOD

60 adult human skulls (30 of either sex) of North Indian individuals were studied to assess the reliability of prominence of supramastoid crest (a non-metric trait) in sex determination. The samples for the study

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were drawn from the Department of Anatomy and Forensic Medicine, Government Medical College, Patiala.

The skulls of only known sex were included in the study. The skulls with physical damage, apparent deformity, defect or disease were excluded from the study. Also, juvenile(spheno-occipital junction not synostosed) and senile skulls(wasted alveolar processes) were excluded from the study.

**Supramastoid crest:** it arises from the temporal squama, just above the external acoustic meatus, as a blunt crest. It extends posteriorly then angulates posterosuperiorly, forming the temporal line.

For the study of prominence of supramastoid crest, Larnach and Freedman<sup>8</sup> and Larnach and Macintosh<sup>9</sup> sexing and population affinities system were followed. The prominence of supramastoid crest was compared with the casts prepared and standardized by Australian National University(Photograph 1). The comparison was made by visual inspection as well as by palpation and was graded into Slight, Medium and Large(Photograph 2).

The data was statistically analysed by Logistic and Probit regression models using SPSS(PC+) software.

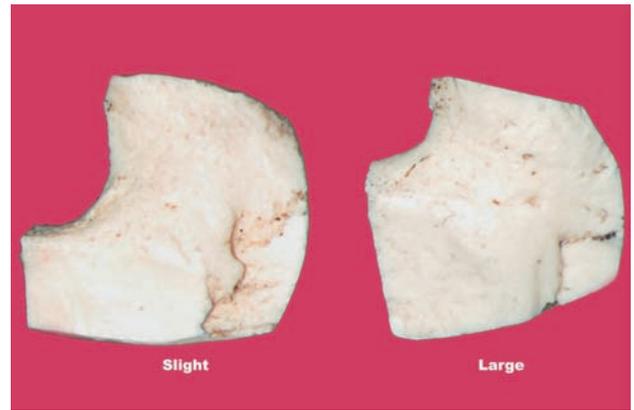


Fig. 1. Standardized Casts of Promience of Supramastoid Crest



Fig. 2. Prominence of Supramastoid Crest

## RESULTS

Table 1: Statistical analysis of prominence of supramastoid crest by Logistic regression

	B	Standard error	Wald	dF	Sig.	Exp.(B)
Prominence of supramastoid crest	-2.070	0.588	13.799	1	0.000	0.126
Constant	5.007	1.404	12.719	1	0.000	149.510

Table 2: Classification results

Observed	Predicted	Sex		Percentage Correct
		Male	Female	
Sex	Male	22	8	73.3
	Female	7	23	76.7
Overall percentage				75

Table 3: Statistical analysis of prominence of supramastoid crest by Probit regression

Variable	Coefficient	Standard error
Constant	3.071596535	0.82213041
Prominence of supramastoid crest	-1.268453513	0.32505901

**Table 4: Classification results**

		Sex	Predicted group membership		Total
			Male	Female	
Original	Count	Male	22	8	30
		Female	7	23	30
	%	Male	73.3	26.7	100.0
		Female	23.3	76.7	100.0

60 adult human skulls were studied to assess the reliability of supramastoid crest in sex determination and data was analysed by Logistic and Probit regression models. Table 2 and 4 showed that prominence of supramastoid crest correctly classified 75% of the sample.

**DISCUSSION**

In the present study, 60 adult human skulls have been studied to know the reliability of the prominence of the supramastoid crest in sex determination, so that the sex can be determined from a fragmentary crania.

The technique for sex determination fall into two broad categories: metric and observational(non-metric). The non-metric study requires experience and training. In the non-metric study preferably standardized casts should be used, as adequate level of methodological standardization decreases the risk of misinterpretation. Therefore, in the present study standardized casts have been used. The casts used in the present study have been prepared and standardized by Australian National University as

Indian casts are not available. The reliability of non-metric traits with respect to sexual dimorphism can increase if specific casts (for the geographic region) are used instead of Australian Aboriginal casts.

The accuracy of sex determination depends partly upon the statistical method employed, therefore stringent statistical method need to be employed to obtain reliable effects. Thus, in the present study the data has been statistically analysed by Logistic and Probit regression models which are the commonly used statistical tools for the analysis of ordinal categorical data. The statistical analysis of non-metric traits either by Logistic regression or by Probit regression will suffice as results were similar by both methods and no betterment was observable by applying both.

The reliability of the prominence of supramastoid crest along with other cranial morphological traits for sexing the skulls has been studied by Larnach and Freedman<sup>8</sup>; Larnach and Macintosh<sup>9,10</sup>; Sakaue and Adachi<sup>11</sup>; Bernard<sup>12</sup>.

**Table 5. Present study compared to earlier published data(incidence of supramastoid crest)**

Author	Sex	Percentage				Region of study
		Absent	Slight	Medium	Large	
Larnach and Macintosh <sup>9</sup>	Male	0.0	32.3	41.5	26.2	Coastal New South Wales
	Female	2.0	60.0	28.0	10.0	
Larnach and Macintosh <sup>10</sup>	Male	0.0	31.9	43.5	24.6	Queensland
	Female	0.0	44.7	40.4	14.9	
Present study	Male	Not studied	0.0	26.67	73.33	North Indian
	Female	Not studied	20.0	56.67	23.33	

Larnach and Macintosh<sup>9,10</sup> concluded from their consecutive studies that skulls of female show little or no development of crests. But a considerable overlap was reason of caution. In the present study, males showed predominantly large crests (73.33%) and females mainly showed medium (56.67%) crests.

Turgut et al<sup>13</sup> studied supraarticular, supramastoid and suprameatal crests on the outer surface of the temporal squama as they are of clinical importance for otological surgeons, neurosurgeons and temporomandibular surgeons. They found that supramastoid crests were commonly observed as a

small crest on male dry skulls (46.6%), but as trace type on female dry skulls (52.05%).

Thus, the results of Larnach and Macintosh<sup>9,10</sup>; Turgut et al<sup>13</sup> and Present study are in consonance that crests are better developed in skulls of male individuals than female individuals.

Sakaue and Adachi<sup>11</sup> studied five morphological traits for sexing skulls which included size of mastoid process and existence of supramastoid crest. They found that the supraorbital arc had the best accuracy rate (80.5%) followed by the mastoid process (78.6%).

Bernard<sup>12</sup> suggested that scoring the size of the supramastoid crest produces a greater percentage of correct sex identification than the qualitative scoring of the overall size of the mastoid process.

### CONCLUSION

The reliability of the prominence of supramastoid crest in determining the sex of skulls of the North Indian individuals was 75%

**Conflict of Interest:** There is no conflict of interest in the present research paper

**Source of funding:** No funds were required as the research was conducted in the Department of Anatomy and Forensic Medicine, Government Medical College, Patiala on dry skulls which were available in Departments only.

**Ethics Committee:** This work is a part of the thesis which has been submitted to the Baba Farid University of Health Sciences for the degree of MS(Anatomy). The permission for conducting this research work was given by the university.

**Acknowledgement:** The authors are thankful to Dr. P Raghvan, Senior Research Associate Scientist, Australian National University, for giving us training in studying the cranial morphological traits and also providing us the casts prepared and standardized by Australian National University.

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# Dyadic Deaths

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## ABSTRACT

Homicide-suicide, murder-suicide & dyadic death all refer to an incident where a homicide is committed followed by the perpetrator's suicide almost immediately or soon after homicide. Here we are discussing an expert opinion case of dyadic death where due to infidelity husband gave his pregnant wife to consume organophosphorus compound, thereby killing both fetus and the wife and later on hanged himself.

**Keywords:** Dyadic Deaths, Homicide-suicide, Spousal Killing, Infidelity

## INTRODUCTION

Homicide-suicide is defined as a lethal event in which an individual kills another and subsequently commits suicide immediately or within short period.<sup>1</sup>

Dyadic deaths is one of the most tragic forms of inter violence and associated with family disruption, psychological trauma and financial crisis. Homicide-suicide deaths, though rare, are universal phenomenon reported from all over the world. The striking common feature in all such deaths is a family relationship or close bond between the perpetrator and victim/s.<sup>2</sup>

Some of the other rare forms of homicide-suicide are filicide-suicide, familicide-suicide, extrafamilial homicide-suicide and homicide involving parents and siblings.<sup>3</sup>

## CASE HISTORY

The present case is an expert opinion case where the father of the deceased filed a complaint on finding the body of his deceased daughter along with the body

of her husband in their own house. The couple had a history of married life of 3 months duration and during this time there had been series of quarrel in their family. The in laws of the deceased harassed and tortured her for dowry and so the deceased and her husband started to stay in a separate house. But when a diagnostic USG report revealed the fetus of 12 weeks gestation, the husband thought that his wife was unfaithful to him. So husband gave her to consume organophosphorus compound and later on hanged himself. The post mortem was conducted by a medical officer and the specimen of uterus and fetus was sent for expert opinion to ascertain the age of the fetus and on gross and radiological examination (Fig 1 & 2) it reveals that the age of the fetus is between 7-8 weeks.

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Fig 1: Uterus and fetus.

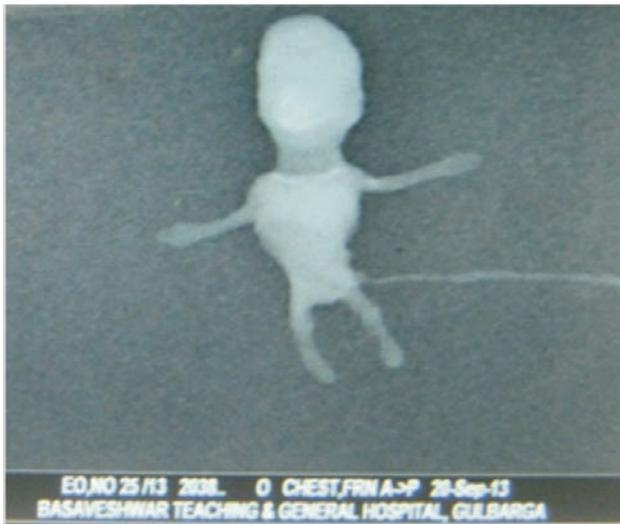


Fig 2: Radiograph of the fetus.

## DISCUSSION

In this case report the head of the family (husband) committed homicide and filicide by giving poison to his pregnant wife and thereby killing the fetus and then committed suicide by hanging himself. Socioeconomic factors like poverty, lack of education, and psychological factors like domestic quarrel, frustration, and infidelity were responsible for this dyadic death.

The feature of relationship between perpetrator and victim/s was almost similar in the present case as well as other Indian reports. That is to say either they are family members or closely related member of families.<sup>1,4,5</sup>

The victims involved in dyadic deaths are usually females, children, mentally disabled individuals or individuals incapacitated by drugs, disease, or alcohol. The perpetrator in these cases is usually male.<sup>6,7,8</sup>

Female perpetrators use less violent means of homicide such as poisoning, either by medication or carbon monoxide poisoning. It is seen that the perpetrator will use the same weapon or method to commit the homicide and suicide, but in some cases, this can differ. Suicidal hanging in homicides-suicides is seen in numerous studies.<sup>7,8</sup>

The victims in homicide-suicides are either related to or in a close relationship with the perpetrator; victims who are unknown to the perpetrator are rare. Spousal killings (commonly associated with discord

on spousal relationship) and children killed by their parents are the commonest form of homicide-suicide.<sup>6,7,9</sup> In the case presented here, the victim was in consortial relationship and had a child with the perpetrator.

Spousal homicide along with children reported in one case precipitate by the husband accusing the wife of sexual infidelity. The infidelity may be real, imagined or delusional. The delusion of infidelity is common which is accompanied by irritability and aggression. Spousal killing occurred as a result of conflict over extramarital, sexual and love affairs.<sup>1</sup>

Jealousy, conflict over extramarital, sexual, love affairs, threat of separation or actual separation from intimate partner is important factors seen in spousal or consortial homicide.<sup>10</sup>

## CONCLUSION

Homicide-suicide (dyadic) deaths though rare have got social impacts. Infidelity being one of the factors is the subjective feeling that one's partner has violated a set of rules or relationship norms and this violation results in feelings of sexual jealousy and rivalry. Here the USG report precipitated this factor and along with the domestic quarrel led to the homicide-suicide pattern of death. Usually the investigating officer makes appropriate investigation and closes the case as the offender is no more. But to prevent such deaths and reduce the incidence a multidisciplinary approach involving social, psychological and psychiatric investigations to evaluate various parameters of life of a person is necessary.

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- Investigating Officer, Madbool Police Station, Gulbarga.

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**Source of Funding:** None

**Ethical Clearance:** Yes

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# Death due to Choking: Two Case Reports

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## ABSTRACT

Choking is one of the common accidents that usually occur in the pediatric and geriatric age group patients. In most of the cases the objects causing blockage of internal airway gets coughed out due to natural cough reflex but at times it can cause death. Such deaths occur suddenly without any obvious signs and symptoms raising suspicion about manner of death. We present here two cases at two extreme ages; which were brought with some superstition and suspicion about cause of death and on careful autopsy they turn out to be cases of choking. The importance of careful examination of internal airway is highlighted.

**Keywords:** Choking, Date Seed, Betel Nut, Chewing Habit

## INTRODUCTION

Choking refers to the blockage of internal airways, usually between the pharynx and the bifurcation of the trachea. <sup>(1)</sup> Food boluses, buttons, safety pins and plastic toys are the foreign bodies commonly encountered in choking. <sup>(2)</sup> Food related asphyxiation peaks in infants less than 1 year of age and declines to low levels by 3 years. The rate of non-food related asphyxiation is relatively constant at 3 years of age and then declines by 6 years. <sup>(3)</sup> In adults, foreign body aspiration is more common in the setting of advanced age, underlying neurological disorder, poor dentition, alcohol consumption and use of sedatives. <sup>(4)</sup> Determination of cause of death is an important facet of Forensic investigation. In majority of cases the cause of death is apparent but some of the cases will leave only few signs of death; even for the skilled investigator. Meticulous examination and thorough

autopsy of a case is very important to ascertain particular cause of death especially when the corpse is directly brought for postmortem examination without any significant history.

## CASES

**Case No 01:** A 6 year old boy was brought dead to casualty department at Dr Shankarrao Chavan Government Medical College, Nanded with history of sudden unconsciousness. The relatives of the deceased were suspecting some superstitious things which were said to be happening in their locality. According to them few unexplained deaths occurred in their locality in recent past due to some bad evil and suspecting this one also of same nature in that chain. On detailed history the relatives informed that the boy had consumed mid-day meal at school and while playing with his friends on playground, he lost his consciousness and fell on ground.

On autopsy external examination was unremarkable and without any injury on the body. On internal examination all vital organs were congested. Stomach showed about 200 ml food material as dalkhichhri mixed with brownish colored pericarp of dates. On dissection of internal airway single, brown colored date seed of size 1.8cm x 0.8cm surrounded by mucous fluid was present completely obstructing the laryngeal inlet. The surrounding mucous

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membrane was congested with patchy hemorrhagic areas surrounding date seed. The lungs were congested and edematous. The opinion as to the cause of death was "Choking"

**Case No 02:** A 75 year old male found dead in his room in quiet surrounding. The police were suspecting foul play while relatives of deceased were claiming the death caused due to heart attack. On autopsy, external examination revealed nothing of positive significance. On internal examination the brain showed senile atrophic changes. Heart showed few senile changes in the form of atherosclerosis but there was no significant narrowing of coronary lumina. Two irregular, brownish-white pieces of betel-nut of size about 1cm x 1cm each surrounded by pool of mucous fluid were seen completely obstructing the larynx. There were also two same size pieces of betel-nut seen surrounded by mucous in the esophagus. The opinion as to the cause of death was "Choking"

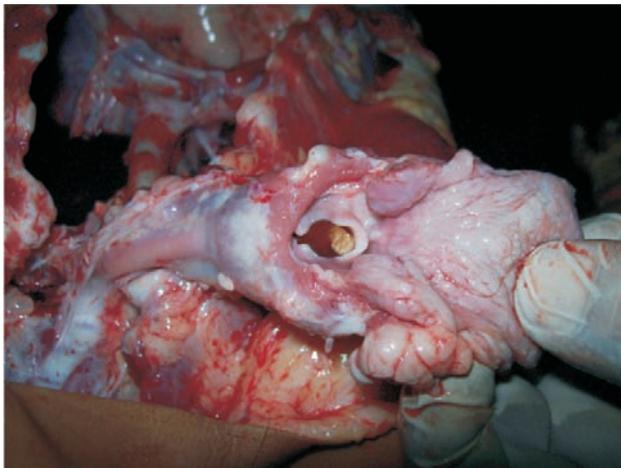


Fig. 1. Showing date seed obstructing the larynx

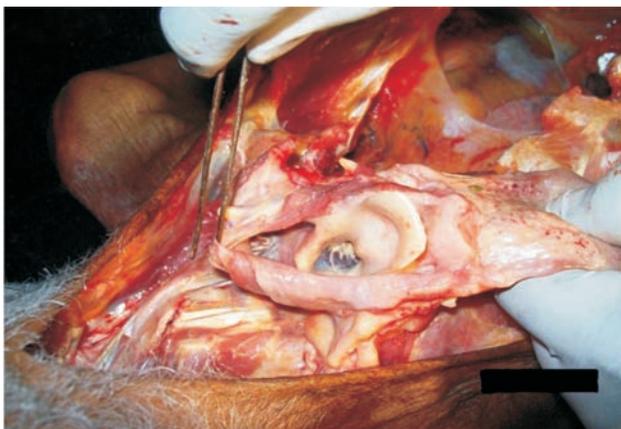


Fig. 2. Showing the pieces of betel nut in larynx and esophagus surrounded by mucous

## DISCUSSION

Deaths by choking are usually referred to hospitals as sudden and suspicious deaths. Even in the era of 21<sup>st</sup> century there are few areas in countries like India where people believe in superstition about existence of some evil which kills the people on his will without any reason. Though it has no any scientific ground but superstition and illiteracy have deep impact on such society hence those people do believe in existence of evils. In our first case on autopsy we observed a date seed completely obstructing the laryngeal inlet. The size of seed (1.8cm x 0.8cm) was in the range of dangerous size object as mentioned in study of Kumar Vet al. <sup>(1)</sup>Children have common tendency to keep things in mouth which is a dangerous practice. The increased respiratory rate during playing, laughing or doing some physical activity with sudden in-flow of air may pull food particles from mouth downwards leading to its impaction in respiratory passage. Suleyman G. et al.<sup>(5)</sup> observed that accidents due to choking are more common in male children. About 90% of those deaths can be avoided if immediate treatment is given to remove the foreign body at scene <sup>(6)</sup> but the important factors that determine the possibility of favorable outcome are age of the affected person, level of consciousness, occurrence of crying, and characteristics of the foreign bodies. The method of finger swapping to remove the foreign body should not be employed as characteristics like diversity in size, shape and smoothness of the surface render the foreign bodies less easily caught by fingers and dislodge the object much deeper in larynx and land the patient in more serious condition. <sup>(7)</sup>

In our second case, the old man was neglected by relatives and was lying alone in his room. Loneliness can lead to psychological disturbances. Habit of chewing betel nut is common practice in India. For this unfortunate old person the habit of chewing betel nut for passing the time culminated in to laryngeal obstruction and death. The person was having senile atrophic changes in the brain which leads to primary neurological disorder that increases the risk of choking in old age.<sup>(5)</sup> Also the elderly people who keep the foreign body in mouth during sleep have increased chances of choking. This old person might have had small nap with betel nut in mouth which accidentally slipped into the larynx leading to obstruction and death.

The finding of small amounts of food material in the airway at autopsy does not indicate that the

individual choked to death by food material as approximately 20–25% of all individuals aspirate food agonally, independent of the cause of death.<sup>(8)</sup>In both the above cases the larynx was completely obstructed by foreign particles and there was no evidence of vomiting in agonal period.

### CONCLUSIONS

- 1) The parents should be educated about the safe feeding practices, dangerous sizes and types of food.
- 2) Elderly people require special attention and care during meal and even while chewing some edibles.
- 3) Stringent law enforcement should be made to take care of elderly by their near relatives.

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**Ethical Clearance:** Not applicable

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# Spontaneous Rupture of 17 Weeks Uterus: a Rare Case

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## ABSTRACT

Uterus is the most unique reproductive organ in humans. Rupture uterus is a hazardous complication of pregnancy, spontaneous rupture of uterus is rare. Uterine rupture can occur in pregnancy or at the time of delivery. The reported incidence of spontaneous uterine rupture is about 1 in 15,000 deliveries and it is more likely in women of high parity. Here we came across one case of 27 year old G3P2 with three and half months amenorrhea, referred to our hospital with the diagnosis of rupture uterus, she had a history of previous cesarean section, Vaginal examination showed a bleeding through cervical os. Ultra sound examination showed 17 weeks fetus with absent cardiac activity seen separate from the uterus with minimal free fluid in the abdomen suggesting ? Rupture uterus. Easy accessibility of abortion services, curb on unauthorized medical practice can reduce the complication rate, in developing countries like India timely hospitalization of pregnant women shall decrease the incidence of rupture of gravid uterus.

**Keywords:** Criminal Abortion, Rupture Uterus, Attempted Abortion, Pregnancy, Caesarean Sections

## INTRODUCTION

Spontaneous rupture of uterus at 16 – 17 weeks gestation is a rare phenomenon. Usually the uterus with previous cesarean can have scar rupture or scar dehiscence at the onset of labour at term. Causes of rupture of uterus at 17 weeks of gestation are mainly due to attempted abortion with drugs or instruments. Here we present an interesting case of a third gravida with a previous cesarean section with 16 -17 weeks pregnancy with rupture of uterus.

## CASE REPORT

A 27 year old G<sub>3</sub>P<sub>2</sub> with three and half months of amenorrhea was admitted with severe pain in

abdomen and vaginal bleeding since seven days. Patient was referred to our hospital with the diagnosis of rupture uterus. The pain was increasing in intensity since two days. She had one previous cesarean section at a private hospital and the second delivery was a spontaneous vaginal on the way to the hospital. Patient gave no history of any intervention during this pregnancy before the current episode. The patient was conscious and coherent with pallor.

Systemic examination was within normal limits except for tachycardia. On abdominal examination there was tenderness in lower abdomen. Vaginal examination showed a bleeding through cervical os. The ultra sonography report available with the patient indicated 17 weeks fetus with absent cardiac activity seen separate from the uterus with minimal free fluid in the abdomen suggesting ? Rupture uterus.

A bedside sonography scan was done in our hospital which revealed a macerated fetus outside the uterine cavity with fluid in the pelvis. This confirmed the diagnosis of rupture uterus. Her haemoglobin was 8.5 gm/dl with mild leukocytosis.

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On laprotomy dense omental adhesions were present and the fetus and placenta were lying in the abdominal cavity. The uterus showed a rupture in the anterior wall over the suture line for the full thickness. The left tube and ovary were adherent to the mesentery. The rent in the uterus was sutured and adhesionolysis done. Peritoneal wash was given and abdomen closed. IV Ceftriaxone 1.5 gms bid, and IV Metronidazole were given. Two units of packed cell transfusion was done Postoperative period was uneventful.

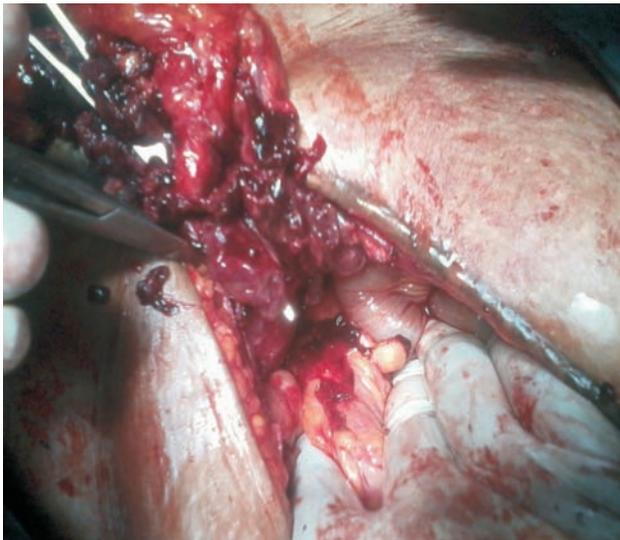


Fig. 1. Laprotomy showing dense omental adhesion



Fig. 2. 16 to 17 Weeks macerated fetus and placenta, removed from peritoneal cavity.

## DISCUSSION

The caesarean section rate is generally increasing worldwide. Although many studies have demonstrated the small risk of complications for vaginal birth at term after a prior caesarean section, experience with second trimester abortion in women with prior uterine scar is limited<sup>1,2</sup>.

Though our patient did not give a clear history of intervention, usually sex determination and induction of abortion with the intention of female feticide was the most probable cause. The uterus had withstood a normal delivery after cesarean in itself suggests that some sort of intervention was done.

The rising number of caesarean sections has proportionally led to an increased number of patients with scarred uteri among those who require termination of pregnancy. Mid trimester abortion is usually performed by administration of prostaglandins as an effective alternative to surgery<sup>3</sup>. As demonstrated by a recent study, the uterine rupture rate with induced trial of labor is significantly higher than with a spontaneous trial of labor<sup>4</sup>. With prostaglandin induction the risk increases depending on the drug used and its regimen<sup>3,5,6</sup>.

Although the majority of abortions are performed in the first trimester, there is still a need for second trimester abortion because of delayed diagnosis of fetal anomalies, logistic and financial difficulties in obtaining abortion services, and failure to recognize an undesired pregnancy in the first trimester, which all contribute to the continuing need for late abortions.

Second trimesters abortions constitute 10–15% of all induced abortions worldwide but are responsible for two-thirds of all major abortion-related complications<sup>7,8</sup>. Medical abortion, the termination of pregnancy through the use of a drug or a combination of drugs, has the potential to reduce complications and to expand access to abortion provided not only by specially trained clinicians but also by other health care providers who may or may not have training in surgical methods of abortion<sup>9</sup>.

According to the WHO, in every 8 minute a women in developing nations will die of

complications arising from unsafe abortions leading to a maternal mortality up to 13%<sup>10</sup>.

All patients with previous caesarean scars should be made aware of the importance of ante-natal care in all subsequent pregnancies. They also require careful pre-natal supervision, proper selection of cases for vaginal delivery, early hospital admission, and close supervision in labor<sup>11, 12</sup>.

With the introduction of prostaglandins and later prostaglandin analogues, the efficacy of medical abortion could be improved, and the risk of complications and side effects reduced. But inadvertent use of prostaglandins by quacks can put the patient in jeopardy. Secondly the desire for male child and the lack of education, social stigma, female foeticide and other barriers to abortion, force women to seek abortion in secrecy at a high cost, leaving the poorest, least educated women to unskilled and highly unscrupulous executors and hence the greatest risk of injury. Abortion when legal should be safe.

The most effective way to reduce the morbidity and mortality would be to prevent unwanted pregnancies by informed and effective use of contraception. Also the society should be educated to accept the female child. Easy accessibility of abortion services, curb on unauthorized medical practice can reduce the complication rate<sup>13, 14</sup>. In developing countries like India timely Hospitalization of pregnant women can decrease the incidence of rupture of gravid uterus.

### CONCLUSION

In developing countries like India, Government promoting to the peoples for hospitalized deliveries and Abortion services as well as small family norms. Although in village areas, it appears that people are least aware or less bothered. This may be due to lack of education, secondary role of females in society, ill treatment to the pregnant women. Multiparity is may be due to strong desire for a male child. Multiparty is one of the known risk factor to cause rupture which is preventable and timely Hospitalization of pregnant women can also decrease the incidence of rupture of uterus.

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# Supernumerary Bones in Superior and Inferior Extremity

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## ABSTRACT

The extra bones are always matter of discussion amongst Anatomists, Radiologist and medico legal Experts. They are always present as a rule in human body. There is dearth of data pertaining to list of such bones. We have tried to make a comprehensive list of name and location of such bones in human body for ready reference. Clinical symptoms created by these bones are unremarkable by clinicians to prevent workloads. A thorough knowledge is always required by medico legal experts who have to deal with such conditions frequently.

**Keywords:** *Supernumerary Bones, Superior Extremity, Inferior Extremity*

## INTRODUCTION

It is always matter of discussion that what need of extra bones in human being is. Such bones are known as supernumerary bones and they are regularly seen amongst individuals. In Anatomy variation is rule and such variation of extra number of bones is of curiosity not for Anatomists but for medico legal experts, and other clinicians. Most of the time, these bones are asymptomatic and more of academic interests. But sometimes it may associate with pathologies and becomes matter of concern for clinicians too.

The various supernumerary bones reported are reviewed and we tried to compile the list of same. It becomes utmost importance for forensic experts also as they may come across such additional components of skeletal system.<sup>1</sup>

Accessory bones are widely in their prevalence and appearances. Occasionally these bones may be associated with painful syndromes such as Os trigonum syndrome, Posterior ankle impingement syndrome, Os peroneum syndrome Os navicular Syndrome etc.due to various pathologies including

trauma, infection, inflammation, degenerations and others.

Here we present a comprehensive chart and descriptions of commonly and not so commonly occurring accessory bones in superior and inferior extremity. Radiological studies like radiography, ultrasound, computed tomography(CT),Magnetic resonance imaging(MRI) provides important information which should used in concert with clinical findings to guide patient management.

## SUPERNUMERARY BONES IN UPPER LIMB

### Most common accessory bones

Os central: additional bone located on the dorsal aspect between the scaphoid, capitate, and trapezoid. It is formed when a small cartilaginous nodule fails to fuse with the scaphoid, and may be doubled.

Os vesalianum Carpi: small bone at the lateral aspect of the carpus adjacent to the base of the fifth metacarpal and hamate. It was first described by Vesalius in 1543.

Os Radiale externum: distal lateral margin of the scaphoid tubercle, adjacent to the trapezium.

Os Epitrapezium: located on the dorso-lateral side of the Os trapezium, distal to the site of the Os radiale externum described before, at the distal lateral aspect of the scaphoid in close proximity to the trapezium.

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### Less common accessory bones

Os Gruberi (between hamate & capitate)

Os epilunate (between scaphoid & lunate)

Os metastyloideum (between the capitate, trapezoid & base of 2<sup>nd</sup> metacarpal).

Os trapezium secundarium (between trapezium & base of 1st metacarpal).

Os praetrapezium (between distal trapezium & central base of 1st metacarpal).

Os paratrapezium (between trapezium & base of 1st metacarpal)

Os trapezoideum secundarium (between trapezium, trapezoid & bases of index & thumb metacarpals).

Accessory bones around the elbow:

Os supratrochleare dorsal (in olecranon fossa of humerus).

Os patella cubiti (near triceps tendon insertion)

Os medial epicondyle (over medial epicondyle)

### Supernumerary bones in lower limb

#### Most common accessory bones

**Os trigonum:** Secondary ossification center of the talus is posterolateral to bone when fails to fuse and remains as separate. The Os trigonum articulates with the lateral tubercle through a fibrocartilagenous synchondrosis. On the plain x-ray the bone appears triangular but may also appear round and oval. This bone may be radiographically misinterpreted as fractures of the lateral or medial tubercles of the posterior process of the talus. The fracture fragment often appears to resemble the Os trigonum on lateral radiographs thus this is called the "pseudo os trigonum" sign.

**Os tibiale externum (accessory navicular):** is the most commonly found accessory ossicle of the foot with reported incidence of about 25-30%. It is located on the posteromedial aspect of the foot adjacent to the posteromedial tuberosity of the navicular bone. Three types of accessory tibiale externum have been described in literature.

Type I is considered to be a sesamoid bone in the distal insertion tendon of the posterior tibialis muscle.

Type II results from a secondary ossification center adjacent to the navicular bone connected to the navicular tuberosity by a synchondrosis.

Type III is the result of fusion of the secondary ossification center of the navicular.

Os peroneum (lateral aspect of cuboid): present at the level of the calcaneocuboid joint within the substance of the peroneus longus tendon. When ossified it is visible on 4.7-30 % of radiographs. It is best seen in the oblique-lateral view of the foot.

Os vesalianum (base of 5th metatarsal): present at base of the fifth metatarsal, embedded in the peroneus brevis tendon in about 0.1-5-9 % of cases. It is best evaluated in lateral oblique radiographs of the foot.

### Less common accessory bones

Os supratolare (antero-supero aspect of talus)

Os supranaviculare (superior aspect of navicular - seen on lateral)

Os processus uncinatus (at intersection of navicula, 2nd and 3rd cuniformal)

Os intercuneiforme (between the 1st and 2nd cuniformal)

Os pars peronea metatarsalia (1st cuniformal and 1st metatarsal)

Os cuboides secundarium (proximal-medial aspect of cuboid)

Os talotibiale (anterior tibia)

Os subcalcis (inferior aspect of calcaneus)

Os sustentaculi Os intermetatarsium (between the 1st and second metatarsal)

Os subfibulare

## DISCUSSION

The causes of accessory bones are manifold. Generally these are present where ligaments and tendons are firmest, muscular action strongest and compression is greatest. According to Gray Anatomy existence of accessory bones to modify pressure, to diminish friction and occasionally alter the direction of pull of muscle. The presences of these bones are associated with epiphysis. Phylogeny and function

combines leads to formation of such ossicles. Phylogeny is responsible for formation and function is responsible for its size.<sup>2,3</sup>

There are number of factors which lead to development of supernumerary bones in human beings. Many theories have been postulated from time to time in order to support development of these bones. The factors responsible may be due to degree of movements of various joints, under or over development of bones, environmental factors, intrinsic genetic factors. The differences may be due to sex of an individual. The epigenic factor includes the mechanical stresses.<sup>4,5</sup>

The anatomical variations of bones in the hand are usually related to the presence of pain caused by pressure over the tendons or the joint capsules. Occasionally sensory disorders involving the median nerve or the ulnar nerve may be present. Usually these kinds of symptoms are caused by post-traumatic bone deformities but sometimes the existence of sesamoid ossicles or exostoses may be the cause of symptoms. The frequency of sesamoid ossicles in human hand is around 0.4% – 1.6%.<sup>6</sup>

The prevalence and distribution of sesamoid and accessory bones in the hands is quite variable between different populations and ethnic groups. The findings of this evidence-based anatomical review provide quantitative evidence that the incidence of accessory bones in human hands depends on genetic rather than functional factors<sup>7</sup>.

Sesamoids and accessory ossicles seen in the foot vary widely in their prevalence and appearance. Pathology of these bones includes trauma, sesamoiditis, and infection, osteoarthritis and pain syndromes. Radiography, ultrasound, scintigraphy, CT and MRI provide information regarding the pathology of these bones<sup>8</sup>.

Many several studies were conducted from time to time in different regions across the globe and on various races. The frequency of 40.4% for a sesamoid bone in the Meta Carpo Phalangeal joint of the index finger in Arab subjects.<sup>9</sup> and 64 % reported in Caucasians<sup>3</sup>

The incidence of sesamoid bones in the thumb IP joint has been reported to be 100% in Africans<sup>10</sup> and from 73 to 100% in Caucasians<sup>11</sup>. However, in the Arab population it was found that only 28.6% of subjects showed a sesamoid bone at this site<sup>9</sup>. Again, this

incidence is much lower than in available literature, which may indicate a population or racial variation.

The tendency to form sesamoid bones may be linked to intrinsic genetic factors and that variation of intrinsic factors may interact with extrinsic mechanobiological factors to influence sesamoid development and evolution.<sup>4</sup>

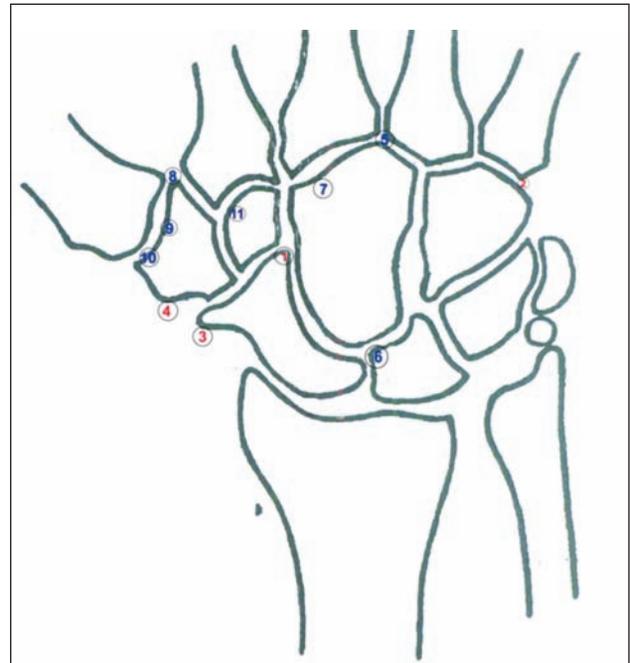


Fig. 1. Locations of accessory bones of the hand : os centrale (1), Os vesalianum carpi (2), Os radiale externum (3), Os epitrapezium (4), Os Gruberi (5), Os epilunatum (6) Osmetastyloideum (7), Os trapezium secundarium (8) Os praetrapezium (9), Os paratrapezium (10), Os trapezoideum secundarium (11).

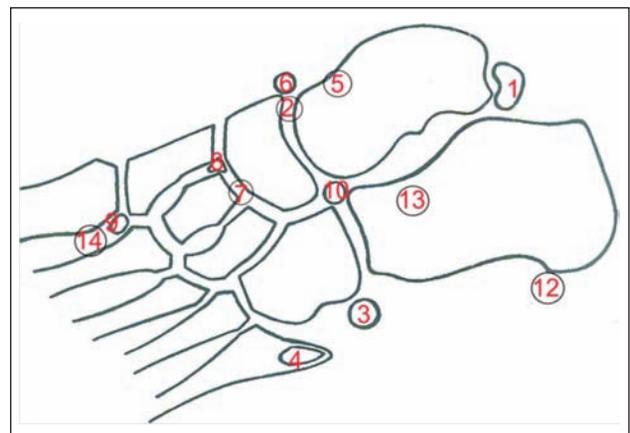


Fig. 2. Locations of accessory bones of the foot Os trigonum (1), Os tibiale externum (2), Os perineum (3), Os vesalianum (4), Os supratolare (5), Os supranaviculare (6), Os processus uncinatus (7), Os intercuneiforme (8), Os pars peronea metatarsalia (9) Os cuboides secundarium (10), Os subcalcis (12), Os sustentaculum (13), Os intermetatarsium (14).

## CONCLUSION

Accessory bones seen in hand and foot extensively variable in their prevalence and appearance. Clinical symptoms created by these bones are unremarkable by clinicians to prevent workloads.

Whatever may be their source of origin but they are always matter of discussion for Anatomists, Forensic experts, Radiologists and Orthopedicians. Most of the time these additional bones are asymptomatic but rarely they may lead to complications. Very less often they may lead to syndromes associated with them. A thorough knowledge is always required by medico legal experts who have to deal with such conditions frequently.

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# Study on the Application of Silver Chloride Nanoparticles for the Detection of Diluted Biological Fluids and Development of Latent Prints

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## ABSTRACT

Forensic science has been playing an important role in the justice administration system<sup>1,2</sup>. Some of the most important evidences such as fingerprints, blood and semen have been easily detected with the available techniques<sup>2,3</sup>. There are certain conditions in which these are beyond the ability of the human eye for the purpose of visualization and analysis. These could be made visible with the application of nanoparticles<sup>6,7</sup>. In this study, an effort has been made to make the latent prints visible by using silver chloride nanoparticles. Though silver compounds are costlier, they could be used for this purpose as they are more effective in such circumstances wherein the evidences are well diluted.

**Keywords:** Silver Chloride, Nanoparticles, Latent Prints Development, Biological Fluids, Detection

## INTRODUCTION

Forensic sciences have a wider application in most of the criminal applications with the required scientific basis. One of the recent developments in the scientific fraternity is the introduction of nanotechnology. They deal with the particles of nanoscale levels<sup>3,5</sup>. They find their applications in most of the fields such as medicine, pharmacy, engineering and agriculture and so on. They find their application in the field of forensic sciences. To mention a few, they are useful in fingerprints, biological applications and explosives detection. Nanoparticles like CdS, AgCl, ZnO, CdSe, TiO<sub>2</sub> etc. has been made by different standard techniques. In these study silver chloride nanoparticles has been made by standard technique. In this study an attempt has been made to apply the synthesized nanoparticles for the detection and development of latent prints and the detection of biological fluids such as blood and semen in different dilutions. Nanoparticles of Silver Chloride and Cadmium Sulphide were synthesized with the acceptable size. The characterization was done successfully with Scanning Electron Microscope (SEM), Ultraviolet-Visible spectroscopy, Infrared spectroscopy, Energy Dispersive X-Ray Fluorescence (EDXRF). The application of these nanoparticles were done in the latent print developments, detection of fingerprints

and detection of biological fluids like blood and semen

Nanotechnology is the study of manipulating matter on an atomic and molecular scale. Generally nanotechnology deals with the structures where at least one dimension is less than approximately 100 nm. The prefix nano in the word nanotechnology means a billionth ( $1 \times 10^{-9}$ ). In case of the forensic sciences, the applications have been more widely available for the purpose of the justice administration. This is useful in the different specialties of forensic sciences. To mention a few, they are useful in fingerprints, biological applications and explosives detection. In this study an attempt has been made to apply the synthesized nanoparticles for the detection and development of latent prints and the detection of biological fluids such as blood and semen in different dilutions. If at all the blood gets diluted they may not be visible with the normal unaided eyes. With the application of nanoparticles they may be made visible. They can be analysed further.

Synthesis and application of Silver Chloride Nanoparticles

Silver nitrate solution was added in dilute hydrochloric acid drop by drop and white color precipitate found. Heated it on a hot plate at 50° C and

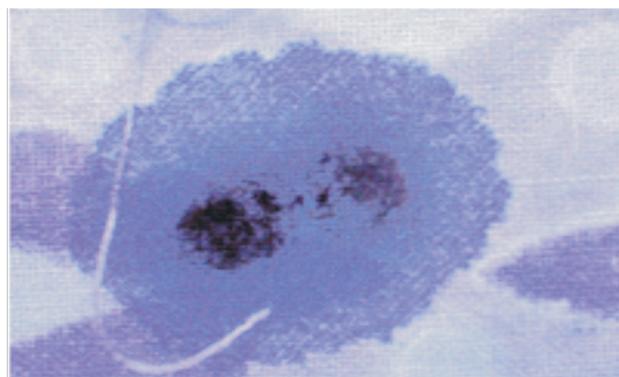
then after five minutes increase temperature 100°, 150°.....350° C and then switch off hot plate and put it for cooling. And then add same amount of capping agent (Mercaptosuccinic Acid) solution (25 mg c.a. + 10 ml dis. Water) stir it and then centrifuge it at 6000 rpm for 10 minutes at 10°C and lyophilize it for get dry particles. Freeze-drying process works by freezing the material and then reducing the surroundings pressure to allow the frozen water in the material to sublimate directly from solid phase to the gas phase. And Silver Chloride particle dry at -20° C and silver chloride dry particles are formed and characterize particles in UV-Visible Spectroscopy, IR Spectroscopy and Scanning Electron Microscope (SEM) and Energy Dispersive X-Ray Fluorescence (EDXRF).

Nanoparticles of silver chloride were synthesized and were subjected to different application in forensic science for the purpose of clarity and resolution. First of all latent prints were applied with Silver Chloride nanoparticles .This was done with the standard procedures as has been prescribed<sup>2,4</sup>.The spraying solution consists of 1) Ninhydrin (20 mg) + methanol (10 ml) + nanoparticles 2).mercaptosuccinic acid (20 mg) + methanol (10 ml) + nanoparticles apply on fingerprints and it works as a binder.

Latent Fingerprints were taken on a blank paper and ninhydrin solution (20 mg ninhydrin + 10 ml Methanol) and 1or 2 mg of Silver Chloride Nanoparticles. Silver Chloride particles were mixed with the ninhydrin solution and spray it on latent prints. Latent Fingerprint containing blank paper put into a glass chamber and glass chamber put on hot plate at 70-80° C for 10 to 15 minutes. A photograph of the developed latent fingerprints was taken and is shown below. A Silver Chloride particle gives red color luminance on Latent Fingerprints<sup>6,7</sup>.



Photograph of the latent print developed with silver chloride nanoparticle

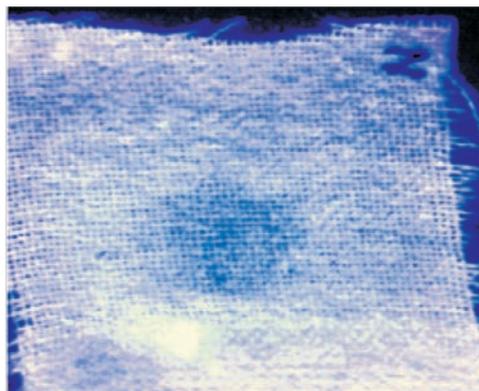


Photograph of dilute blood stain after the application of silver chloride nanoparticles

The solutions of Mercaptosuccinic Acid (20 mg) a capping agent was added to 10 ml of methanol . Then 1 ml of blood was taken in a test tube. Blood was diluted with 9 ml of distilled water. Three white cloth pieces were taken and were soaked with the diluted blood which was almost colorless . Then they were applied with the silver nanoparticles contained solution by spraying. They were viewed under UV light source and were made visible for which the photograph was taken. Same procedure was applied for the semen samples also. They have been shown above with the distinct photographs.

#### Silver Chloride Nanoparticles Applied in Semen

First of all the solution of Mercaptosuccinic Acid (20 mg) was prepared with the capping agent and was taken in 10 ml 10% of methanol. Then they 1 ml of Semen was taken in a test tube and was diluted with 9 ml of distilled water. White cloth pieces were taken and soaked with the diluted semen. This was applied with the silver nanoparticles solution with the mercaptosuccinate solution then it was visible. The photograph of the cloth piece was taken under Ultra-Violet light for clarity.



Photograph of Silver Chloride Nanoparticles applied on cloth piece with diluted semen in UV light

## RESULTS AND DISCUSSION

Silver chloride nanoparticles applied latent prints were found to be superior than the routine chemical method developed latent prints. Ninhydrin spray mix with silver chloride nanoparticles and sprayed on latent fingerprints and particles of silver chloride gives red color luminance in normal camera light. Mercaptosuccinic acid solution mixed with silver chloride and applied on cloth pieces with diluted blood. It gives violet color under UV light. Diluted semen mixed with mercaptosuccinic acid solution and the silver chloride nanoparticles was detected with the bluish discoloration. The semen and blood stains were found to be better visible with the application of silver chloride nanoparticles after the dilution of about 10% of its original concentration.

## CONCLUSION

Nanoparticles of Silver Chloride were synthesized by chemical methods and were found to be useful in the forensics sciences by way of detecting the diluted blood and seminal stains and the development of latent prints. The fingerprints though very old may be detected easily with the application of silver chloride nanoparticles and the biological fluids may also be detected even though they are diluted to the extent of non detectable levels of

In every scientific useful study there would be a limitation in the form of restricted application. In this study also, there was a possibility of the detection methods for the biological fluids in lower concentration. So, still lower concentration could be tried out using the nanoparticles of still lower sizes.

**Acknowledgement:** Nil

**Conflict of Interest:** Nil

**Source of Support:** Self.

**Ethical Clearance:** Has been obtained from the committee.

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# Stature Estimation from Hand Length and Foot Length in Adults - a Regional Study in Chennai, Tamilnadu

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## ABSTRACT

Identification of dead body and proof of corpus delicti is essential and integral part of any criminal and civil justice delivery system throughout the world. The main part of corpus delicti (i.e. the body of the offence; the essence of crime) is the establishment of the identity of the dead body. The stature prediction occupies relatively a central position both in the anthropological research and in the identification. Various studies have been conducted in the estimation of stature from long bones to bony fragments. In the present study an attempt has been made, which is first of its kind in Tamilnadu, to estimate the stature of an adult individual of either sex not only from hand length, foot length but also from a variety of combination of both hand and foot lengths of either sides. . In this regional study multiplication factors also have been derived to estimate stature from hand length and foot length for both sexes.

**Keywords:** Forensic Anthropology, Stature, Hand Length, Foot Length, Regression Equation, Multiplication Factor

## INTRODUCTION

Identification is necessary in living persons, recently dead persons, decomposed bodies, mutilated bodies and skeleton. If the victim's identity is not known, it becomes difficult for the police to solve the crime.<sup>1</sup> Identification of dead body and proof of corpus delicti is essential and integral part of any criminal and civil justice delivery system throughout the world. The main part of corpus delicti (i.e. the body of the offence; the essence of crime) is the establishment of the identity of the dead body.<sup>1</sup>

Visual identification becomes difficult or impossible in cases of fires, explosions, advanced decomposition, mutilation, aircraft accidents, earthquakes, mass disasters and other terrorist activities.<sup>1</sup>

The stature prediction occupies relatively a central position both in the anthropological research and in the identification. Estimation of stature of an individual from the skeletal remains or from the mutilated or amputated limbs or parts of limbs has obvious significance in the field of forensic anthropology. Studies on the estimation of stature, mostly of the long bones have been reported as indicated by the

published work of Karl Pearson (1899)<sup>2</sup> and Trotter and Glessner (1952)<sup>3</sup>. The Indian perspective of the problem of stature estimation has been studied by the Athwale et al (1963)<sup>4</sup>, Patel et al (1964)<sup>5</sup>, Lal and Lala (1972)<sup>6</sup>, Kalte and Bansal (1974)<sup>7</sup>, Thakur and Rai (1987)<sup>8</sup>, Saxena (1984)<sup>9</sup>, Bhatnagar et al (1984)<sup>10</sup>, Jasuja (1987)<sup>11</sup>, Jasuja et al (1991,93,97)<sup>12,13,14</sup>.

There are lot of international and regional level studies regarding the stature estimation and other aspects of identification from various body parts. A mere superficial perusal of the various studies regarding the stature estimation clearly indicates that it is population specific. Hence this study of stature by hand and foot length specific to our region (Chennai, Tamil Nadu) assumes great deal of importance and interest.

In the present study an attempt has been made, which is first of its kind in Tamilnadu, to estimate the stature of an adult individual of either sex not only from hand length, foot length but also from a variety of combination of both hand and foot lengths of either sides. In this regional study multiplication factors also have been derived to estimate stature from hand length and foot length for both sexes.

## MATERIALS & METHOD

The present study was conducted in the Institute of Forensic Medicine, Madras Medical College and also in the Institute of Internal Medicine, Government General Hospital, Chennai-600 003 over a period of 9 months from January to September, 2007. The study sample consists of 619 Healthy individuals comprising 311 males and 308 females in the age group of 18 to 59 years.

### In this study the samples included are

- i) The medical students of second MBBS attached to Madras Medical College, Chennai.
- ii) Apparently healthy individuals attending the outpatient department of general medicine and their accompanying attenders.
- iii) Patients admitted in the medical wards having no abnormality in the hand and foot and spine and their accompanying attenders.

### General healthy population.

The study sample consists of mostly right handed preponderance, however some cases of left hand dominance are also included.

In this study all the recording were made in the morning hours between 8 a.m. to 11 a.m to avoid diurnal variation in well lighted room.

### Techniques involved in taking anthropometric measurements<sup>10</sup> Stature

#### Height-vertex or Standing height

It is vertical distance between the point vertex and the floor when the subject stands in anatomical position with palms touching the thighs with head in Frankfurt horizontal plane. The standing height method was chosen for taking stature of a person, because it is most accepted method worldwide.

#### Instrument (figure 1)

The instrument consists of a horizontal squared flat wooden platform (18" X 18" X 3") in which a vertical calibrated wooden rod is inserted and fixed at the middle part of the one among the four sides. The scale has got calibration from 0 – 195 cm. to the nearest mm accuracy. A flat projected horizontal sliding wooden bar, which can be moved from above downwards, perpendicular to the vertical calibrated wooden rod is used to note the vertex point.



Fig. 1. Instrument for measuring standing height (stature).

#### Technique

The subject is made to stand in an erect posture and measurement is taken without any wear on head and foot. The subject should stand up on the platform against the vertical calibrated wooden rod, feet axis parallel or slightly divergent with head balanced on

neck in F.H. plane. Hands should hang down. The movement of projected horizontal sliding wooden bar is controlled by the right hand, and moved from above downwards along mid saggital plane of the subject to just touch the vertex point. No pressure should be exerted since this is a contact measurement. Then it is fixed by the given screw at that level. The subject is then asked to step down and measurement noted in cm to the nearest mm accuracy.

### Hand length

**Total hand length:** It is straight distance from Dactylion (tip of the middle finger) and midpoint of the most distal flexing crease of the wrist, while the hand is extended along the long axis of the forearm. In this study, the total hand length method is applied to take hand length measurement to get more accurate results.

### Instrument (figure-2)

A specially designed instrument (depth gauge- 12" size) consist of a metal calibre which has measurements from 0 -30 cm. with nearest mm accuracy. A movable metallic piece, which has flat surface at right angle to the calibre, attached with fixation screw and it can be moved along the long axis of the scale by releasing the fixation screw. It is used to touch the dactylion gently.



Fig. 2. Instrument for measuring hand length.

### Technique

The subject is asked to sit on a stool and to extend his hand with all the fingers together in correspondence with long axis of the forearm, on a table with dactylion protruding away from the edge of the table. The observer stands along the subject, place the instrument on the surface of the palm with the free end (zero point – 0.0cm) of the instrument fixed

on the mid-point of the most distal flexing crease of wrist and the movable metallic piece is slided to touch the tip of the middle finger. Then it is fixed by tightening the fixation screw and it is taken out of the hand. Reading is noted.

### Foot length

It measures the straight distance directly from pternion (hind-most point on the heel of the stretched foot) to acropodion (the most distally placed point on the toe-cap of the first or second toe when the foot is stretched). The weight of the body should rest mainly on the foot being measured. The medial border of the foot should be placed parallel to the measuring instrument.

### Instrument (figure-3)

It is a specially designed instrument more or less like an osteometric board of a miniature size. It consists of a horizontal rectangular wooden platform with a fixed metal scale with calibration from 0 – 30 cm. to the nearest mm accuracy. A small wooden piece is permanently fixed perpendicular to the wooden platform at the zero point (0.0cm) of the scale. A movable wooden sleeve with its measuring borders at right angle to the calibrated platform, which can be moved along the horizontal plane of the platform parallel to the permanently fixed wooden piece from the other hand. It is used to touch the acropodion gently.



Fig. 3. Instrument for measuring foot length.

### Technique

The measurement recorded by allowing the subject to stand with one leg being slightly bent and drawn backwards so that the body rest mainly on the other foot which is to be measured. The foot is held stretched

with all the toes close together, with its medial border along and parallel to the one of the long borders of the rectangular platform. The pternion of the foot is allowed to gently touch the fixed wooden piece at the zero point (0.0cm) and the sliding wooden sleeve is allowed touch the acropodion. The recorder then fixes sliding sleeve and the subject is asked to slowly take out the foot from the platform without any disturbance. The reading is then recorded from the scale.

While taking hand and foot measurement, the nails were clipped and trimmed if they were protruding beyond the points of acropodion and dactylion.

The data collected were subjected to statistical analysis by using SPSS (Statistical product and service solution) statistical software and regression formulae were derived with various combinations to reach the best estimate possible

**RESULTS AND DISCUSSION**

In this study 619 cases were taken up for analysis of various parameters like hand length on both sides, foot length on both sides.

Care has been taken to effectively make the sex distribution equally for both males and females (50.2% of males and 49.8% of females) (Figure- 4).

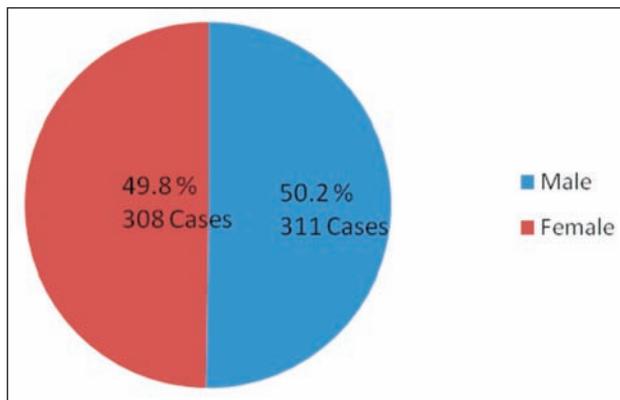


Fig. 4

Cases taken up for study starting from 18 years up to 59 years without omitting even a single year of age progression (figure-5). While taking into consideration the age distribution of the study sample, individuals who have not completed 18 years were deliberately excluded since the process of fusion and growth of long bones would not have got completed. Likewise individuals who have completed 60 years of age and above were also excluded due to the reason that their stature decreases significantly because of osteoporosis and senile changes.

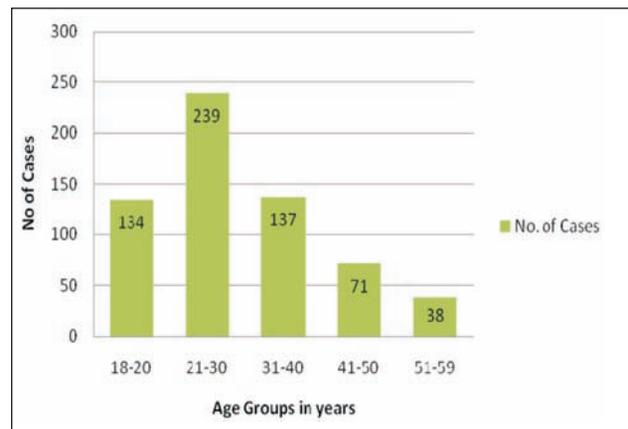


Fig. 5.

In the agewise distribution, the groups of 18 – 20 years and 21 – 30 years constitutes 60.3% (370 Nos.) of total sample size. The stature reduction will be progressive and more during the 6th decade of life and hence due care has been taken to reduce the sample size gradually starting from 4th to 6th decade.

All the data of the study sample were analyzed by applying mean, standard deviation, range, correlation coefficient for the selected variables for both sexes and multiple and simple regression equations for estimation of stature from hand length and foot length were derived separately for males and females. (Table- 1)

**Table: 1 Mean and standard deviation and range of the selected variables of the study sample and comparison between both sexes.**

Variables in cm	Male				Female				Comparison	
	Mean.	S.D	Range		Mean	S.D.	Range		't' value	'p' value
			Min.	Max.			Min.	Max.		
Stature	167.455	7.213	146.1	190.0	154.106	6.389	139.6	178.0	24.364	<0.001
RHL	18.748	0.922	16.2	21.4	17.253	0.792	15.1	19.6	21.630	<0.001
LHL	18.892	0.914	16.5	21.6	17.291	0.781	15.0	19.2	23.430	<0.001
RFL	25.332	1.327	21.3	30.4	23.073	1.144	19.6	26.3	22.675	<0.001
LFL	25.410	1.299	21.8	30.3	23.091	1.127	19.6	26.4	23.711	<0.001

The result indicates there is a significant difference in all the selected variables namely, 1. Stature 2. Right hand length 3. Left hand length 4. Right foot length 5. Left foot length in which males are having higher values than females. It is because in general male individuals are having 1-2 years of extended growth period than in female individuals which results in longer and heavier bones, increase in stature and other dimensions of body parts.

The analysis of the said data clearly shows that there is no significant variation between hand length on both sides and foot length on both sides in case of males as well as in females.

While considering the pearson correlation in both sexes, all the variables showed positive correlation and statistically highly significant. Among the 4 variables, the left foot length (0.763) and right foot length (0.686) showed higher correlation in males and females respectively. (Table- 2 & 3)

**Table 2: Correlation co-efficient of the selected variables for male**

Variables	RHL in cm.	LHL in cm.	RFL in cm.	LFL in cm.
Stature	0.745**	0.728**	0.746**	0.763**
RHL	-	0.959**	0.807**	0.822**
LHL	0.959**	-	0.813**	0.822**
RFL	0.807**	0.813**	-	0.969**
LFL	0.822**	0.822**	0.969**	-

\*\* - P < 0.01

**Table: 3 Correlation co-efficient of the selected variables for Female**

Variables	RHL in cm.	LHL in cm.	RFL in cm.	LFL in cm.
Stature	0.670**	0.650**	0.686**	0.665**
RHL	-	0.958**	0.783**	0.763**
LHL	0.958**	-	0.779**	0.756**
RFL	0.783**	0.779**	-	0.957**
LFL	0.763**	0.756**	0.957**	-

\*\* - P < 0.01

The stature of the adult male was estimated by 9 different regression equations from these variables.

**Table: 4 Multiple and simple regressions equation for estimation of stature from hand length and foot length in males**

S.no	IndependentVariables	Equations	SEE	R	R <sup>2</sup>
1	RHL, LHL, RFL,LFL	S = 48.87 + 0.299 (RFL) + 2.314(LFL) + 3.072 (RHL) - 0.284(LHL)	4.443	0.791	0.626
2	RHL, RFL	S = 50.134 + 2.262 (RFL) +3.202 (RHL)	4.487	0.785	0.616
3	LHL, LFL	S = 49.489 + 2.441 (LHL) +2.827 (LFL)	4.497	0.783	0.614
4	RFL, LHL	S = 51.448 + 2.810 (LHL) +2.484 (RFL)	4.576	0.775	0.600
5	LFL, RHL	S = 48.644 + 2.839 (RHL) +2.582 (LFL)	4.429	0.791	0.625
6	RHL	S = 58.161 + 5.830 (RHL)	4.818	0.745	0.555
7	LHL	S = 58.940 + 5.744 (LHL)	4.956	0.728	0.529
8	RFL	S = 64.671 + 4.057 (RFL)	4.807	0.746	0.557
9	LFL	S = 59.766 + 4.238 (LFL)	4.667	0.763	0.583

1) If all the 4 measurements namely right hand length, right foot length, left hand length and left foot length are known the stature of the adult male person estimated by regression equation No.1.  $S = 48.87 + 0.299 (RFL) + 2.314 (LFL) + 3.072 (RHL) - 0.284(LHL) \pm 4.443$

The multiple correlation coefficients between

stature and all the 4 independent variables among adult males was found to be 0.791 (R value), which is statistically significant at P less than 0.01 level.

In other words if we know all the 4 measurements 62.6% of times of our prediction of stature estimation exactly matches with the actual stature of the male person.

**Table 5: Multiple and simple regressions equation for estimation of stature from hand length and foot length in Females**

S.no	Independent Variables	Equations	SEE	R	R <sup>2</sup>
1	RHL, LHL, RFL, LFL	$S = 52.677 + 2.148 (RFL) + 0.235 (LFL) + 3.109 (RHL) - 0.416 (LHL)$	4.470	0.719	0.517
2	RHL, RFL	$S = 52.601 + 2.341 (RFL) + 2.299 (RHL)$	4.457	0.719	0.516
3	LHL, LFL	$S = 52.562 + 2.802 (LHL) + 2.299 (LFL)$	4.566	0.702	0.492
4	RFL, LHL	$S = 53.712 + 2.384 (LHL) + 2.564 (RFL)$	4.511	0.710	0.505
5	LFL, RHL	$S = 51.813 + 3.133 (RHL) + 2.089 (LFL)$	4.508	0.711	0.505
6	RHL	$60.932 + 5.401 (RHL)$	4.753	0.670	0.448
7	LHL	$62.268 + 5.311 (LHL)$	4.865	0.650	0.422
8	RFL	$65.654 + 3.834 (RFL)$	4.653	0.686	0.471
9	LFL	$67.101 + 3.768 (LFL)$	4.779	0.665	0.442

If all the 4 measurements namely right hand length, right foot length, left hand length and left foot length are known the stature of the adult female person estimated by regression equation No.1.

$$S = 52.677 + 2.148 (RFL) + 0.235 (LFL) + 3.109 (RHL) - 0.416 (LHL) \pm 4.470$$

In general if we know more than one measurement i.e. all 4 measurements or ipsilateral hand and foot measurements or contralateral hand and foot measurements, the prediction validity of the estimation of the stature of the person was higher compared to prediction validity from a any single measurement alone.

**Table 6: multiplication factors for stature estimation from hand length and foot length of both sides in both sexes**

Selected Variables	Male	Female
Right hand length	8.93	8.93
Left hand length	8.86	8.91
Right foot length	6.61	6.68
Left foot length	6.59	6.67

**CONCLUSION**

Stature prediction will be more accurate, when we use combination of any hand length and foot length, for calculation by regression formulas. However it can also be estimated if any one of the parameter is available. It is always more preferable if we get the foot length than hand length. While calculating stature by regression formula method, the results are relatively more precise in males rather than in females.

There is no significant variation in the multiplication factors in case of males and females while estimating stature using hand length and foot length. To conclude, since this study gives statistically highly significant values, stature estimation in this

regional population can be more accurately calculated by applying these regression equations and multiplication factors

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**Conflict of Interest:** Nil

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**Ethical Clearance:** Obtained from the institutional ethical committee.

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# Fatal Accidental Cut Throat Injury by Manja: a Case Report

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## ABSTRACT

Kite flying is a popular sport in India among children and young adult males especially during spring season. However this sport turned fatal for a girl aged five years when she sustained fatal cut throat injury by a kite thread. The girl was seated in front on a motorbike driven by her father when her neck came across the kite string of a flying kite. She succumbed to her injuries within an hour of the accident. Fatal cases due to cut throat injury by kite thread are rarely reported in literature. The case highlights the need for law enforcement agencies to create awareness among people and form rules and regulations to avoid fatal consequences of such a sport.

**Keywords:** Kite String, Sport, Fatal, Cut Throat Injury, Law Enforcement Agencies

## INTRODUCTION

What started as a re-creational activity ages back has evolved into a sport called kite fighting. These fighter kites compete voraciously to cut the fine threads of the other in a rampage to win. Indians celebrate Makar Sankranti (harvest festival), Republic Day, Independence Day, every year at various times throughout the length and breadth of the country by flying of the colorful kites (patang).<sup>1</sup>

In Pakistan, about 450 people have been killed during the kite-flying festival in the last ten years. Most of them were teenagers and children. At least 19 people, including 8 children, lost their lives and more than 500 were injured while celebrating the festival in the year 2005 alone. In most of these fatal cases, death had been caused by the special kite-lines carrying razor-like metal strips called "Manja".<sup>2</sup> In India too, though such cases are not infrequent but statistical evaluation is still awaited.

Manja (Kite string) is an abrasive material made of cotton or nylon string that is coated with fine glass powder using glue and other chemicals as adhesives. Cotton thread of any thickness or brand can be used for making manja. However, fine, smooth and strong

threads are preferred.<sup>3</sup> Chinese manja is made of metallic/nylon yarn with an abrasive coat of crushed glass gummed on to it making it razor sharp and non-biodegradable.<sup>1</sup>

Kite flying are associated with various types of injuries, including accidents that occur during the preparation of the threads, electrical injuries from high tension currents, falls that occur during the game, or injuries caused to bystanders during kite flying, especially those riding motorcycles or bicycles.<sup>4-5</sup> Injuries related to kite flying commonly range from mild injuries to severe disability and death and may manifest with varied clinical presentations with chemical, metallic and manja strings.<sup>6</sup> Hereby reporting an accidental case of fatal cut throat injury caused due to kite string.

## CASE REPORT

A five years old girl was brought to the department of Forensic Medicine, Indira Gandhi Government Medical College, Nagpur, for post-mortem examination on 2/11/2011 with an alleged history of accidental cut throat injury by a kite string. On perusal of police inquest and history narrated by relatives regarding the manner of accident, the deceased was

seated on front of a motorbike driven by her father and kite string accidentally came across her neck leading to fatal cut throat injury.

On autopsy, clothes of the deceased were found intact and soaked in blood at places. The body was pale, averagely built, rigor mortis was well marked in whole body, post-mortem lividity was faintly appreciated and fixed, no oozing of blood or any other fluid was noted from mouth, ears or nostrils, blood stains were present over the body surface at places and no purging was seen. On local examination, transversely placed deep incised cut throat injury was present over the front of neck and extending on both sides from midline, 10cms on right and 3cms on left with tailing of 1 cm on left side. The underlying superficial and deep muscles were cut, trachea was cut at the level of 2<sup>nd</sup> tracheal ring and right external jugular vein was cut. Both margins of the wound were ragged and upper edge was abraded in midline for 4 cm. No other surface injury was observed.

On internal examination, there was no evidence of air embolism due to injury to external jugular vein. All visceral organs were intact and pale. Stomach contained about 50cc semi-digested food without any peculiar odour and spine was intact. Blood clots were present in trachea. Opinion as to the cause of death was given as "Hemorrhage and Shock due to accidental cut throat injury to neck".



Fig. 1. Showing cut throat injury due to manja.



Fig. 2. Showing torn external jugular vein.



Fig. 3. Showing trachea cut at the level of 2<sup>nd</sup> tracheal ring

## DISCUSSION

Kite flying is done from roof as well as ground. The one who is flying the kite can sustain injury to the palm of the hand. If the injury is severe, it can result in the complete transection of flexor tendons. The person flying a kite from the rooftop can also be injured by falling from a height. This could lead to polytrauma since he may be moving around while looking at the sky. The person who is not flying the kite usually suffers injuries above the clavicle involving the head

and neck region. As the stray kite drags the thread, it can tangle around the neck or limb of a person riding a motorbike causing serious and sometimes fatal injuries.<sup>8</sup>

Pattern and characteristics of injuries caused by manja include<sup>3</sup>

- a) They are always transversely or obliquely placed encircling the contour of the body.
- b) They are usually single.
- c) They are unidirectional.
- d) Edges of the incised wound are abraded.
- e) Margins of the incised wound are ragged.
- f) Incised wounds are deepest at the center of the injury.
- g) Glass particles can be found at the angle of the injury in the opposite direction of the moving manja.

Motorcyclists, cyclists and pedestrians including both the adult and elderly people may sustain injuries when they come across strings of a flying kite or a wandering kite because of inattention to their surroundings.<sup>5</sup> The severity of the injuries suffered by the motorcyclists depends on both the speed of the vehicle and the kite, which is directly related to the wind speed.<sup>7</sup> Manja having a white color can be more dangerous as they are difficult to visualize by driving motorcyclists. Moreover, as the use of motorcycles has significantly increased in the last few years, riders are especially vulnerable to injuries caused by manja. Nowadays, with the large scale use of Chinese manja the incidences of people suffering from injuries have gone up many folds.

Contact between manja and human skin can lacerate the skin and the deep fascia of the neck and injure internal cervical structures, such as the carotid arteries, jugular veins, larynx, and trachea.<sup>9</sup> In two cases reported by Neto et al<sup>8</sup>, both victims were riding bikes and sustained neck injuries. In one case there was laceration of internal jugular vein while trachea was lacerated in the second case. The present case highlights the potential lethal injuries to the vascular system and visceral injuries to the neck that can occur due to an innocent looking thread.

## CONCLUSION

Injuries related to kite flying are preventable to a great extent. Precautions include choosing a safe location like an open ground and keeping a safe distance from telephone lines, electricity cables, trees, roads, cars, and people. Participants should not touch the kite string during flight, allow anyone to walk in between the control handle and the kite, or fly a kite in strong winds. Participants should wear gloves if possible while flying a kite. Laws should be passed for banning the use of Chinese and other glass coated manja. Strict actions should be taken against kite vendors not following the law. Compulsory wearing of helmets should be implemented. Awareness programs must be undertaken before every kite flying season regarding the hazards of such a sport. Moreover, this atypical mechanism of injury must be examined to develop preventive measures and to prepare emergency physicians and trauma surgeons for the appropriate management of patients.

**Acknowledgement:** None

**Conflict of Interest:** No conflict of interest

**Source of Support:** Not applicable

**Ethical Clearance:** Not required

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# Quack - A Killer in Disguise: a Case Report

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## ABSTRACT

Quack is one of the several pejorative names used for doctors or peddlers using supposedly ineffective medicines and it also relates to advertising. Quacks are practicing in every field of medicine, field of surgery being no exempt. Quackery in surgical field is mainly in the treatment of anal canal and perineal diseases. Some of the people are really happy for visiting them and declaring their ailments being cured. But many of them have to repent for, mainly because their original problem gets complicated and the price for treating the complication proves at times to be too burdensome than the price incurred for treating the original ailment. We present a fatal case where a person with scrotal swelling, actually being an inguinal hernia, was misdiagnosed and operated upon as hydrocele by a quack.

**Keywords:** Quack, Inguinal Hernia, Hydrocele

## INTRODUCTION

Most human beings will do almost anything to prolong their existence or to relieve themselves from the suffering of a disease. Others will do anything to exploit these desires by selling what they claim to be magical remedies or panacea for all diseases even for the incurable ones. A quack is one who practices a form of medicinal system without qualification, training and registration from the appropriate council or authority<sup>1</sup>. Quacks are practicing in every field of medicine, field of surgery being no exempt. A fair bulk of population from all walks of life and different cross sections of society, visit these quacks for their ailments. Some of them are really happy for visiting them and declaring their ailments being cured. But many of them have to repent for visiting quacks, mainly because their original problem gets complicated and the price for treating the complication proves at times to be too

burdensome than the price incurred for treating for treating the original ailment. We present here a case where a young man with a scrotal swelling was operated upon by a self-styled unqualified doctor suspecting a hydrocele. The man succumbed to the complications of the radical operative procedure done by the quack, which would have been a minor surgery with remote chances of mortality to a qualified surgeon.

## THE CASE REPORT

A corpse of a 28 years old male was brought for medicolegal autopsy with a history of post-operative complications following a surgical procedure done for a scrotal swelling. According to the history received from the relatives and the investigating authorities the deceased had been to a quack a couple of days back. The quack operated upon him and was discharged on the same day itself. While at home the condition of the deceased deteriorated and he was subsequently admitted to a private hospital with complaints of severe pain in abdomen. He succumbed on the same night.

The autopsy was performed 16 hours after death. The victim was 169cm tall and weighed 59kg. A surgically incised wound of size 07 cm x 01 cm was

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present on right lateral aspect of scrotum. Fecal matter and pus was seen oozing from the wound. Internal examination revealed collection of about 1000 ml yellowish fluid admixed with fecal matter in the peritoneal cavity. Ileum was completely transected at 46 cm proximal to ileo-caecal junction. Indirect inguinal hernia was evident with the loops of small intestines seen protruding through the internal inguinal ring. The spleen was enlarged and multiple sub-capsular pus flecks were present. Stomach contained semi-digested food material. Brain and both lungs were congested and edematous. All other organs were congested. Opinion as to the cause of death was given as "Septicemia associated with perforation peritonitis due to ileal transection".



Fig. 1. Stitched wound over scrotum



Fig. 3. Transected ileum



Fig. 4. Actual track of indirect inguinal hernia



Fig. 2. Fecal contents in peritoneal cavity with congestion of intestinal walls

## DISCUSSION

Health is one of those pertinent factors which can either help or hinder the process of national development. The credit and repute of any health care system depends on the quality of service it renders to the beneficiaries.<sup>2</sup> According to a study conducted by Association of Medical Consultants (AMC) in 2009, there are around 2.5 million quacks in India, with Mumbai having as many as 20000 and Delhi having 40000 quacks. Interestingly, there are around 95,000 quacks in Maharashtra state as against 90,000 registered doctors in the state<sup>3</sup>.

Few reasons why patients visit quacks can be (1) the attractive publicity gimmicks claiming faster, cheaper and sure cure<sup>4</sup>. (2) Regular practitioners are less enthusiastic in treating these ailments. (3)

Misconceptions in population at large about surgery for genital ailments viz. Surgery is followed by too much of a pain, bleeding and more importantly can destroy ones masculine vigor. (4) Low cost of treatment. (5) Privacy and secrecy is often better maintained; (6) Treatment by quack is treatment thought to be without surgery or operation.

Mortality risk following elective hernia repair is low, even at high age<sup>5</sup>. The quack in the case who claimed to have a bachelor degree in Ayurveda medicine from some college in West Bengal state had worked as an operation theatre attendant in the past and had assisted surgeons in hydrocele and hernia repair surgeries. He had been practicing medicine since last couple of years in a locality of the city chiefly inhabited by laborers. The deceased being a laborer, must have fallen prey to the tall claims of cheaper cure by the quack. After mistakenly diagnosing the indirect inguinal hernia as a hydrocele the quack must have opened up the scrotum under local analgesia. Suspecting the intestinal loops as a hydrocele sac he incised the intestines and transected them.

People trust the quack with their lives who would not trust him with the loan of six pence. It is unfortunate that people approach quacks for their low charges, but ultimately end up either in paying more or endangering their lives because of the wrong treatment they undergo. Ethics is not a criterion for these men – they are not bound by any oaths to safely manage patients. The innocent patient is easily taken for a ride due to an easy access to such quacks and the promise of early relief<sup>6</sup>.

As per the 1998 Supreme Court of India ruling in the Mukhtiar Chand case, no doctor can practice a system of medicine that he or she is not well versed in. According to the rules of Medical Council of India (MCI), the punishment for quackery is a fine of rupees 1,000 and one year imprisonment. But the Indian Penal Code states that quackery is a non-cognizable offence, and hence the police cannot arrest the quacks.

Quackery can be effectively tackled by improving & strengthening the health infrastructure and facilities,

improving the public health delivery system, outreach & coverage, increasing public awareness and consciousness, reporting quackery & malpractices, ensured implementation of the acts/ rules and active participation of medical and health professional bodies/associations.

## CONCLUSION

There is a need to educate the masses about the dangers of being treated by the quacks. To distinguish quacks from registered doctors, doctors should display their certificates in their clinics, abiding by the new ethical code of conduct of MCI. The Medical Associations and law enforcing agencies are required to deal with these pretentious charlatans, offering quack remedies with iron hands.

**Acknowledgement:** None

**Conflict of Interest:** No conflict of interest

**Source of Support:** Not applicable

**Ethical Clearance:** Not required

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# Morphological Study of Liver Disease in Alcoholics - an Autopsy Study

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## ABSTRACT

**Background and Objectives:** Alcohol induced liver disease is a major cause of ill health and mortality. This autopsy study is conducted to know the morphological changes of liver disease in alcoholics and to study the incidental liver findings.

**Materials and Method:** Present study is a prospective descriptive study. Total of 50 autopsy liver specimens with history of habitual alcohol intake, laboratory findings and autopsy findings were collected from the department of Forensic medicine during the period 2011-13. Detailed gross and microscopic examination of liver specimens were done.

**Results:** Mean duration of alcohol consumption was 13years. Hepatomegaly was the common gross finding seen in 42%(n-21) of cases. Hepatic steatosis of macrovesicular type and severe grade was the common microscopic finding seen in 54%(n-27) of cases. Fibrosis was seen in 94%(n-47) cases and association between duration of alcohol consumption and fibrosis was statistically significant. Hepatic siderosis i.e. stainable iron was found in 70%(n-35) of cases and veno-occlusive lesion seen in all the cases. Miliary tuberculosis was the incidental finding seen in 8%(n-4) of cases.

**Conclusion:** Autopsy is an excellent learning tool. This study showed that fibrosis and veno-occlusive lesions were invariable findings and on progression leads to cirrhosis which is an end stage liver disease.

**Keywords:** Autopsy, Liver, Alcoholics, Morphology, Diseases

## INTRODUCTION

Alcohol is proved to be a hepatotoxin. Diagnosis of alcoholic liver disease is based on accurate history of habitual alcohol intake, appropriate laboratory investigations like raised gamma glutamyl transferase, mean corpuscular volume and histopathological examination<sup>1</sup>. By definition an alcoholic is usually taken to be an individual who consumes an amount of alcohol capable of producing pathology (Criteria committee national council on alcoholism, 1972). For most individuals this is in excess of 80gm of ethanol per day<sup>2</sup>. The spectrum of alcohol induced liver lesions include fatty liver, alcoholic hepatitis, alcoholic cirrhosis and hepatocellular carcinoma<sup>3</sup>. The literature search on autopsies indicate progressive decline in

autopsy rates. The recent autopsy workshops have emphasized the importance of medical autopsy which is an excellent learning tool. Many conditions would go unnoticed and undiagnosed unless the autopsy is performed. In 10-20% of autopsies the findings are either unexpected or accidental. Hence this autopsy study was conducted to know morphological changes in liver disease in alcoholics and to study the incidental liver findings.

## MATERIAL AND METHOD

Autopsy liver specimens were collected from the department of Forensic medicine during the period 2011-13.

**Inclusion criteria:** Postmortem cases aged above thirty years with history of habitual alcohol intake

**Exclusion criteria:** Liver specimens showing autolytic changes

Clinical history, laboratory findings and autopsy findings were collected from autopsy records.

Minimum three representative sections from right lobe, left lobe, deeper areas and from any grossly visible lesions were taken. Following routine tissue processing and paraffin embedding, sections of five micron thickness were taken and stained by routine Haematoxylin and Eosin staining. Special stains like Van Gieson / Masson's trichrome/ Reticulin for connective tissue, Perl's Prussian blue for iron and Ziehl Neelsen for acid fast bacilli were done wherever necessary.

### RESULTS

Majority of patients belonged to age group 40 to 49 years. Males accounted for 96% and females were 4% of cases. Mean duration of alcohol consumption was 13years. Hepatomegaly was the common gross finding. Histopathological spectrum in the present study included steatosis in 28% cases, steatohepatitis in 26% cases, cirrhosis in 18% cases, hepatitis in 10% cases, perivenular fibrosis in 10% cases and miliary tuberculosis in 8% cases (Graph 1). Severe grade and macrovesicular type of steatosis were more common.

Alcoholic cirrhosis grossly showed micronodularity in 70% cases, microscopically they showed stage IV fibrosis, regenerating nodules with macrovesicular steatotic change in 80% cases, associated introlobular inflammation and bile duct proliferation was seen in 60 and 70% cases

Fibrosis was seen in 94% of cases studied, stage II fibrosis was seen in 50% of cases, stage III / bridging fibrosis was seen in 26% of cases and stage IV / nodular fibrosis was seen in 18% of cases(Graph 2). Veno-occlusive lesions were seen in all the cases, phlebosclerosis was the common type (Graph 3). Hepatic Siderosis was seen in 72% of cases studied, grade I in 30% cases, grade II in 30% cases, grade III in 8% cases and grade IV in 4% cases studied(Graph 4).

Cirrhosis was more commonly seen in patients consuming alcohol for more than 10yrs . Association between duration of alcohol consumption and fibrosis was found to be statistically significant (Table 1).

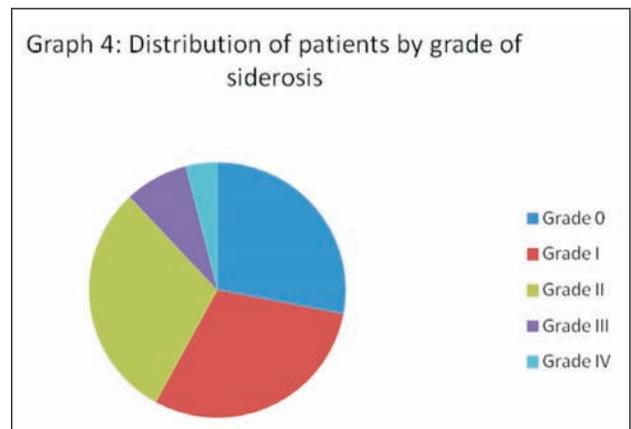
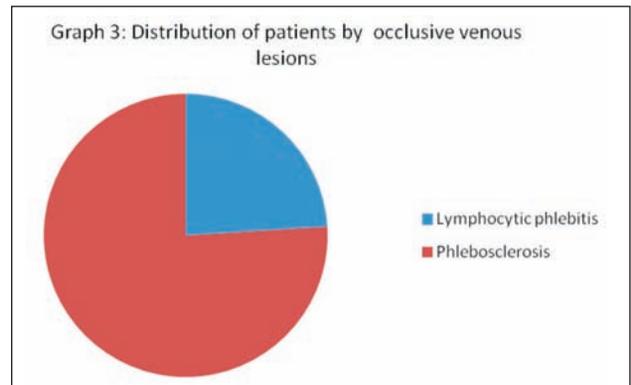
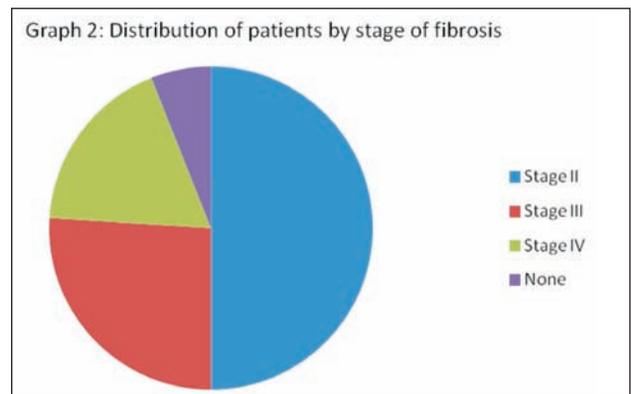
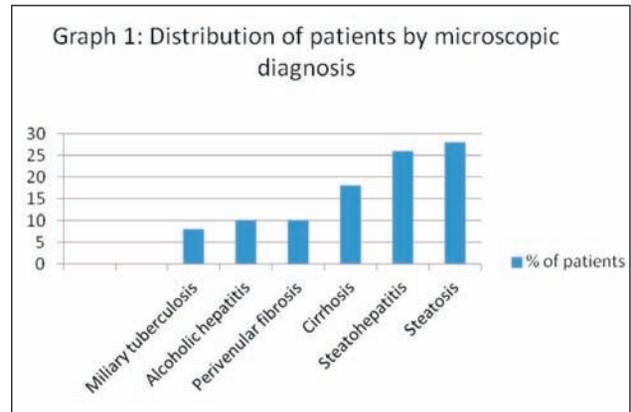


Table 1: Association between duration of alcohol consumption and fibrosis

Correlation between duration of alcohol consumption and stage of fibrosis	N	Spearman R	t-value	p-level
	50	0.2772	1.9986	0.0513

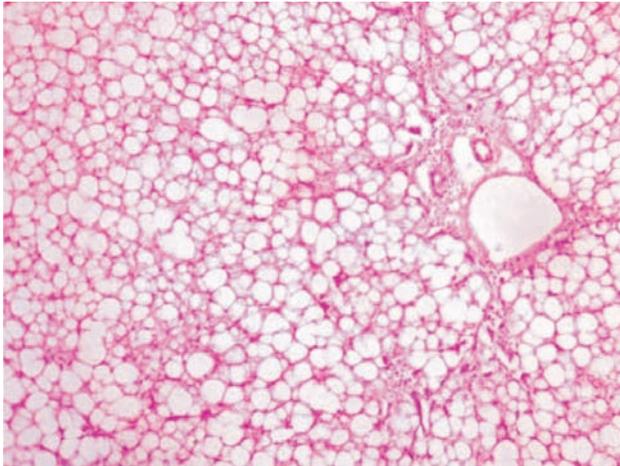


Fig. 1. Microphotograph of macrovesicular hepatic steatosis (H&E, 100X)

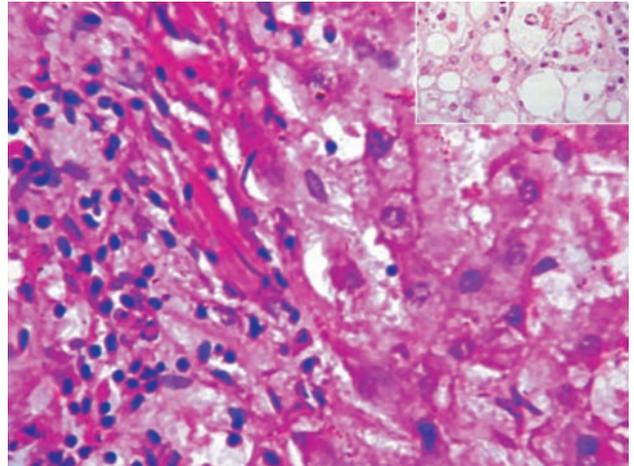


Fig. 2. Microphotograph of chronic hepatitis showing ballooning degeneration of hepatocytes, fibrosis and lymphocytic infiltration with Mallory body in the inset. (H&E, 400x)



Fig. 3. Gross photograph of micronodular cirrhosis of liver



Fig. 4. Gross photograph of liver showing cystic area filled with caseous material

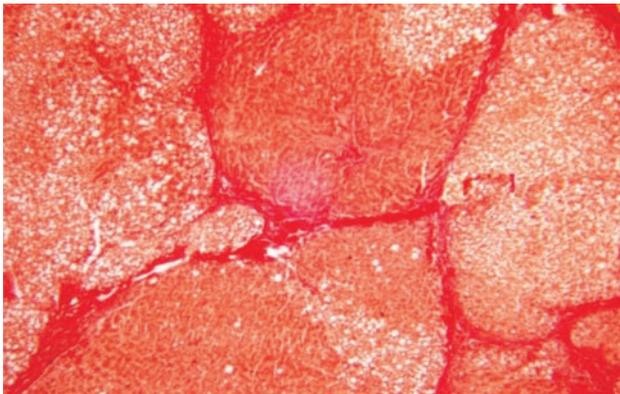
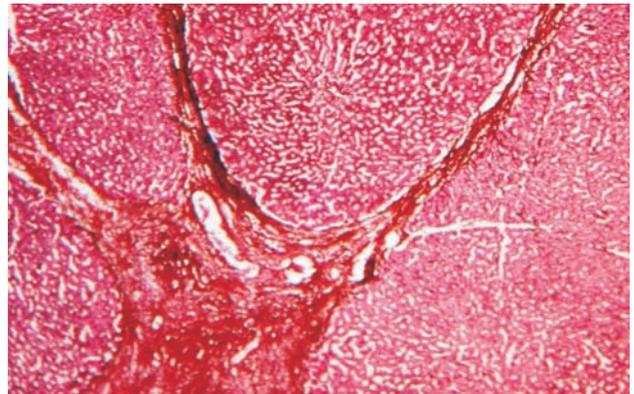


Fig. 5,6. Microphotograph of cirrhosis 100X (Van Gieson & Reticulin stain)



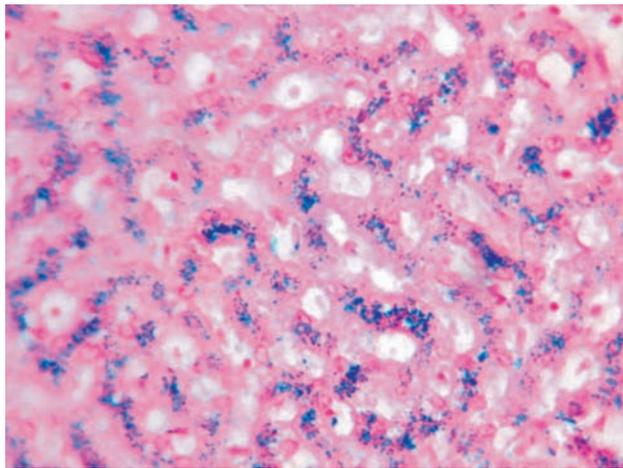


Fig. 7. Hepatic siderosis grade III (Perl's prussian blue stain, 400x)

inturn leads to altered lipid metabolism, causing fat accumulation within the hepatocytes leading to fatty liver<sup>4</sup>. Also there is activation of stellate cells which further activates fibroblast leading to collagen synthesis and hence fibrosis. These lesions begins at perivenular/ centrilobular region. This is because chronic alcohol ingestion results in an increased consumption of oxygen causing centrizonal hypoxia, hence alcohol induced liver injury selectively affects perivenular region in early stages<sup>5</sup>. Detailed histological assessment is required to know the stage of the disease and to assess certain parameters which predict progression of liver disease to cirrhosis. Cirrhosis is the end stage lesion and precursor to the development of hepatocellular carcinoma.

**DISCUSSION**

Hepatic changes are common in alcoholics and their development is determined by dose and duration of alcohol intake. Mechanism of alcohol induced liver lesions are due to hepatotoxic affects of acetaldehyde, altered redox potential (NADH>NAD), immunological and cytokine mediated injury. This

Different studies have different defining criteria for alcoholism. In our study we have included patients consuming alcohol regularly for more than 5years.

**Gross findings**

Hepatomegaly was the common gross finding in many studies

**Table 2: Hepatomegaly in various studies**

Hepatomegaly	Mendenhall et al <sup>2</sup>	Hardison et al <sup>6</sup>	Helman et al <sup>7</sup>	Present study
Incidence	80%	78%	91%	42%

Orrego et al<sup>12</sup> showed that water, fat and protein all contribute to the enlargement of hepatocytes leading to hepatomegaly.

**Microscopic findings**

**Table 3: Comparison of microscopic findings in fatty liver**

	Amarapurkar et al <sup>8</sup>	Teli et al <sup>9</sup>	Present study
Incidence of steatosis	75%	88%	54%
<b>Morphological type</b>			
Macrovesicular	–	76%	50%
Mixed		23%	40%
Microvesicular		1%	10%
<b>Inflammation</b>			
Mild	48%	–	60%
Moderate	41%		40%
Severe	8%		–
<b>Fibrosis stage</b>			
I	12%		10%
II	12%	–	40%
III	38.60%		30%
IV	38.60%		20%

**Hepatic steatosis**

Leevy CM<sup>10</sup> analyzed 270 patients of fatty liver and found that alcoholism was the commonest cause for steatosis 43.3% followed by diabetes 6.3%.

Many studies have emphasized role of histological assessment in a case of fatty liver, extent of

inflammation and degree of fibrosis provides basis to decide whether or not steatohepatitis is present<sup>11</sup>.

In our study, alcoholic steatosis in addition to fatty change majority of the cases showed signs of inflammation and fibrosis which are important predictors for progression to hepatitis and cirrhosis.

**Table4: showing comparison of microscopic diagnosis**

Microscopic findings	Brunt et al <sup>12</sup>	Krasner et al <sup>13</sup>	Sherlock et al <sup>14</sup>	Liew et al <sup>15</sup>	Present study
1) Hepatic steatosis	45%	18.4%	15%	12.9%	54%
2) Alcoholic hepatitis	22%	6.9%	11%	6.1%	10%
3) Cirrhosis	29%	58%	36%	74%	18%
4) Perivenular fibrosis	4%	-	-	7%	10%

**Cirrhosis**

Cirrhosis in chronic alcoholics evolves by three phenomenon- fatty steatosis, necrosis and fibrosis occur together but may act independently to some extent and at different speed ending in cirrhosis. Incidence of cirrhosis among alcoholics in autopsy studies ranged from 2-30%. Lelbach<sup>16</sup> found that the prevalence of cirrhosis increased linearly with duration of alcohol consumption and reached 51% who consumed alcohol for more than 15 yrs. In Brunt et al<sup>12</sup> study alcoholic cirrhosis was of micronodular type in two-third of cases and commonest pattern was cirrhosis with fatty change and severe inflammation, which is comparable with the present study. In present study cirrhosis accounted for 18% of cases, 90% of them were consuming alcohol for more than 15yrs. Alcoholic cirrhosis grossly showed micronodularity in 70% cases. Microscopically stage IV fibrosis, regenerating nodules with macrovesicular steatotic change was seen in 80% of cases. Associated intralobular inflammation and bile duct proliferation was seen in 60 and 70% of cases.

Majority of the studies mainly focused on spectrum of alcoholic liver disease which includes fatty liver, alcoholic hepatitis and cirrhosis. Present study also emphasizes on additional components in the spectrum which includes perivenular fibrosis, veno-occlusive lesions and iron overload (hepatic siderosis).

**Fibrosis**

Alcohol produces highly characteristic but not entirely specific pattern of fibrosis. Fibrosis is due to stellate cell activation. Early lesion is pericellular fibrosis producing chicken wire pattern with Masson’s

trichrome or any other special stain for collagen. This further progresses to perivenular fibrosis responsible for veno-occlusive lesions. Bridging or stage III fibrosis is characteristic feature of alcoholic hepatitis, this is followed by nodular or stage IV fibrosis ending up in cirrhosis. In present study there is significant association between duration of alcohol consumption and stage of fibrosis. It has been suggested that this lesion is a precursor of cirrhosis and is useful in identifying patients progressing to more serious liver injury.

**Occlusive venous lesions**

Goodman et al<sup>17</sup> studied nature and significance of vascular lesions in alcoholic liver disease from 200 autopsies and concluded that occlusive lesions contribute to the development of portal hypertension in alcoholic liver disease. In present study occlusive venous lesions were seen in all the cases , phlebosclerosis was seen in 76% cases and lymphocytic phlebitis in 24% cases.

**Hepatic siderosis**

It has been found that excess stainable iron is found in both hepatocytes and Kupffer cell in many patients with alcoholic liver disease. This is due to direct effect of alcohol on small intestine enhancing iron absorption, high iron content of some of the beverages and hemolysis associated with spur cell. In Brunt et al<sup>12</sup> study stainable iron was found in 39% cases and majority were of grade I and II. In present study all the cases were studied for iron load by Perl’s Prussian blue stain. Stainable iron was found in 72% cases and majority were grade I and II.

## CONCLUSION

Autopsy is an excellent learning tool. It provides abundant material for better morphological assessment of the disease. This autopsy study on alcoholics showed that fibrosis is an invariable finding and is statistically significant with the duration of alcohol consumption. Perivenular and perisinusoidal fibrosis accounts for portal hypertension and on progression leads to cirrhosis which is an end stage liver disease. Identifying histological parameters like severe grade of steatosis, inflammation and fibrosis in a case of fatty liver gives an idea about the progression of the disease to hepatitis and cirrhosis. Miliary tuberculosis was the common incidental finding in our autopsy study which gives an idea about burden of tuberculosis in the community.

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# Chemical Enhancement of Fingerprints on Various Porous and Non-Porous Surfaces

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## ABSTRACT

Latent fingerprints created by the transfer of perspiration from skin to a surface, require chemical enhancement to make ridge detail visible. This study contains two separate investigations, the first part investigates the chemical development of latent fingerprints on porous surfaces studying different paper types, using different chemical techniques. The second part of the study involves the analysis of fingerprints in which the transfer medium is blood. A side-by-side comparison of the available chemical techniques targeting a variety of porous and non-porous surfaces was carried out and the sensitivity of the chemicals was also tested through serial dilutions and concentration gradients of whole blood. Findings indicate that several conditions affect the quality of fingerprints. The degree of fingerprint ridge detail yielded during chemical development is influenced by factors such as the chemical technique used and the particular substrate from which the fingerprints are enhanced.

**Keywords:** Latent, Ninhydrin, DFO, Blood

## INTRODUCTION

Fingerprint identification is based on two primary factors; uniqueness and permanence.

Fingerprints are a reproduction of friction skin ridges which release perspiration leaving the finger's ridge pattern on the surfaces upon contact. Latent prints deposited in this manner are invisible to the eye. Some means of development is generally required for their visualization.<sup>1</sup>

This study investigates the various techniques for the development of fingerprints. The initial part of the study relates to the chemical development of latent fingerprints on various types of paper. The different absorbent properties of such paper types were considered given that different paper types absorb the

sweat of fingerprints differently. Ninhydrin and DFO, which both react with the amino acids present in fingerprints, were compared to investigate which chemical yields overall best results on a particular paper type.

The second part of the study further analyzed fingerprints present in blood, since often fingerprints are deposited in combination with biological material. An evaluation of different enhancement methods including Amido Black, Cyanoacrylate, Ninhydrin and DFO was carried out whilst studying both porous and non-porous surfaces. The effectiveness of the development techniques at different blood dilutions was also a parameter of the study.

Knowing which development technique yields the best results when faced with different surfaces in the forensic field is a valuable asset for forensic experts.

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## MATERIALS AND METHOD

### Subjects

The fingerprints used in this study were obtained by prior agreement from a volunteer. The volunteer's

fingerprint was used throughout all the phases of the study. The same one volunteer was considered in order to limit as much as possible any variations in the pressure with which the latent fingerprint was made. The thumb print was produced by applying medium pressure on a surface for five seconds. In the second part of the study, the thumb was first pressed onto a paper towel dampened with the blood, and then immediately touched onto the surface being investigated.

### Surfaces/Substrates

The first part of the study investigated different porous surfaces. The fifteen paper types used in this study are art paper, rag paper, offset cartridge paper, bible paper, light colored marbled paper, newsprint, fax/thermal paper, brown paper, wax paper, bond paper, embossed paper, board paper, photographic paper, dark colored marbled paper and silver paper. Ten samples of each paper type, measuring 8cm x 6cm were utilized for each chemical test carried out.

The second part of the study utilized non porous surfaces namely glass, ceramics, adhesive tape and plastic and porous surfaces including paper, wood, gypsum and limestone. Ten samples of each surface studied, measuring 15cm x 15cm were used. All substrates were first cleaned using ethanol and handled through the use of latex gloves to prevent transfer of unwanted fingerprints.

The selection of substrates of this study was based on those most commonly encountered at crime scenes.<sup>2</sup>

### Reagents and Methods

Ninhydrin and DFO were utilized in the first part of the study. The performance of Ninhydrin dissolved in three different solvents was investigated. Three different Ninhydrin working solution were prepared mainly Ninhydrin dissolved in Ethanol, Ninhydrin in Acetone and Ninhydrin in Methanol, to investigate any difference in the performance of the three Ninhydrin carriers.<sup>3</sup> Following treatment with Ninhydrin, the paper articles were examined for clarity after seven days to allow further fingerprint development. When Ninhydrin comes into contact with amino acids in fingerprint residue, a purple/red print is yielded.

The DFO working solution was also prepared and after exposing the paper articles to DFO, horizontal drying was ensured to avoid the formation of any fluorescent bands which can mask fingerprints. The

coloured reaction is much weaker than that obtained with Ninhydrin and thus fluorescence examination is necessary. Quaser 2000/30 was used at excitation wavelengths in the range of 473-548nm and 503-587nm.<sup>4</sup>

In part 2A of this study, whole defibrinated horse blood was utilized. The use of defibrinated blood ensured that blood coagulation was prevented. Ninhydrin and DFO working solutions were applied to the porous surfaces. Excitation wavelengths of 400-469nm were utilized for fingerprints in blood, so as to enhance contrast as much as possible.<sup>4</sup>

For non-porous surfaces, fingerprints contaminated with blood were enhanced with Amido Black by first fixing the blood by immersion in methanol followed by immersion in working solution. This was followed by washes in an acetic acid-methanol solution and an acetic acid-distilled water solution.<sup>3</sup> Amido Black stains protein in blood to give a blue-black product as can be seen in Figure 1. Cyanoacrylate treatment was carried out by heating the cyanoacrylate in a high humidity fuming chamber. As the fumes condense, white-coloured latent prints develop.



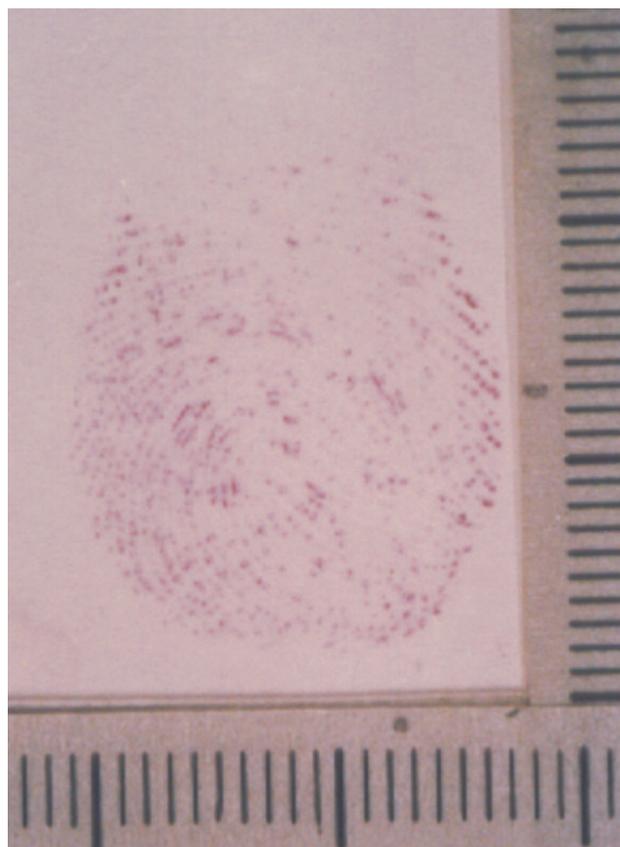
Fig. 1. A Fingerprint enhanced using Amido Black

Part 2B of the study was carried out on two porous (paper and gypsum) and two non-porous surfaces (glass and ceramics) using Ninhydrin and Amido Black for the respective surfaces. Whole defibrinated horse blood was serially diluted from concentrations ranging from 1:10 to 1:10,000, using physiological saline as the diluent. Fingerprints were obtained on all the surfaces. The appropriate chemical development followed, depending on the surface type. This was repeated using all the blood concentrations prepared. The above procedure was repeated using sequential touches where four fingerprints were sequentially made next to each other on the same surface without re-dipping the finger in the touch pad. Sequential touches of a surface provide a convenient, reproducible gradient of concentration of the transfer medium, in this case whole horse blood.

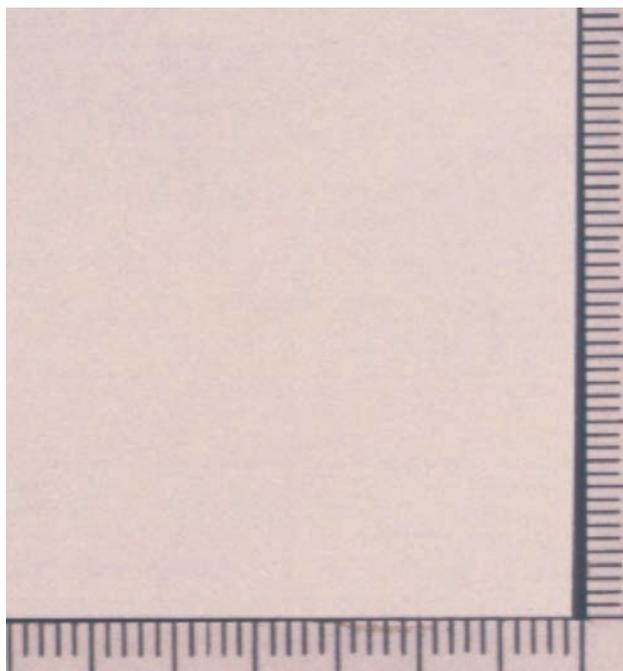
### Fingerprint Analysis after Development

The fingerprints were photographed, dated and stored. To make a quantitative assessment of the study carried out, it was necessary to 'grade' the developed fingerprints. Developed fingerprints were 'graded' by studying the ridge detail yielded. A 'quality' scale from 0 (lowest ridge detail) to 3 (highest ridge detail) was used.<sup>5</sup>

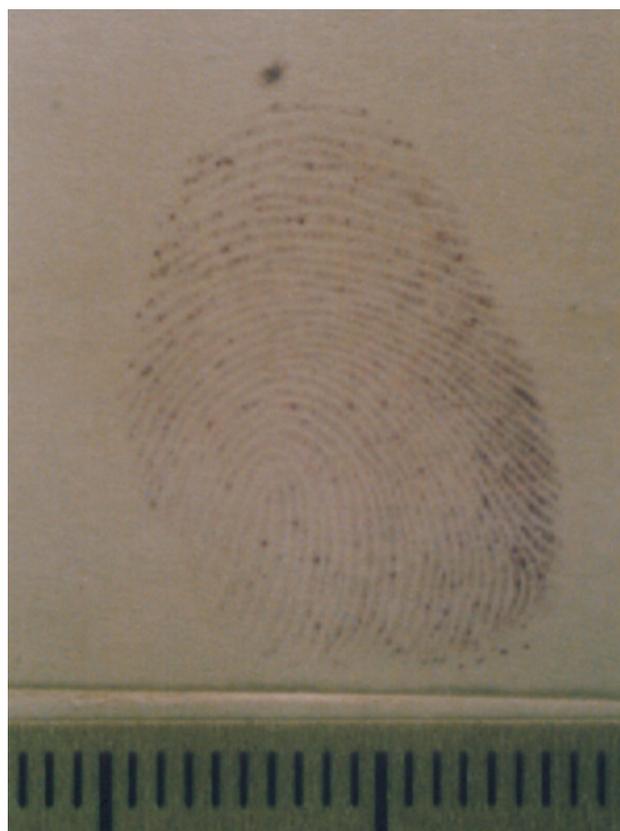
Figure 2 depicts the grading standards used to grade developed prints.



Grade 1



Grade 0



Grade 2



Grade 3

Fig. 2. Ninhydrin - Developed Fingerprint Grading Scale

## FINDINGS

Results were analyzed using SPSS statistical application. T-tests, Friedman tests, Two-way Analysis of Variance were utilized. T-tests and Friedman tests were performed for Part 1 and Part 2A whilst Regression Analysis was used for Part 2B.

In the first study, differences were noted in the performance of the four chemicals used on the selected substrates, Ninhydrin in ethanol yielding best results (overall grade 1.79) followed by Ninhydrin in acetone (overall grade 1.70), DFO (overall grade 1.64) and lastly Ninhydrin dissolved in methanol (overall grade 1.11). It was observed that both chemical and paper type are significantly affecting mean clarity since p-values obtained for both factors was  $< 0.05$ .

The findings of this study indicate that paper is a good source for developing latent prints, as it is generally absorbent. Amino acids have an affinity to the cellulose of the paper. Different paper types have different characteristics and this explains why varying results were obtained on different paper types. Table 1 indicates the first and second chemical preferences for the fifteen different paper types studied, according to the results yielded.

Table 1: First and Second Chemical Preferences for first phase of the study

Paper Type	Ninhydrin in Ethanol	Ninhydrin in Acetone	Ninhydrin in Methanol	DFO
Art Paper	×	“	“	
Rag Paper		“	×	
Offset Cartridge Paper	×	“		
Bible Paper	“	×		
Marbled Paper		×		“
Newsprint Paper	“	×		
Fax Paper	×			“
Brown Paper			“	×
Wax Paper	×			“
Bond Paper		“		×
Embossed Paper	“	×		
Board Paper	“	×		
Photographic Paper		×	“	
Coloured Marbled Paper	“	×		“
Silver Paper				“

“ 1<sup>st</sup> Preference

× 2<sup>nd</sup> Preference

Study part 2A indicates that in the case of the non-porous surfaces (glass, ceramics, adhesive tape and plastic), Cyanoacrylate provided a higher estimated marginal mean (overall grade 2.13) than Amido Black (overall grade 1.80) whilst in the case of paper, wood, gypsum and limestone i.e. porous surfaces Ninhydrin (overall grade 1.43) yielded better clarity means than DFO (overall grade 1.25). However, in both porous and non-porous surfaces, the discrepancy noted between Cyanoacrylate and Amido Black and between

Ninhydrin and DFO is not drastic. A p-value < 0.05 was obtained when the variable in consideration was the surface type. When chemical type was the factor studied, a value of 0.109 was obtained for p. This implies that surface type is the only factor that significantly affects mean clarity.

Once again, findings allow the deduction of the first and second chemical preferences for the porous and non-porous substrates studied as can be seen in Table 2.

**Table 2: First and Second Chemical Preferences for second phase (Part 2A) of the study**

<b>Non-Porous Surface</b>	<b>Cyanoacrylate</b>	<b>Amido Black</b>
Glass	×	“
Ceramics	×	“
Adhesive Tape	“	×
Plastic	“	
<b>Porous Surface</b>	<b>Ninhydrin</b>	<b>DFO</b>
Paper	“	×
Wood	“	
Gypsum	“	×
Limestone	×	“

“ 1<sup>st</sup> Preference  
 × 2<sup>nd</sup> Preference

For Part 2B of the study, non-porous surfaces yielded higher scores than porous surfaces. For non-porous surfaces a linear relationship between blood concentration and mean clarity exists. However, this was not observed when the sequential touch technique was used on porous surfaces.

Table 3, illustrates the dilution or sequential touch which yielded best results on the particular porous or non-porous surface investigated.

**Table 3: Dilution / Sequential Touch Yielding Best Ridge Detail for second phase (Part 2B) of the study**

**Serial Blood Dilutions with Amido Black**

<b>Non-Porous Surface</b>	<b>1:10 Dilution</b>	<b>1:100 Dilution</b>	<b>1:1000 Dilution</b>	<b>1:10000 Dilution</b>
Glass	“			
Ceramics	“			
<b>Serial Blood Dilutions with Ninhydrin</b>				
<b>Porous Surface</b>	<b>1:10 Dilution</b>	<b>1:100 Dilution</b>	<b>1:1000 Dilution</b>	<b>1:10000 Dilution</b>
Paper	“			
Gypsum	“			
<b>Sequential Touches with Amido Black</b>				
<b>Non-Porous Surface</b>	<b>Sequential Touch 1</b>	<b>Sequential Touch 2</b>	<b>Sequential Touch 3</b>	<b>Sequential Touch 4</b>
Glass				“
Ceramics				“
<b>Sequential Touches with Ninhydrin</b>				
<b>Porous Surface</b>	<b>Sequential Touch 1</b>	<b>Sequential Touch 2</b>	<b>Sequential Touch 3</b>	<b>Sequential Touch 4</b>
Paper		“		
Gypsum		“		

“ Preferred Dilution/ Sequential Touch

## CONCLUSION

It can be concluded that both substrate and chemical technique have a significant influence on final ridge detail yielded. Knowing which technique to use, will ensure that fingerprints are developed using the method which will yield best possible results.

Prior identification of the best methodology for the development of latent fingerprints on any given surface will avoid subjecting the fingerprints to an inefficient development method which could potentially yield poor development results.

Even though technology continues to advance, fingerprints remain a valuable tool today due to their unique characteristics.

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# An Unusual and Rare Case of Burn: Challenge to Cause and Manner of Death

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## ABSTRACT

Many a times scene of incidence, the inquest report, history narrated by relatives and postmortem findings may not go hand-in-hand. Suicides by burning especially by females are very common in our country(1), but charred (burn) body without conflagration in which manner is suicidal is rarely occurred and reported. "Char means to burn to charcoal". Investigation in such a case by police officer is again a matter of his knowledge and experience. So we are reporting such case; A well built, 26 years old married but separated, mentally stressed female living with her mother and brother since 7 years, was found in bathroom in a charred condition on 03/01/2012 at 06:30 hrs. As per inquest, manner of death is suicidal. The autopsy findings did not reveal exact cause of death but raised the suspicion of homicide. So the present case report will make everyone to think over not only importance of cause and manner of death in case of charred body but also to reinforce the investigating authority for thorough investigation in favor of justice to the victim.

**Keywords:** Charred Body, Scene of Incidence, Experience of Police Investigating Officer, Cause & Manner, Justice to Victim

## INTRODUCTION

As we know that, fire is good for any domestic purpose but when used to commit the crime it is heinous.

In all fire deaths, five main facts have to be established.<sup>(2)</sup>

- 1) Identification of the deceased.
- 2) Whether the victim was alive at the time of the fire (antemortem/postmortem).
- 3) The cause of death.
- 4) The manner of death.
- 5) Any other factor contributed to either cause of the fire or the death.

In this case, charred burn body was found in a bathroom, brought by police as a case of suicide for the postmortem examination.

"Char means to burn to charcoal". (Dictionary meaning) It is, in fact, extremely difficult to burn a body due to its high water content. Household fires generate temperature seldom exceeding 1600°F (1200-1600). The optimum temperature for cremating a body is generally in the 1800 to 2000°F range, with 1<sup>1/2</sup> to 2<sup>1/2</sup> hours needed to complete cremate the body. Ordinary house fires lack the intensity and the time to completely incinerate a human body.<sup>(3)</sup>

## CASE REPORT

On 03/01/2012 at 15:00 Hrs, API of PS Yavatmal city brought a case of charred burn body for postmortem examination to the department of forensic medicine SVNGMC, Yavatmal. As per history narrated by relatives and inquest report; a well built 26 years old married women, separated from husband after 15 days of marriage, mentally stressed female living with her mother and brother since 3 years of separation from husband. As there was hearing of the case of "Alimony (compensation)" in the court of Wardha district on 02/

01/2012, it was attended by brother, mother of the deceased and deceased herself. After returning, at night they (Brother, mother and deceased) slept at 22:00 Hrs on 02/01/2012 and on the morning of 03/01/2012 at 06:30 Hrs deceased was found in bathroom in a charred condition.

#### History narrated by close relative (brother)

As per the history given by police which is narrated by brother of deceased: -She was under stress due to her separation, for which she was already on psychiatric treatment. She had committed suicide in a closed bathroom by pouring kerosene and immolated herself between 22:00 Hrs of 02/01/2012 to 06:30 Hrs of 03/01/2012 from where the dead body was recovered.

#### Autopsy findings

##### External examination

Dead body presented in two pieces, upper segment of the body completely charred and both lower limbs having superficial burn, separated from upper segment at the level of upper 1/3<sup>rd</sup> of thigh

##### Position of Limbs

Both upper limbs charred. Right upper limb is abducted at shoulder and flexed at elbow joint. Left upper limb is completely charred into ashes. Both lower limbs are straight.



Fig. 1. complete charred body

##### Surface wounds and injuries

- Upper segment of the body is completely charred.
- Both lower limbs shows patchy superficial burns over whole area except upper femoral area showing deep burn with charring.
- Superficial burn margins and base pale reddish-yellow with few scattered blisters. On prick opening, blister contains air, base of the blisters pale yellow and dry.
- Evidence of sharp and clean cut margins is seen encircling the complete upper 1/3<sup>rd</sup> of both thighs involving skin, underlying muscles, tissue and bones with blackening and no blood infiltration appreciated.
- Evidence of fracture of upper 1/3<sup>rd</sup> of both femur bones with clean cut margins, blackening and no blood infiltration appreciated.



Fig. 2. Clean cut sharp margins over both lower limbs

##### Internal examination

- Evidence of heat cracks is seen over both temporo-occipital region of skull with cooked brain matter.
- Neck structures are completely charred and unidentifiable.
- Thoracic cage is completely charred and thoracic organs are seen as blackish mass.

No fluid blood available and also no blood hematoma found.

- Abdominal organs charred. Liver and spleen identified, forming a black mass.
- Pelvic organs are completely charred into ashes, unidentifiable.

### Material preserved

Tissue from upper clean cut margins of both limbs send for histopathology to rule out ante-mortem injury (vital reaction).

Mass from thorax and abdomen was kept for chemical analysis to rule out poisoning/ drugs.

Partly burnt clothes and skin from thighs are kept for analysis for detecting accelerant used for burning.

Note: No fluid blood available or hematoma found for detection of carbon monoxide level.

### Spot (place of incidence) visit

We visited the spot with Investigating Officer, on next day which was 16km from Yavatmal. A separately placed latrine and bathroom was situated, 35 feet away and in front of the house. Latrine and bathroom is made of brick-concrete wall and roof of tin, bathroom size (place of incident) 8x7 ft with a wooden door and small concrete window of size 1.5x1ft. Bathroom is totally black with carbon particles and a inner latch of the door was broken by kicking the door which was locked from inside (as per history given by brother of deceased).



Fig. 3(a) Scene of Incident (Bath Room)



Fig. 3(b)

Note: 1) Wooden door of the bathroom is blackened but not burnt.

2) The inner latch of the door was broken. (As per history, the door had broken by kicking in an attempt to open it as deceased from inside had locked the door.

Analysis report- Histopathology report not significant. Viscera report still awaited.

### DISCUSSION

In the above case cause and manner of death is big question.

After postmortem examination, no exact cause of death was revealed.

Considering the scene of incidence, her psychological condition and history narrated by close relatives, manner may be suicidal.

Points in favour of suicidal manner.

1. A married but separated after 15 days of marriage, mentally stressed female.
2. Living at her brother's home since 3 years from separation & was dependent on him.
3. On psychiatric treatment but no previous history of suicidal attempts. (Diagnosis is not known)
4. Locked bathroom. (There are so many homicidal burn cases in the closed room at which the inner latch of door was found locked) <sup>(4)</sup>

Considering the case history, autopsy findings and scene of incidence raise the questions of homicidal manner.

Points in favor of homicidal manner.

1. Wooden door of the bathroom is blackened but not burnt.
2. In this case, it is very interesting to note that dead body presented in two pieces, upper segment of the body completely charred and both lower limbs completely intact and just having superficial burn, separated from upper segment at the level of upper 1/3<sup>rd</sup> of thigh or whether it is "Wick effect"? But the wick effect does not rule out manner i. e. either suicide or homicide<sup>(5)</sup>.
3. Is it possible to get totally charred burn body in a close room by pouring kerosene (suicidal)? (No, it is in fact, extremely difficult to burn a body due to its high water content)<sup>(6)</sup>
4. Is it possible to get totally charred burn body in a close room by pouring kerosene (homicidal)? (Yes, it is possible but it requires constant source of inflammable agent and plastic material)
5. Charred burn body without conflagration in which manner is suicide is rarely occurred and reported. (No data available of such cases)
6. The body of an adult does not burn completely in a burnt house, as the temperature usually does not exceed 650 ° C. <sup>(7)</sup>
7. The optimum temperature for cremating a body is generally in the 1800 to 2000 ° F range, with 1<sup>1/2</sup> to 2<sup>1/2</sup> Hrs needed to completely cremate the body. Ordinary house fires lack the intensity and the time to completely incinerate a human body. <sup>(8)</sup>

8. The only way to properly cremate a body outside the crematorium is to elevate it, so that as it burns, the melting fat will feed the fire and contribute to the consumption of the body. <sup>(9)</sup>
9. Bodies lying on flat surface tend to be extensively charred on all surfaces, except the surface on the ground. Here, there may be excellent internal preservation. <sup>(10)</sup>
10. Evidence of sharp and clean cut margins is seen encircling the complete upper 1/3<sup>rd</sup> of both thighs involving skin, underlying muscles, tissue and bones with blackening and no blood infiltration seen. (Is it possible to have such type of margins in a case of burn?)
11. Evidence of fracture of upper 1/3<sup>rd</sup> of both femur bones with clean cut margins and blackening and no blood infiltration seen. (Femur bone fractures in this case are not heat fractures, because wherever soft tissue surrounding a bone is scant or thin, the bone shows sharp, clean cut heat fractures. Charring, calcination and splintering; where the bone is deeply embedded in muscle. The action of heat on a bone is to produce a molten condition, characteristic of fusion by heat.) <sup>(11)</sup>
10. Position of lower limbs was straight. (The posture of a body which has been exposed to great heat is often characteristic. The legs are flexed at the hips and knees and arms flexed at elbows. This stiffening is due to the coagulation of proteins of muscles and dehydration, which cause contraction. This pugilistic attitude occurs whether the person was alive or dead at the time of burning.) <sup>(12)</sup>
11. Superficial burn margins and base pale reddish-yellow with few scattered blisters. On prick opening, blister contains air, base of the blisters pale yellow and dry. (The exposed skin surface may be reddened in ante-mortem and post-mortem burns, the classical distinction of a 'red flare' or 'vital reaction' being unsafe as an infliction before death.) <sup>(13)</sup>
12. (No inflammatory reaction, presumably due to heat thrombosis of the dermal vessels such that inflammatory cells could not reach the area of burn and produce a reaction) <sup>(14)</sup> and may be due to sharp cutting injuries.

## SUMMARY AND CONCLUSION

It is not always possible to find exact cause of death on postmortem findings only in charred burn body.

Manner is more concerned to the Investigating authority and Judiciary.

It is matter of knowledge and experience of Investigating Officer to investigate such case.

As inadequate investigation and no allegation may lead to aborted justice to victim, because homicidal case may be considered as suicide and the chapter may be closed.

Therefore it is very important to establish the manner, so that "No innocent may be charged and no guilty should escape".

**Conflict of Interest:** Nil

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# A Cut- Throat with Lower Leg Injuries- an Autopsy Case Report

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## ABSTRACT

Incised injuries in the neck or cut throats can be due to homicides, suicides or accidents in that order. Though there are differences in the injuries seen in these three manners of death, atypical features can be encountered in practice. In addition to the postmortem examination, careful analysis of the medical and psychiatric history of the person, circumstances of the incident and findings in the scene play a vital role in the determination of the manner of death. In this case, repetitive and jagged nature in the neck injury, , absence of spurting marks in the blood distribution in the scene and especially the presence of injuries in the lower leg which was not found in the literature demand clarification. The hesitation marks, depressive illness, blunt nature of the weapon and circumstances seem to be helpful in meeting this demand.

**Keywords:** *Incised Injury in the Neck, Hesitation Marks, Injuries in the Lower Leg, Blunt Nature of the Weapon, Depressive Illness*

## INTRODUCTION

Finding a dead body with incised wounds especially a cut throat always gives rise to various speculations and poses many challenges to the investigating team. Sharp force injuries seem to be more or less common to both suicides and homicides. <sup>1</sup>Though there are well recognized differences between these two categories, there is always a possibility of ambiguity and atypical features. <sup>2,3</sup> Such questionable features demand alternative explanations. The differentiation becomes much more difficult when there are atypical injuries associated with suspicious circumstances. Though the postmortem examination is essential in this exercise, the police and forensic science investigations, the scene visit as well as the careful analysis of the history and the circumstances of the incident are equally important. <sup>1,3,4,5.</sup>

## CASE REPORT

A 59 year old school principal, about to retire in 2 months time was found non- responsive in a pool of blood in the wash room adjacent to his office around 7.40 am on a Monday. He has had come to school around 6.00am and had been seen by students 45 minutes before the recovery of the body. He was looked for by the vice- principle as he did not turn up as usual for the morning assembly beginning at 7.30am.

His body has been in prone position with the neck turned to his left side. Cut injuries in the neck and right leg have been noted. Blood pooling was found near his head and feet. He has been rushed to the nearest hospital within 15 minutes where he was pronounced dead on admission.

In the subsequent scene visit by the forensic team, blood was noted only on the floor and on the nearby commode. The walls were free from blood marks. A paper cutting knife and a ball point pen had been under the body. (Fig1)

The knife was identified as the one being used in his office for cutting papers. It had smears of blood on

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Fig. 1. Blood pooling with knife and ball point pen

it. Its blade had a pointed end but the cutting edge was relatively blunt. The blade's maximum length was 6cm and it had a ricasso of 4cm and a plastic handle of 12 cm. (Fig2).



Fig. 2. Paper cutting knife used in the act.

Before removing the body, the first attendants have removed his right shoe and the sock noticing the injuries in that leg.

There were no signs of struggle or robbery in the surrounding premises as revealed by the police investigations including finger print experts. His neck tie was found on a cabinet outside the office.

During the history taking, the relatives revealed that the deceased was not happy about the vice-principal being appointed to the post after his retirement. When probed into the medical history of the deceased, the relatives revealed him been taken to a psychiatrist as he had some behavioral changes and panic attacks lately. The psychiatrist's note indicated the diagnosis of endogenous depression. He had been put on Venlafaxine, Mirtazapine, Fluvoxamine and Dormicum just one week prior to this incident. In addition the deceased has had diabetes and high blood pressure too.

He had been a right handed person. There was no history of alcohol or substance abuse as well as past suicidal threats or attempts.

#### Postmortem Examination

The body was average built, clad in a long sleeve shirt with a vest, trousers and underwear. Only the upper most button of the shirt has been unfasten exposing the neck. The clothing was not disturbed in spite of the handling of the body during transport to hospital. The blood stains were noted on the upper part of the shirt and the vest, the lower part of the right leg of the trousers. Subsequent inspection of the right sock and the shoe showed blood on them. There were no cuts or tears in the clothing and socks.

Both hands were blood stained but devoid of injuries.

There was an incised wound, 14cm in length running across the front of the neck at the level of the laryngeal prominence. The portion left to the midline of the injury was shorter than the portion right to the midline. Its left portion was clearly cut but the right portion had jagged margins. Its depth was also increasing towards the right end before becoming shallow again. On the left side only the skin and ptilasma were cut, in the middle the airway was found severed almost 2/3 of its circumference between the lower boarder of the thyroid cartilage and the cricoids cartilage. On the right external jugular vein was found

cut with a half thickness cut in right sternocleidomastoid muscle. The neurovascular bundles in the neck were spared. A transverse superficial cut in the perichondrium was also observed across the lamina of thyroid cartilage. (Fig 3) There were parallel, superficial linear hesitation marks almost uniform in depth in relation to the incised injury. (Fig 4, Fig 5)



Fig.3. Right side of injury with jagged margins and hesitation marks



Fig. 4. Cut throat with perichondrial cut across thyroid cartilage



Fig.5. Left side of injury with sharp margins and hesitation marks

There was an "V" shaped, 15cm wound obliquely placed in the back of the lower part of his right leg 12cm above the heel. Its medial portion was longer than its lateral portion. Its margins were much jagged than those of the neck wound. It had cut the tendo calcaneus partly at its posterior most part. In its postero-medial aspect the soleus muscle was found severed up to the tibial bone only with a superficial line on the periosteum of tibia. The posterior tibial artery was found severed and retracted. There were three almost parallel, shallower and shorter wounds below the medial end of the main wound and another one below its posterior most part. The "V" shaped wound had a skin tag attached to the medial side. (Fig 6, Fig 7) The depths of leg wounds were not uniform.



Fig.6. Medial aspect of leg injuries



Fig.7. Posterior aspect of leg injuries

The whole body was devoid of any other injury except those described above.

The air passage was free from aspiration of blood or vomitus. The autopsy procedure did not revealed features of air embolism.

The stomach contained 100ml of whitish fluid without a remarkable smell.

The cut surface of internal organs and mucus membranes were pale. Except coronary atheroma without significant narrowing, all the other organs were unremarkable.

The analysis of stomach content and blood did not revealed common poisons, sedatives or alcohol. The local facilities were not adequate to detect the drugs which were said to be given by the psychiatrist.

## DISCUSSION

Sharp force injuries are seen in suicides but more commonly in homicides<sup>1</sup>. There can be similarities between them depending on the circumstance of infliction.<sup>2</sup> Therefore this differentiation is of vital importance in the investigations of deaths. Though suicidal cut throats have some typical features, there can be peculiarities. The correct diagnosis requires evaluation of the history, circumstances and findings in the scene in addition to the careful evaluation of the features of the wound and the weapon.<sup>1,3,4</sup>

In the neck of the case under discussion, there was a single deep injury associated with injuries suggestive

of hesitation marks made after exposing the neck by unbuttoning the shirt. Undamaged clothing favors self infliction<sup>1,3</sup>. Though hesitation marks are used to identify a suicidal infliction, there are instances where injuries similar to them found in homicides as well.<sup>2,4,5,6,7</sup> But the fine uniform nature of injuries found in this case cannot be inflicted without evoking a struggle resulting injuries in other parts of the body in a conscious person unless restrained.<sup>1</sup> All the injuries in this case are found in only two anatomical sites in the body and not even a scratch found elsewhere. Restraining or making him incapacitated was highly unlikely according to the place, time duration and the circumstances of this incident. Absence of evidence of struggle and defense injuries can be used to differentiate suicides from homicides in questionable cases.<sup>1,6</sup>

Being a right handed person his neck injury had to be started on the left side of the neck if it a self inflicted one. The neck injury was almost horizontal and seemed to be starting neatly on the left side but not at a higher level than its more lateral right end. This seems to be a deviation to the common description of self inflicted injuries.<sup>2,4,7</sup> Furthermore it had relatively ragged margins on the right. The blunt nature of the blade of the knife might have prompted him to make sawing motions resulting in such an injury.<sup>2,4,6</sup> Same sawing effect might be responsible for the superficial cut seen on the lamina of the thyroid cartilage.<sup>4</sup> The laxity of skin in this case especially due to aging could have made folds towards the direction of motion of the knife resulting in the jagged nature at the right end.<sup>2</sup>

The cut in external jugular vein could have caused air embolism. But this is not invariable. Completely severed veins may collapse<sup>4,7</sup>. It seems that he has not succumbed to air embolism according to the autopsy findings. There was no evidence of aspiration of blood. Absence of these two possibilities can be expected.<sup>5</sup> Some activity even after air embolism is possible as the death can be delayed at times.<sup>3</sup> The neck injury has caused him voiceless but not incapacitated to inflict some more injuries. Such multiple injuries have been reported even in women suffering from psychiatric disorders.<sup>3,7</sup>

Though injuries in wrists, ante-cubital fossae and groins are common sites in addition to neck injuries, literature survey failed to reveal cuts in legs in cut throat cases. His fully clothed nature while on duty might have led him to inflict subsequent injuries in the lower part of the right leg after pulling up the

trouser leg. The selection of the leg seems to be a unique feature in this case. The position of the injuries in the lower leg is easily accessible to the person after bending down as well as in seated position. Such atypical locations are probable in suicides and can be associated with hesitation marks.<sup>6</sup> In this case leg injuries showed several fairly deep repetitive cuts rather than superficial hesitation marks. Such several gashes can occur in suicides.<sup>8</sup> The wound edges were much jagged than those of the neck. His agitated nature and the blunt nature of the knife, short blade and the presence of a ricasso might have resulted in these features.<sup>2,6</sup> It is not improbable to assume that infliction of leg injuries were after the infliction the neck injuries as injuries in the neck might not be severe enough to incapacitate him at once.

Absence of blood spatter at a higher level in the scene and pooling of blood at the neck region and the leg region indicates that he might have lain down on the floor as soon as sustaining injuries. The blood distribution in relation to the body suggests that there had not been attempts of walking after sustaining injuries. But it is essential to look for alternative explanations.<sup>9</sup> Absence of a trail of blood and finding the knife and a ball point pen which might have come from the shirt pocket of the deceased under the body were consistent with the previous assumption.

Though the posterior tibial artery was found severed, no definite spurting marks noted in the scene as expected in arterial injuries.<sup>9</sup> This is also an atypical finding in this case requiring an explanation. The trouser leg might have covered the injury after its infliction preventing blood travelling away making spurting marks on the walls. Bleeding mainly might be from veins and the horizontal position of the body might have facilitated such venous bleeding. Hypertensive people can go into shock even at a higher blood pressure than normotensive persons.<sup>10</sup>

With pallor observed in the internal organs and amount of blood observed in the scene as well as the nature of the structures cut, it is reasonable to conclude that the death has been due to exsanguination.

The history of recent behavioral changes and panic attacks, seemingly unnecessary worry about his successor and the psychiatrist's note are indicative of his mental status. In the elderly, major depression has been

identified as the commonest cause for suicide.<sup>11</sup> Almost half of sharp force suicides are associated with alcohol or mental illness.<sup>1</sup> Some antidepressants are also known to increase suicidal tendency during the beginning of the treatment. The drugs used in this case (Venlafaxine, Mitazapine, Fluvoxamine) are known to increase suicidal risk at times.<sup>12</sup>

Though the jagged and repetitive nature of the main injury in the neck, the presence of multiple injuries in the lower leg and absence of spurting marks in spite of arterial cut seem to be peculiar in this case, the overall assessment of the postmortem findings with the history, the circumstances, the scene and the nature of the knife points towards a suicide rather than a homicide.

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**Ethical Clearance:** As there is no way of identifying the deceased or the relatives, special ethical clearance was not obtained.

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# Medicolegal Study of Tattoo Marks in Tribes of Dindori District of Madhya Pradesh

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## ABSTRACT

The practice of extensive body tattooing dates back to long back in history. Apart from being made for body decoration, tattoos hold different meanings, have many beliefs attached to them. Now days, such an extensive tattooing is getting restricted to the tribal people only. It's an integral part of tribal culture & Baiga is one such tribe which is known for their extensive body tattooing. They are most abundantly populated in an area known as "Baiga-Chak" in the central India. They have deep beliefs associated with their tattoos. Here, in this paper we have studied various tattooing practices followed by Baigas of Dindori district of Madhya Pradesh, India with respect to the importance they assign to their designs & medico-legal purposes they can serve.

**Keywords:** Full Body Tattooing, Baiga, Baiga-Chak, Dindori, Medico-Legal Purposes

## INTRODUCTION

The art of tattooing/body decoration is widely found among the tribes of India, especially in central India, All the societies decorate the body, temporarily or permanently, but there is enormous cultural variation in it <sup>(2)</sup>. It's generally used to satisfy aesthetic needs of a particular tribal group but apart from that it can serve various medicolegal purposes as well i.e. they help us to identify the person, alive as well as after death, in different circumstances; to know the social position, gender, occupation, religion & ethnic identity<sup>(3)</sup>.

India is 2<sup>nd</sup> in world in number of tribal people, after Africa. In India, it's mainly concentrated in the tribal parts as an integral part of their society, slowly spreading to the non-tribal communities as well.

Apart from body decoration, the tradition of tattooing is very much associated with belief system, folklore, social structure, religion & medicinal value etc of the particular tribe. This tradition is transmitted from generation to generation. It's very different from the tattoos of other communities which depict their names, of their spouses or names of their deities written in Hindi etc <sup>(5)</sup>.

Baiga is one such tribe. It's one of the most primitive & one of the *Particularly Vulnerable Tribal Groups* (PVTGs) of Madhya Pradesh, India <sup>(9)</sup>; known for their traditional methods of treatment, shifting cultivation & extensive tattooing of their bodies<sup>(8)</sup>.

According to 2011 census, there are about 3,50,000 to 4,00,000 Baigas in India, out of which 3,17,549 Baigas are present in Madhya Pradesh itself. The major baiga districts in MP are- Mandla, Dindori, Balaghat, Shahdol, Anuppur & Umariya. Each district has at least 25,000 Baigas living in them. There is an area, Baiga-chak, where they are dominantly present. It is spread over 52 villages <sup>(10)</sup>.

The females are very fond of body decoration by ornaments of different kinds in different body parts <sup>(2)</sup>. They are tattooed by the people of Badi-Badanin community <sup>(10)</sup>. The various inks/pigments used in tattoo making viz. India ink, carbon dust, indigo, Chinese black, Prussian blue, cinnabar, cobalt, vermilion<sup>(1)</sup>.

**Following are the various reasons for their tattooing practice:**

1. **Religion & belief system:** These people like to tattoo various symbols related to their totem or

religion. It's a common belief in them that, these deities protect them from different natural calamities, evil spirits, black magic, enemies, wild animals etc. For eg: Gond females tattoo the symbol of triangle at the sole of the right feet as per the belief that it will protect the feet from getting bruised while walking barefoot; oval shape with a series of dots(Padm sen Deo, the Foot God) is marked at the sole of left foot for protection; five dots & a line (Gajkaran Deo, the elephant god) at the upper part of foot, one dot on each toe & line from big toe to little toe & it is believed that these symbols will enable them to bear weight<sup>(2)</sup>.

2. **Beliefs associated with their medicinal values:** Tattooing on some parts help them to cure some diseases<sup>(7)</sup>. For eg: Tattooing of image of cobra by a Gond lady at face below mouth is believed to protect them from effects of eating poisonous things; an image of Chandi mata on forehead preserves & guards the parting of hair that is the life of woman's husband.
3. **Social status:** It's a common belief in most of the tribes of central India that a tribal girl should tattoo her body prior to marriage; this tattoo is treated their as the best kind of dowry.
4. **As a wealth & ornament:** The tribal people treat tattoo as one of the best kind of wealth & ornaments as they once worn, can't be removed or taken away from them i.e. they are permanent & also less costly & remains with them even after death.
5. **As a mode of sexual expression:** The Baiga female tattoos an oblong figure just above the buttocks representing the gate. Similarly, a symbol of peacock is tattooed at the breast when a girl reaches puberty. It's strictly not allowed until she is adolescent. They also tattoo a basket (dauri) at their breast when girl reaches puberty; these tattoos are made to attract the males <sup>(2)</sup>.

In this paper, emphasis will be given on the importance of tattoos in tribal life, what are the symbols used & their significance, the method of tattooing, the changing trend over the period of time & how this information aids in various medicolegal purposes tattoo marks fulfil.

## AIMS & OBJECTIVES

1. To discuss the importance of tattoos in the tribal life.
2. To analyse the various symbols used in tattoos & their significance.
3. To discuss what medico-legal purposes these tattoo marks can serve.

## MATERIAL & METHOD

It's an observational study conducted on 47 tribal females of Ladwani, a village in Dindori district of Madhya Pradesh. All the subjects included were examined after taking written informed consent.

Their tattoo marks were studied for the designs they make & the significance attached to those designs & the observations were recorded in a well designed Performa attached as appendix-1 at the end.

## RESULTS

Table 1: Body parts bearing tattoo marks

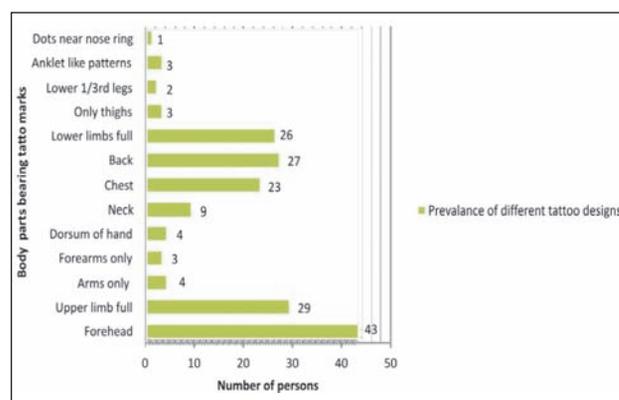


Table 2: Tribal community wise incidence of tattoo marks in females

TRIBE/CASTE	FEMALES			
	M	Um	W	Total
Baiga	42	01	01	44
Gond	01	-	-	01
Vishwakarma	01	-	-	01
Patel	01	-	-	01
TOTAL	45	01	01	47

M- married. UM- unmarried. W- widowed.

**Table 3: Age wise distribution of tattoo marks in females of different tribal communities**

Age of Marking <sup>1st</sup> Tattoo	Number of Persons		
	BAIGA	GOND	OTHERS
0-10yrs	-	-	-
10-20yrs	44	01	02
20-30yrs	-	-	-
TOTAL	44	01	02

**Table-4 : Design/symbol & body part wise distribution of tattoo marks**

Design/Symbol & Body Part	Number of Persons Found Having It	Age/Time of Making	Significance/Remarks
Forehead (seeta rasoi/ hearth, plates & spoons)	43	After adolescence (10-12 yrs), Prior to marriage	Identity of the Baiga tribe
Arms full (haldi gaath/ turmeric roots like Lines & dots)	29	At puberty mostly before marriage; later in few.	
Arms (half till elbow)	04		
Forearms	03		
Upper limb random designs(dorsum of hands)	04	At the time of marriage or later	
Neck (zig-zag lines)	09	Before marriage	Not made if either or both parents are dead
Chest (sun like pattern surrounded by zig-zag lines)	23	At puberty, not until girl is adolescent	Decoration purpose, to attract their spouse.
Back (2 columns of horizontal lines)	27	Before marriage	
Legs full (different arrangements of lines/Fish bones)	26	After marriage	
Legs half till knee	03		
Lower 1/3 <sup>rd</sup> legs	02		
Lower limb random designs (floral designs in anklet like pattern)	03	Before marriage	
Dots near nose ring	01	Before marriage	Decoration purposes

### OBSERVATIONS & DISCUSSION

- Of the total 810 population of Ladwani village of Dindori district of Madhya Pradesh, 47 females who had tattoos & who agreed for examination & gave written informed consent accordingly were studied.
- Only the females were found to have tattoos.
- Of these 47 females, 44 belonged to Baigas tribal community & 1 to Gond, 1 to Patel & 1 to Vishwakarma tribal community respectively.
- Out of the total 47 females studied; 1 was less than 15 years of age & was unmarried; 21 were between the age group of 16-30 years of age & were married; 12 females were between the age group of 31-45 years of age & were married; 10 were between 46-60 years of age & were married & 3 were above 60 years of age of which 2 were married & 1 was widowed.
- It was also noted that amongst the 47 females examined, the youngest female to have tattoo was 15 years old. The minimal average age to mark the 1<sup>st</sup> tattoo was found to be between 10-12 years amongst all cases.
- Amongst the 47 females examined, it was found that 'Forehead' was the commonest body part tattooed i.e. 43 (91.5%), followed by full length of both Upper Limbs i.e. 29 (61.7%), Back i.e.27 (57.44%), full length of both Lower Limbs i.e. 26 (55.3%), Chest i.e. 23 (48.9%), Neck i.e. 9 (19.14%), both Arms only i.e. 4 (8.5%), Dorsum of both Hands only i.e. 4 (8.5%), followed by both Forearms i.e. 3 (6.4%), both Thighs i.e. 3 (6.4%), both Lower Limbs random & sparing i.e. 3 (6.4%).

There was only 1 (2.12%) case in which tattooing was found near nose ala.

- In the 47 females examined, it was also noted that there were 7 (14.9%) females who had tattooed only 1 body part i.e. Forehead & in the rest of the females 40 (85.1%) more than 1 body parts were tattooed.
- In all the females who had tattooed on Forehead, it was noted that the tattooing was marked prior to marriage when the girl reaches adolescence. It is considered as the identity of 'Baiga' women & believed to remain with them even after their death.
- It is classically a 'V' shaped design with a dot in its centre, 3 dots on each side of it, 2 vertical lines on each side of dots & a dot on each temple after the lines. It is called as 'Seeta rasoi' i.e. symbols of hearth, plates & spoon which depicts the future life of a Baiga woman.
- In the 29 females in whom tattooing was found on both upper limbs, it was noted that they are marked around puberty, mostly before marriage. These are the arrangements of various horizontal & vertical lines & dots, from the shoulder to the hand.
- In 27 females on whom tattooing was found to be on the back, it was noted that it comprises of 2 vertical columns of horizontal & vertical lines & was predominantly for personal identity, decoration & liking of the partner.
- The whole legs were found tattooed in 26 women. They were vertical, horizontal & slanting lines & dots. They call it 'machhali ki haddi' i.e. the 'fish bones', predominantly for ornamentation.
- The chest was found tattooed in 23 females, which bore design/symbol resembling sun, surrounded by zig-zag lines. This was found to be marked at puberty, not until a girl is adolescent. It's made for decoration purpose, for attracting their spouse.
- The neck was found tattooed in 9 females out of 44 Baigas. It was found to be zig-zag lines around neck in a chain/necklace like pattern for ornamentation. In rest of the females, the reason for not tattooing neck & in whom the whole body was tattooed, was the death of either of the parents.
- The most common reason of not having tattoos on full arms or legs or back was unbearable pain. They were mostly in younger age group i.e. below 35

years of age, showing the changing trend over time.

- It was noted that there were no skin diseases or any other issues that might have initiated or aggravated by tattoo making; instead they believe few specific tattoos cure their diseases; like few random designs on swellings reduce the swelling or on joints are believed to cure arthritis.
- The 3 non-Baiga women wore all the tattoos for decoration purpose only.



Fig. 1. Different arrangement of lines & dots/fish bones on legs of a baiga female.



Fig. 2. 2 Columns of horizontal lines on the back of a Baiga female.



Fig. 3. Sun like design on the chest of a Baiga female.

### CONCLUSION

In Baiga tribal community tattooing by females is a common practice from adolescence onwards depicting their tribal identity & heritage. Further, in addition to identification, religion, social status, medicinal value & sexual expression, these tattoos depict various aspects of their life. The higher the status, the more extensive tattooing is common. They consider them as their most precious & valuable ornaments, which no one can take from them.

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# Mystery of Double Murder Unraveled by Forensic Clues - a Case Report

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## ABSTRACT

A mother and her teenage son living in a house in remote area were not seen around for a week. The father of the lady living in adjoining area became suspicious and visited her house. He smelled stench emanating from the locked house and immediately informed the police. On reaching the spot, the police opened the locked door by taking out conventional metallic loop from the wooden door plank and found dead body of lady in a pool of blood on the floor while that of her son on the double bed. The scene of occurrence was examined for vital clues by the forensic experts after a week. The forensic investigators tried to establish linkages between the victim, suspect, crime scene and individual items as with any form of evidence. The presence of palm prints on the wall, blood streaks and spatters on the wall and blood droplets/drip pattern on the iron box (trunk) lying adjacent to the wall helped in knowing etiology of crime and led to conclude that the assailant had suffered an injury on his/her hand. On the basis of evidences, the forensic team advised the police to make search for suspect (s) and the police succeeded in arresting stepdaughter of the deceased who had suffered an injury on the thumb of left hand.

Laboratory analysis of the forensic clues not only established the link of assailant to the scene of occurrence but also enabled Hon'ble court to convict the accused for committing double murder.

**Keywords:** Blood Groups, DNA Profiling, Dupatta, Lock, Key, Larvae/Maggots

## INTRODUCTION

Murder is the unlawful killing with malice aforethought of another human and generally this premeditated state of mind distinguishes murder from other forms of unlawful homicide<sup>[1]</sup>. India has earned the dubious distinction of being the country where maximum number of murders takes place in the world, three times more than its neighbour Pakistan and double the figures in the United States<sup>[2]</sup>.

Murder, rape and kidnapping are common normal phenomenon in this modern civilization. Over the decades, many murder cases in India have grabbed the spotlight and still continue to shock the public years after they were committed<sup>[3]</sup>. According to the National Crime Records Bureau (NCRB) report 34,434 murders were reported in India in 2012<sup>[4]</sup>. After being the most

literate state in the country, Kerala is now named as the state which has recorded the highest rate of crimes<sup>[5]</sup>. 95 murders were reported in 2013 in Himachal Pradesh as compared to 113 in 2012. The crime rate has reduced a little bit as compared to previous year<sup>[6]</sup>.

Forensic investigation is increasingly playing an important role in the pursuit of justice and forensic science today has shaped the world of justice, fuelling crime investigations and signifying the progress of modern technology. The developments in forensic science have likewise introduced many vital crime solving techniques over the past few decades<sup>[7]</sup>.

Locard's exchange principle dictates that every time you make contact with another person, place, or thing, it results in an exchange of physical materials<sup>[8]</sup>. After

the evidence is carefully collected at the crime scene, it is typically processed inside a crime lab<sup>[9]</sup>. Blood is the most common and perhaps most important form of evidence in criminal justice today. There is no substitute for it, whether for medical or forensic purposes. Bloodstain patterns tell a lot about position and movement during the crime, who struck whom first, in what manner and how many times<sup>[10-12]</sup>.

Alec Jeffreys developed a technique called DNA fingerprinting in 1985 which can be used to identify individuals. DNA profiling is especially useful for solving crimes but can also be used to confirm if people are related to each other, such as for paternity testing<sup>[13]</sup>. Forensic scientists can compare the STR profile of a blood sample with that of a suspect or the victim to look for a match. If two DNA profiles match there is only a one-in-a-billion chance that they are from two different people – unless they are identical twins<sup>[14]</sup>. Physical evidences are of utmost importance to link the case and equally important to examination of locks and tools is the examination of keys because keys are handled by users and provide an excellent source of forensic evidence.<sup>[15]</sup>

Forensic entomology is the study of insects/arthropods in criminal investigation. By studying the insect population and the developing larval stages, forensic scientists can estimate the postmortem index, any change in position of the corpse as well as the cause of death<sup>[16]</sup>.

### CASE HISTORY

A case of gruesome double murder where a mother and her son were done to death by stepdaughter. The conspicuous absence from the house for a week and the foul smell emanating from inside the locked room, the father of deceased got suspicion and informed the police. The police opened the locked door by taking out conventional metallic loop from the wooden door plank and saw dead bodies of a woman and a boy in putrefied conditions with maggots all around. The body of the woman was found on the floor in a pool of blood while that of her son on the double bed.

The forensic team carried out an extensive search for vital clues and other incriminatory evidences. They found blood stained palm print on the wall, blood stains on double bed, mattresses, homemade mattress/*drugget*, quilt and pillow covers, iron box (*trunk*), beddings, door plank and latch. Extensive blood stains along with long black hair like strands were found on the cemented floor where the body of the lady was stated to be lying. Blood stained palm

print, blood streaks and splatters on the wall and blood droplets/drip pattern on the iron box (*trunk*) lying adjacent the wall.

### Situation at the scene of crime

At the scene of crime, the forensic team observed the following:

- a) Blood: blood was splattered in various places in the room. Blood stains were detected on the wall, door plank and latch. Clotted blood on the double bed and cemented floor with beddings smeared with blood were seen in the room.
- b) Blood spatter: presence of bloodstains and blood pattern at the scene of crime indicated struggle between assailant and victim.
- c) Maggots/flies and larvae were found on the bed, cemented floor and near the window of the room.

Physical examination of the blood stains was performed at the scene of crime (SOC) and the SOC was documented photographically. All the questionable blood stains were chemically tested for the presence of blood using a Benzidine test.<sup>[17]</sup> Blood stained palm print on the wall, blood streaks and splatters trickling down the wall, blood droplets/drip pattern on the iron box (*trunk*) lying adjacent to the wall clearly indicated that accused might have injury on the hand and had taken support of the adjoining wall while making attempt to kill the victims. The blood ooze out from the hand of the assailant made *blood droplets falling perpendicular* and attaining a spherical shape on the iron box (Fig.6). On the basis of the evidences found on the spot especially the blood drip pattern, the forensic team advised police to search for a person who may be having injuries in his/her hand. After that police started search for accused and arrested stepdaughter of the deceased who was having injury and healing wound with stitches on the *thumb of left hand* and taken treatment at a hospital.

The injury on the thumb assumed importance as it was a bite-injury inflicted by the victim while her mouth was being closed forcibly with hand and being strangulated with *dupatta*. The doctor confirmed the ante-mortem nature of ligature marks encircling the whole neck in the PMR. The boy sleeping on double bed got up after hearing noise, saw the whole incident and started screaming. Fearing disclosure of the heinous incident through the boy, the stepdaughter also strangulated the boy with *dupatta* and leather belt by giving repeated jerks. The *dupatta* was found encircled around cervical spine of boy.

After killing the mother and son, the accused locked the door from outside and fled with mobile phone of the deceased and keys of the room. Circumstantial evidences corroborate the incident but forensic experts had to prove it scientifically.

## MATERIALS AND METHOD

The evidences found on the spot were blood stained palm print on the wall, blood stains on double bed, mattresses, homemade mattress/*drugget*, quilt and pillow covers, iron box (*trunk*), door plank and latch, extensive blood stains along with long black hair like strands on the cemented floor and other beddings. The dry blood stains caused due to dripping of blood from the thumb was scratched from the iron box and some dry blood stains were lifted from the trunk on cotton thread by using normal saline. Further, blood sample of accused was taken for matching the same with the DNA extracted from the scratched blood from the trunk and blood lifted from the trunk on cotton thread for DNA fingerprinting. Large number of dead and live flies/maggots, larvae and pupae found on the double bed, floor and near the window of the room were collected to calculate or determine the time since

death. The lock removed from the main door and keys which were thrown into the pit outside the cowshed by the accused and recovered by the police in pursuance to a disclosure made by the accused for checking the locking and unlocking mechanism. The evidences collected were examined and analysed in the laboratory.

## Laboratory examination

### Blood grouping

All the questionable blood stained exhibits were chemically tested for the presence of blood by conducting Benzidine test<sup>[17]</sup>. Gel-diffusion methods were used for detection of the origin of blood<sup>[18]</sup>. Blood grouping was done from the dried blood stains collected on cotton thread from the palm print on the wall, iron box (*trunk*), door frame, latch of door, cemented floor of the room, double bed, mattresses, homemade mattress/*drugget*, quilt and pillow covers and other beddings by using absorption-elution method as per the laboratory procedure manual of forensic serology<sup>[17]</sup>. The evidences recovered are mentioned in Table 1.

Table 1: Evidences analysed in laboratory

Exhibit No.	Exhibit	Blood detection	Origin of blood	Blood group
1.	Blanket	Positive	Human	A
2.	Cloth mattresses	Positive	Human	A
3.	Cloth mattresses/ <i>drugget</i>	Positive	Human	A
4.	Bed sheet	Positive	Human	A
5.	Pillow cover	Positive	Human	Inconclusive
6.	Quilt cover	Positive	Human	O
7.	Mattress piece	Positive	Human	Inconclusive
8.	Bed sheet	Positive	Human	Inconclusive
9.	Cloth piece on iron box	Positive	Human	Inconclusive
11.	Blood lifted from the cemented floor	Positive	Human	B
12.	Blood lifted from the iron box ( <i>trunk</i> )	Positive	Human	Inconclusive
13.	Blood lifted from the cemented wall	Positive	Human	Inconclusive
14.	Blood lifted from the palm print on the wall	Positive	Human	Inconclusive
15.	Blood lifted from the door plank and loop	Positive (insufficient for blood grouping)	Human —	
16.	Dupatta	Positive	Human	B
17.	Dupatta	Positive	Human	A
18.	Blood sample (suspect)	Positive	Human	O
19.	Blood scratched from the trunk and blood lifted from the trunk on cotton thread	DNA profile of blood stains on the iron box ( <i>trunk</i> ) and DNA profile of control blood sample of stepdaughter matched.		
20.	Lock and keys	On examination, lock could be operated successfully for locking and unlocking with the keys recovered from the pit thrown out by the stepdaughter after the commission of crime.		
21.	Larvae/maggots	On the basis of recovery of insects of different development stages, the postmortem interval ( <i>PMI</i> ) of approximately 8-10 days could be estimated.		
22.	Viscera	On chemical examination, no poison/narcotic drug and psychotropic substance could be detected.		

DNA profiling: blood sample of the accused was taken for DNA fingerprinting and compared with blood found on the iron box, (*trunk*) quilt cover and the cemented floor using standard protocol given in the literature.

Lock and keys: the lock and keys were examined physically in the laboratory for checking locking and unlocking mechanism.

Post-mortem interval (PMI): to determine the minimum time since death. PMI was estimated as per standard protocol given in the literature.

### RESULTS

The DNA profile obtained from the blood sample of accused completely matched with DNA profile obtained from the dry blood scratched from the iron box (*trunk*) and blood lifted from the trunk on cotton thread. Human blood was detected in all the exhibits. Blood group 'A' and 'B' were detected in the deceased's exhibits. The blood detected from the blood sample of the assailant and the blood found on the quilt cover was human blood of group 'O'. Similarly, the lock removed from the door of the room was found attaining the locking and unlocking position by using respective keys recovered from the pit outside the cowshed. Large number of dead and live flies, pupae, larvae/maggots found on the double bed, cemented floor and near the window of the room indicated the time of death within 8-10 days.

Postmortem report (PMR) of the deceased (lady) indicated that she had been strangled to death with *dupatta*. The boy was strangled to death with *dupatta* and leather belt. Ante-mortem ligature marks encircling the whole neck of the boy and a fracture of cervical spine (C-6 and C-7 vertebrae) indicated that he died due to strangulation causing asphyxia leading to cardio-respiratory arrest and death which was confirmed in the PMR. The facts correlated with the description of the incident given by the suspect to forensic team. The photographs taken at SOC are given in figures in Table-2.

Table 2: Nature of evidences documented photographically at the scene of crime



Fig 1: Blood stains on door plank



Fig 2: Blood stained blanket, bed sheet and mattress



Fig 3: Blood stained leather belt used for strangulation



Fig 4: Blood stained quilt



Fig 8: Dead flies near window of the room



Fig 5: Forensic expert collecting blood stains



Fig 6: Blood droplets showing drip and wipe pattern

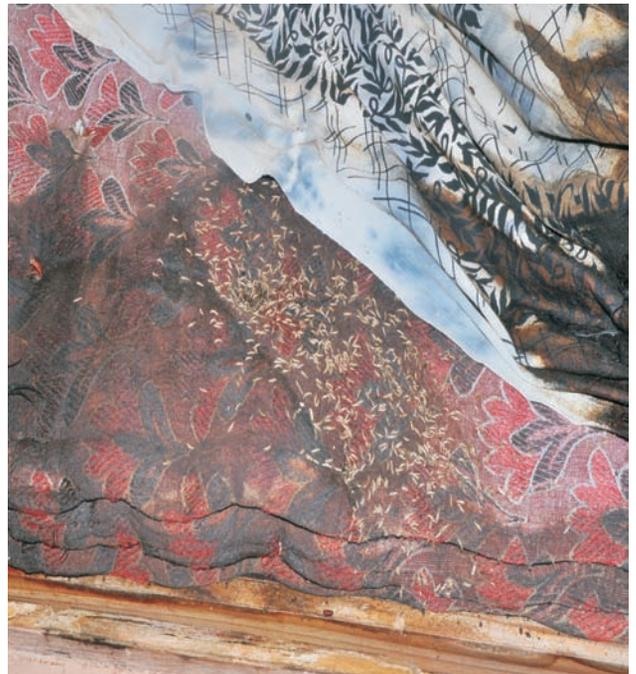


Fig 9: Dead and live maggots, larva and pupae on mattress



Fig 7: Blood stained bed sheet

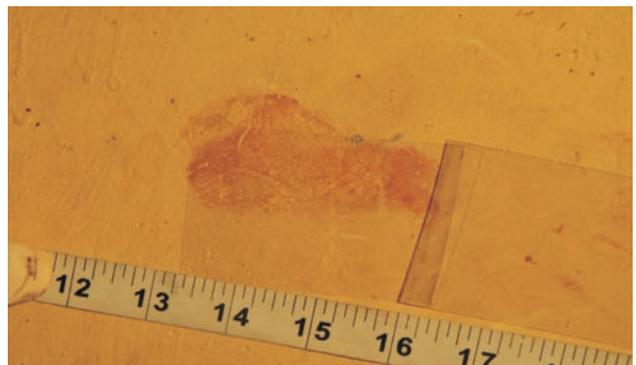


Fig 10: Blood stained palm print on the wall

## DISCUSSION

Investigation of a murder through forensic depends on physical evidences present on crime scene. Physical evidence is any object that can establish that a crime has been committed or can provide a link between a crime and its victim or between a crime and its perpetrator. The present case was solved on the basis of biological and physical evidences. Similar case pertaining to theft and murder was unravelled through forensic investigation by Kumar et al, 2011<sup>[19]</sup>.

In forensic cases, blood has always been considered class evidence, but the potential exists for individualized blood typing, and even today, forensic serologists can provide testimony with some strong probability estimates linking a single individual and that individual only to a bloodstain<sup>[18]</sup>. In the present study the blood group detected from the blood sample of the assailant and the blood found on the quilt cover lifted from double bed was human blood of group 'O' showed linkage. Flies and maggots are the most common insects to be found on and around a dead body and play an important role in determining the time since death. In the present case the PMI estimated was 8-10 days and similar findings had been reported in some other studies also.

Jeffreys used DNA profiling first time to identify Colin Pitchfork as the murderer of two young girls in the English Midlands in 1986<sup>[20]</sup>. In the present study DNA profiling was used to match the blood sample of accused and blood collected from the quilt cover.

## CONCLUSION

The DNA profile, blood grouping and other supporting physical and circumstantial evidences clearly showed linkage of the accused at the scene of occurrence. The accused was sentenced a rigorous imprisonment for life and fine under section 302 IPC for ghastly murdering her stepmother and stepbrother by the Hon'ble court.

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# Effects of Salt Water and Elevation of the Corpse on the Rate of Decomposition and Subsequent Insect Succession

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## ABSTRACT

The post-mortem decomposition and corresponding insect succession is a continuous process, which commences from the moment of death, until skeletonisation. Many studies have been carried out looking at these processes, and what may have an effect upon them. The effect of salinity levels in water and elevation have on a corpse is very rarely touched upon at all. With the field of forensic entomology growing in popularity with law enforcement agencies all the time, more studies need to be undertaken. This study is designed to investigate the effects that elevation of the corpse and salinity level have on decomposition rates, whilst comparing insect biodiversity and population levels of insects on the individual corpses. So far no research has been carried out in this particular area of the field. Three pig corpses were left to decompose in the open air and therefore exposed to the insect population. One corpse was elevated, limiting its contact with the ground. A second corpse was soaked in a salt water solution, whilst a third corpse was used as a control. Insects were sampled and pictures were taken for a 43-day period during the months of March and April, in Leicestershire, England. The results indicate that insect succession and the rate of decomposition are both affected respectively with regards to salinity and elevation level.

**Keywords:** *Forensic Entomology, Diptera, ADD, ADH, England*

## INTRODUCTION

Forensic Entomology is an area of science that has developed to provide accurate evidence using insect activity to assist the courts in reaching conclusions.<sup>1</sup> The use of Forensic Entomology is usually associated with scenes of murder, however this is not always the case, Forensic Entomology is also essential in neglect and abuse investigation. Civil cases can also turn to Forensic Entomologists for advice. White provides an example for when this might be the case; civil cases rely more on knowledge of a specific order of insects and their ecology than on insect succession, and could be the result of an individual seeking the help of a forensic entomologist to bring a claim for reimbursement for personal loss or inconvenience.<sup>2</sup>

Most species of animals belong to one of four large orders: Coleoptera (Beetles), Lepidoptera (Moths,

Butterflies), Hymenoptera (Ants, Wasps, Bees, Sawflies), Diptera (Flies). Goff talks of 'specialisations' that helps insects cope with environmental change.<sup>3</sup> An example would be the physiological differences between the juvenile and adult stages. Members of the order Diptera, along with other orders such as Hymenoptera, Lepidoptera and Coleoptera, are known within entomology as 'Holometabolous'. Meaning the 'insects life cycles consist of four distinct stages, that unfold in sequence'.<sup>3</sup> These distinct stages are; Egg stage, Larval stage (Juvenile), Pupal stage, and Adult stage.

The other order of insects that is highly significant in Forensic Entomology is the order of beetles known as Coleoptera. The vast majority of this order can be distinguished from other adult insects using two characteristics; 'the forewings are reduced to hard or leathery elytra (wing cases), which usually meet on

the centre-line of the abdomen, and they have biting rather than sucking mouthparts'.<sup>4</sup>

With reportedly over 160,000 species of Diptera alone, these little creatures are ubiquitous, and thus are perfectly suited to the detection of many forms of crime. Although it is thought that many species are yet to be discovered and the number of species actually present on the planet could be up to 800,000'.

Such a large number occupying a single order is hugely inconvenient, therefore, the order of Diptera is split into two lesser orders or 'Suborders' as they are traditionally known. These are Nematocera and Brachycera.<sup>5</sup>

Insects use a proportion of the environmental energy to grow and develop.<sup>4</sup> The amount of environmental energy to achieve life stages can be calculated. This calculation is a common feature of integrated pest management predictions, crop production as well as forensic casework.<sup>5</sup> The units used for this calculation are known as accumulated degree-days or ADD and can be added together to reflect periods of development.<sup>7</sup> If the time period is shorter, and the length of time being discussed is in hours then the thermal values will be as accumulated degree-hours or ADH.<sup>3</sup>

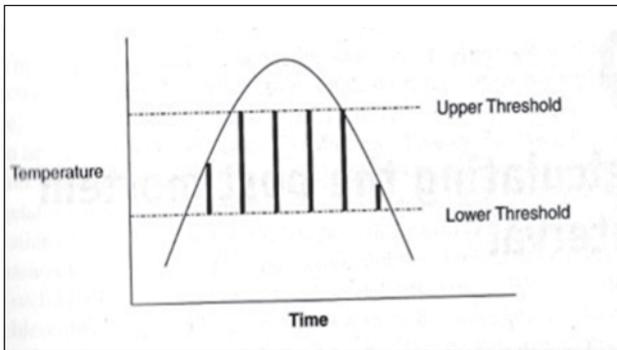


Fig 1. (Insect growth in relation to upper and lower threshold temperatures).<sup>6</sup>

The specific base temperature is usually calculated in a laboratory setting using set temperatures. In particular base temperature is calculated by plotting temperature against total days to develop, using this linear graph back calculations are used to isolate the base temperature of the species in question. This graphical method of determining the base temperature is called the linear approximation estimation method.<sup>6</sup>

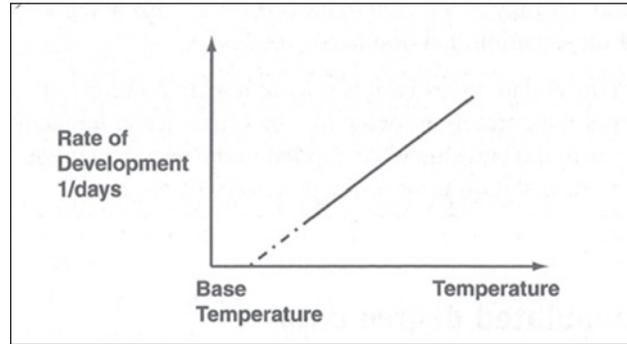


Fig 2. (Graph to show base temperature determination using the linear approximation method).<sup>6</sup>

Calculations are made to determine the ADH for a particular maggot on that particular body. Subtracting the calculated ADH from the time that the maggots were collected provides a time when the insects first colonized the body. This is otherwise known as first insect activity.<sup>4</sup>

This 'Physiological energy budget', can be represented as the area under a curve, for temperatures above the base temperature, in each 24 hour period. For each hour or day, the budget is represented as a rectangle of time in relation to temperature; Underestimation is compensated for with over estimation at another point of the graph.<sup>6</sup> Therefore, total accumulated degree hours/days, reflect the time taken for the insect to develop to the stage recovered from the scene.

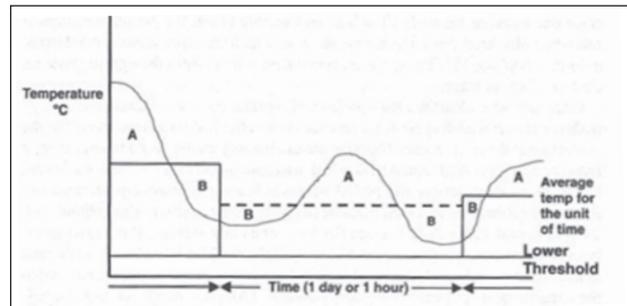


Fig 3. (Graph to show the justification for using the accumulation averaged temperatures over time).<sup>6</sup>

Larvae should be collected from each site in batches of 20-30 per jar, so no additional heat or ammonia is generated during transit.<sup>6</sup> Once a maggot has completed its third and final feeding stage, it begins something that is commonly referred to as the post feeding stage. This is a time in a maggot's life when it leaves the body to find somewhere safe to pupate.<sup>3</sup>

The decomposition system simply explained; organic matter is synthesized by the producers, eaten by a series of consumer levels and with the aid of the decomposer, all the organic materials are incorporated into the bodies of the consumers and unconsumed producers.

Matuszewski provides an explanation of a possible improvement that could be made to the current protocol for measuring decomposition, this is a 'processes oriented approach to decomposition'.<sup>7</sup> Meaning, instead of looking at which stage may be present, it would be more accurate to describe, which decomposition processes are active. This raises an important point showing how decomposition cannot be regarded as having discrete stages but rather a continuous process that must be recorded as such.

### METHOD

Holes were dug approximately 50cm in depth to house 'UPVC ground guard boxes', for two pens in the ground. A third pen was constructed to protect the 'elevated corpse' that limited its contact with the ground. Therefore the corpse was lifted and hung from a gallows made from timber using extra strong sterilized rope. To prevent arthropods crawling from the ground a thick layer of petroleum jelly was placed

approximately 100cm from the ground around the timber stand. Soil samples were taken and using a number of Tullgren funnels arthropods were sampled from under the corpses. Pitfall traps were also used to sample arthropods that were unable to fly to the corpse and preserving them in 80% ethyl alcohol.

The corpses were sourced from Keythorpe Valley Farm, Leicestershire, England. They were collected at 6:00am Saturday 15<sup>th</sup> March 2014, and transported in airtight plastic bags to Burbage, Leicestershire. One corpse was placed in a salt-water solution and soaked for 6 hours before being exposed. Each corpse was placed 50 metres apart to ensure cross-contamination was minimized. Air and soil temperatures were taken daily and cross-referenced against Met Office data to improve accuracy. Photographs were also taken daily at 12:00pm so direct day to day comparison could be made.

The insects were sampled using a net (adult), and sterilized tweezers (juvenile) and placed into specifically labeled containers. Half the juvenile samples were preserved in 80% ethyl alcohol. The other half was reared to adulthood to conform species.

The corpses were sampled for a 43-day period between the months of March and April.

### FINDINGS

**Table 1.1. Shows the observations made for each stage of decomposition and the corresponding insect succession that was collected for each stage on the Control pig carcass.**

Stage of Decomposition	Observations	Insect Succession
Fresh	Little or no smell noticed, during the first few hours adult flies of different species became interested. Mainly landing near and on the body.	Insects sampled during this stage: Calliphora, vicina; Lucilia, sericata; Calliphora, vomitoria.
Bloated	Gases start to build up inside the abdomen and so carcass starts to bloat. Larvae can be seen feeding in and around orifices especially, mouth and anus. Strong smell of decomposition escapes.	Insects sampled during this stage: Calliphora, vicina; Calliphora, vomitoria; Lucilia, sericata; Cynomya, mortuorum.
Decay	Bloated abdomen became deflated and maggot masses noticed nearer the surfaces of the body. Damage to the abdomen is noticed, relatively large hole with maggot mass feeding inside. Putrefaction juices noticed were present underneath body and escaping from eyes and mouth. Many adult flies were present, mainly on the body and around the orifices.	Insects sampled during this stage: Calliphora, vomitoria; Lucilia, sericata; Cynomya, mortuorum.
Advanced Decay	Putrid smell present escaping the body. Maggot masses were found to be present further into the carcass and not as near to the body surface. Large amount of putrefaction juices was present leaching from body and pooled underneath with some maggots feeding upon them. Skin of carcass started to become hard and leathery.	Insects sampled during this stage: Cynomya, cadaverina (two only); Calliphora, vomitoria; Lucilia, sericata; Cynomya, mortuorum.
Skeletonisation	Not present during the 43 day period the carcass was observed for.	Not Applicable.

**Table 1.2. Shows the observations made for each stage of decomposition and the corresponding insect succession that was collected for each stage on the Salt Water pig carcass.**

Stage of Decomposition	Observations	Insect Succession
Fresh	No smell was present during this stage. Little fly activity was also observed.	Insects sampled during this stage: Calliphora, vicina (Adult)
Bloated	Abdomen started to bloat 2 to 3 days after the control pig carcass. Strong smell of decomposition was present, some larval activity was observed, mainly in and around orifice areas.	Insects sampled during this stage: Calliphora, vicina; Lucilia, sericata.
Decay	Bloated abdomen became deflated and maggot masses were observed, again mainly around orifice areas. Juices that are caused by putrefaction were observed leaching from body resulting in small pool underneath body with a small group of maggots feeding. Maggot masses were also observed, only inside eyes, nose and anus. Approximately 3 days behind control pig in state.	Insects sampled during this stage: Calliphora, vicina; Lucilia, sericata.
Advanced Decay	Skin became dry and leathery. Offensive smell emanated from body and maggot masses observed to be present were much deeper in the carcass than previous stage. Pool of putrefaction juices became a little larger and more maggots were feeding upon it.	Insects sampled during this stage: Calliphora, vicina; Lucilia, sericata; Phormia, regina.
Skeletonisation	Not present during the 43 day period the carcass was observed for.	Not Applicable.

**Table 1.3. Shows the observations made for each stage of decomposition and the corresponding insect succession that was collected for each stage on the Elevated pig carcass.**

Stage of Decomposition	Observations	Insect Succession
Fresh	Small amount of smell was noticed and little fly activity was observed.	Insects sampled during this stage: None (Adult specimens of what was thought to be Calliphora, vicina. This cannot be confirmed due to the insects not being captured).
Bloated	Gases started to bloat the abdomen approximately 4 to 5 days after the control pig carcass. Potent smell was noticed being given off by carcass. Fly activity was observed, particularly eggs were present around mouth and anus with a small number of 1st instar larvae present.	Insects sampled during this stage: Calliphora, vicina; Lucilia, sericata. (Only one juvenile of each species)
Decay	Abdomen became deflated and very putrid smell was given off from body. Putrefaction juices were observed leaching from body, particularly from the eyes, nose and mouth. Rather more adult insects were observed than juvenile.	Insects sampled during this stage: Calliphora, vomitoria; Lucilia, sericata;
Advanced Decay	Very potent smell of decomposition was noticed. Skin was observed not quite as dry as the other carcasses. Putrefaction juices were observed in a medium sized pool directly underneath the head end of the carcass. These juices were a dark grey/brown in colour. No maggots were seen to be feeding upon the juices.	Insects sampled during this stage: Calliphora, vomitoria; Lucilia, sericata.
Skeletonisation	Not present during the 43 day period the carcass was observed for.	Not Applicable.

**Table 2.2. Shows the temperature data collected from the scene and the data taken from the local meteorological station, which were used to provide the corrected temperature recordings.**

<b>Date</b>	<b>Temperature taken at scene (Degrees Centigrade)</b>	<b>Meteorological Data (Degrees Centigrade)</b>
15/03/2014	13	13
16/03/2014	13	12
17/03/2014	13	13
18/03/2014	11	11
19/03/2014	14	15
20/03/2014	12	11
21/03/2014	11	11
22/03/2014	13	13
23/03/2014	11	10
24/03/2014	12	11
25/03/2014	11	11
26/03/2014	9	9
27/03/2014	8	9
28/03/2014	12	11
29/03/2014	16	16
30/03/2014	18	18
31/03/2014	16	15
01/04/2014	14	15
02/04/2014	14	14
03/04/2014	12	12
04/04/2014	15	15
05/04/2014	14	13
06/04/2014	12	12
07/04/2014	11	11
08/04/2014	13	12
09/04/2014	14	14
10/04/2014	12	12
11/04/2014	13	13
12/04/2014	12	12
13/04/2014	14	13
14/04/2014	13	13
15/04/2014	13	13
16/04/2014	14	14
17/04/2014	13	12
18/04/2014	12	12
19/04/2014	13	13
20/04/2014	13	13
21/04/2014	17	16
22/04/2014	12	13
23/04/2014	13	13
24/04/2014	14	14
25/04/2014	11	11
26/04/2014	15	15

**Table 3.1. Shows the insects of the order Diptera that were observed on or near the individual pig carcasses.**

Pig Carcass	Insects observed and stage
Control	Calliphora, vicina (Adult and Juvenile); Lucilia, sericata (Adult and Juvenile); Calliphora, vomitoria (Adult and Juvenile); Cynomya, mortuorum (Juvenile); Cynomya, cadaverina (Two Juvenile); Stomoxys, calcitrans (Adult, not sampled).
Salt Water	Calliphora, vicina (Adult and Juvenile); Lucilia, sericata (Adult and Juvenile); Cynomya, mortuorum (Juvenile); Phormia, regina (Adult and Juvenile); Cynomya, cadaverina (only three Juvenile).
Elevated	Calliphora, vicina; Lucilia, sericata. (Only one juveniles of each species, Adults also observed but not sampled); Calliphora, vomitoria; (Adult and Juvenile).

**Table 3.2. Shows the insects, not of the order Diptera, that were observed on or near the individual pig carcasses.**

Pig Carcass	Insects observed and stage (determined to Order level, minimum)
Control	Coleoptera (Adult); Hymenoptera, Family: Vespidae (Adult); Acari (Adult); Lepidoptera, Family: Pieridae (Adult).
Salt Water	Coleoptera (Adult); Hymenoptera (Adult); Dermaptera, Species: Forficula, auricularia (Adult).
Elevated	Hymenoptera (Adult); Araneae, Species: Araneus, diadematus (Adult).

**Fig 4. – 6. Show the decomposition state of the individual pig carcasses side by side for direct comparison.**



**Fig 4. (Elevated)**



**Fig 5. (Control)**



**Fig 6. (Salt Water)**

## DISCUSSION

The practical aspect of the investigation in particular was a success, on the whole. This is demonstrated by only having evidence of insects present on the pig carcasses, and the determination of the sampled insects down to species level.

It was exceptionally important that wind speed was monitored, as it is known that if the speed of the wind is too high insects cannot gain access to the corpse, unless access can be gained by walking. This may account for the lack of biodiversity and population density of the insects that were found to be present on the elevated pig corpse.<sup>2</sup>

Difficulties were encountered when the problem of recording these stages of decomposition arose. However, using photography to capture a picture of each carcass every day conquered this problem. These

pictures could then be placed side by side to provide a direct comparison day by day, and changes could be noted.

Although the investigation was a general success, limitations were also encountered throughout. One of the most important limitations of the investigation was the different level of sunlight that was faced. Although the carcasses were placed in specifically similar environments, the level of sunlight that a particular carcass experienced was different. For example tall trees were present surrounding the garden, at certain times these would shade one of the carcasses but not the others and vice versa. If the investigation was to be repeated this must be addressed accordingly.

### CONCLUSION

Taking into account the results that were gathered from this investigation, it can be seen that salinity level and elevation had an effect on both the biodiversity and population level of the insects. Therefore the results obtained support both hypotheses respectively, as it can be clearly seen, both insect biodiversity and population density were both affected by salinity and elevation levels.

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# Trends of Suicides in and around the City of Bilaspur (CG)- a Retropective Study

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## ABSTRACT

Committing suicide in most of the cases is an escapist work. It is the latest resort to fly over from stress and strains of life. In most of the situations it also reflects the push and pull in a society

During the period of the year 2001 to 2003 the dead bodies of the deceased who had committed suicide & brought to the mortuary of C.I.M.S, Bilaspur were autopsied. Their age, sex, socioeconomic status, educational status, mode of committing suicide were taken into account in the study & presented in tabulated form.

This study mirrors the social trends in and around Bilaspur city.

*Keywords: Suicide, Trend, Poisoning, Burn*

## INTRODUCTION

Suicide as a manner of death is known to the human society since long. The number, mode and means of suicide varies in nature and is increasing steadily.

## MATERIAL AND METHOD

The postmortem center of CIMS, Bilaspur caters the need of postmortem examination of the Bilaspur district in Chattisgarh. Bilaspur is the only city in this district and is studded with rural areas around it.

During the period of 2001 to 2003 all the suicide cases brought to the morgue of CIMS for postmortem examination were included in this study. The details of the history from the relative of the deceased and through PM examination finding confirmed the manner of death in this retrospective study. Total 603 numbers of suicide death were examined during this period.

## OBSERVATION

During the period at 2001 to 2003 total numbers of

1944 medicolegal autopsies were performed out of which 603 cases were of suicide (Table-I). Number of males who committed suicide was 329 & that of females was 274 (Table-II). The prime age to commit suicide is the period 20-29 years both for males and females. The least vulnerable age for committing suicide is 60 and above, both for males and females (Table-III).

During the month of October the suicide death reaches the highest numbers i.e, 70 and it is lowest in July i.e. 39 (Table-IV).

Poisoning is embraced by most people i.e. 193 for suicide, next preferred method is burns (190), then hanging (130). The least preferred method is drowning (only 6).

Among those who committed suicide 172 are married males & 182 married females. Unmarried are 249 (154 males &95 females)(Table-V).

317 cases of the suicide are from rural upbringing & 286 cases are of urban inhabitants( Table- VI).

**Table I: Total postmortem versus suicidal cases**

Year	Total P.M	Suicidal Cases	Percentage
2001	556	136	24.46
2002	654	167	25.53
2003	734	300	41.03
Total	1944	603	31.06

- Rate of deaths are steadily increasing in relation to total postmortems

**Table II: Sex distributions of suicidal cases**

Year	Male	Percentage in relation to total suicidal cases	Female	Percentage in relation to total suicidal cases
2001	76	55.88	60	44.11
2002	97	58.08	70	41.91
2003	156	52	144	48
Total	329	54.56	274	45.43

- Male deaths due to suicides in relations to total suicide cases are in declining trend, where it is in rising trend in females.
- Death due to suicides in male outnumber females cases

**Table III: Age Distribution**

AGE (IN YEAR)	MALE	FEMALE
0-9	00	00
10-19	41	55
20-29	105	117
30-39	85	54
40-49	53	22
50-59	25	11
60&above	20	15
Total	329	274

- Prime age for committing suicide is 20-29 years for both sexes.
- Next higher period is 30-39 years.
- Suicide during the age group of 10-19 years indicate rising psychological stress

**Table IV: Seasonal variation in suicide deaths**

Month	Hanging	Poisoning	Burn	Train Run Over	Drowning	Total
JAN	10	16	14	06	00	46
FEB	04	23	16	08	00	51
MAR	10	14	14	15	00	53
APR	14	13	09	04	02	42
MAY	14	11	17	07	00	49
JUNE	11	19	13	07	00	50
JUL	14	09	12	04	00	39
AUG	16	13	21	05	00	55
SEPT	13	14	06	07	01	41
OCT	10	20	30	09	01	70
NOV	04	24	25	04	01	58
DEC	10	17	13	08	01	49
TOTAL	130	193	190	84	06	603

- Poisoning is the most preferable method
- Next most preferred method is burning which is more significant.
- October is a peak period of committing suicides.
- Drowning is the preferred method

**Table V: Marital Status**

Married		Unmarried	
Male	Female	Male	Female
172	182	154	95
Total =354		Total =249	

- Married females are more prone to commit suicides

**Table VI: Rural and urban distributions**

Rural		Urban	
Male	Female	Male	Female
163	154	166	120
Total =317		Total =286	

- Urban males are more susceptible for committing suicide

## DISCUSSION

The males outnumber the females in autopsy cases. The female suicides accounted for 45.43% of total suicide.

During the 20-29 years of age both in male and female cases commit suicide in highest percentage. Next common is the age group 10-19 years & 30-39 years where suicide rate is higher. In pediatric age group we have found out no suicides. But this age group is no bar to suicide even though in this age group suicide is very difficult to accept by the public<sup>1,2</sup>. Suicide rate in 15-19 years old males indicates increased psychological stress.

Even though poisoning is a method adopted for committing suicide in highest numbers of cases, it reflects the trend in an agricultural developing country as reported by Senanayak. N., Peiris H. (1993)<sup>3</sup> & Dhaberg A et all (1995)<sup>4</sup> in their study of trends and availability of methods used for suicide. Next preferred method of suicide is resorting to burning. It is the method adopted by females. The same result is reported by Raleigh VS (1996)<sup>5</sup>. Same things has been reported by Howton K. et all (1998)<sup>6</sup> in their study as method used for suicide by farmers in England & Wales.

In our study deaths due to hanging is less but not the least preferred method which is higher in the study conducted by Langley J. et all (2000)<sup>7,8</sup>

The most striking finding in our study is least numbers of drowning cases even though rivers, wells & ponds exist here in good numbers; people do not embrace the method of drowning for committing suicide.

## CONCLUSION

From the above observations it can be concluded that the numbers & means of committing suicide is rapidly changing in this part of the country.

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