

Volume 40  
Number 3  
July-Sept  
2018

(Official Publication of Indian Academy of Forensic Medicine) Indexed with InoMED, Scopus & IMSAR, Index Copernicus, available online at : <http://medind.nic.in> & [www.iafmonline.in](http://www.iafmonline.in)

IAFM

UGC Approved No: 28596

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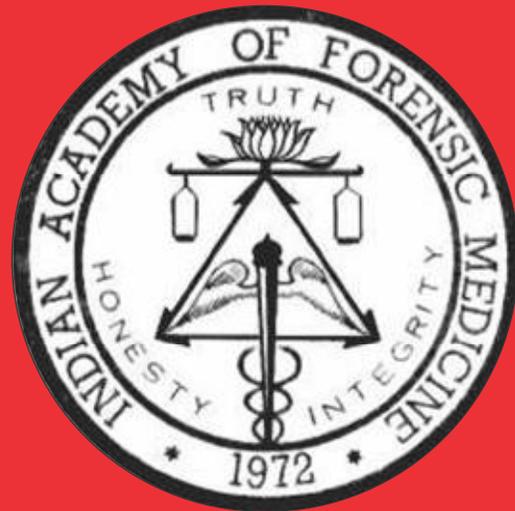
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Publication Quarterly

ISSN : 0971-0973

# JOURNAL OF INDIAN ACADEMY OF FORENSIC MEDICINE



( A Peer Reviewed Journal )

( Official Publication of Indian Academy of Forensic Medicine )

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**Followed by the E C Meet on 20th October 2018**



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**The G. Sec Dr. Madhu being felicitated**



**Vice President South Zone, Dr. Cyriac Job, Delivering a talk**



**Joint Editor, Dr. Manish Nigam, being felicitated after his talk**

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# **Journal of Indian Academy of Forensic Medicine (JIAFM)**

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# Journal of Indian Academy of Forensic Medicine

Volume: 40 • Number: 3 • July – Sept. 2018

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Print ISSN: 0971-0973. Electronic ISSN: 0974-0848. [www.iafmonline.in](http://www.iafmonline.in)

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## From the Editor's Desk

# JIAFM

A Quarterly Publication  
Volume 40, Number 1, Jan.- March, 2018

Dear Friends,

It gives me great pleasure to present the 3rd Issue of 2018 to the Hon'ble Members of the Academy. I wish to thank all the authors and contributors of the scientific material published in this issue. I am thankful to all the members of the Editorial Board and the reviewers for the immense support in getting the Journal Published. Every person does this task in addition to his professional job and commitments. My Special thanks to Joint Editor Prof Manish Nigam and Drs. Amandeep Singh & Mandar R Sane, for their selfless devotion to the Journal.

Your Journal is now indexed in **Scopus**, **Index Medicus for South-East Asia Region (IMSEAR)**, **Indian Citation Index (ICI)**, **IndMed (ICMR, New Delhi)** & **The Index Copernicus (ICV 2017: 114.07)**. The **Impact Factor** for your Journal is **0.212**, as per the Thomson Reuters Metric™. It is one of the very few Journals in the speciality of Forensic Medicine **recognised by the UGC**, with Serial No: 28596.

We are still in the process of purchasing **Plagiarism Detecting software**, to be used for the Journal. **Upgrading the standard of the manuscripts** has now become mandatory to upgrade the standard of your Journal, which is, again, **Mandatory for PUBMED Indexing**. We will have to approach the PUBMED in august 2019 for seeking indexing as the last time, it asked us to make certain changes and then approach it after 24 months.

Any suggestions for further improving the quality of the Journal are most welcome.

Jai Hind & Long Live IAFM

Dr. Dasari Harish  
Editor

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**Editorial**

## Verification of Signatures of Other Doctors - Can We Just Stop There?

<sup>1</sup>Dasari Harish, <sup>2</sup>Mandar R Sane

### Abstract:

At times, a doctor, as an expert witness, has to depose on facts observed by another doctor. The spectrum for such evidence may extend from just identification of the signatures of his colleague, to even furnishing expert opinion based upon facts observed by him; who now happens to have left the institution, or is untraceable, or summoning him to the witness box would entail large amount of funds. Legal stand on such expert evidence seems to be ambiguous, even though, now, both the Hon'ble Supreme Court and the High Courts have decreed that when called upon to do so, the expert witness is to give opinion based on facts observed by his colleague, provided these facts have been agreed upon by both the prosecution and the defense and that they have been admitted by the court. The position of the various laws and the outlook of the courts is discussed in this editorial.

**Key words:** Expert Witness, Medical Evidence, Hearsay Evidence, Signature, Indian Evidence Act, Criminal Procedure Code.

### Background:

Many a times, we are called by the courts to identify signatures of our colleagues or juniors who had prepared medico-legal reports/ made entries in case files, etc, but have since left the department/ institution. What is our purview there? Can we just stop at identifying the signatures or if asked by the prosecution/ defense/ court, can we give our opinion, based on the document prepared by the other doctor?

This is the question we have tried to answer in this editorial. During the last 28 years in this field, of the 1st author, this question came up innumerable number of times. Various courts had their opinions regarding the same. Some required that evidence be given, some categorically refused permission saying that the doctor was called only for signature verification and hence, no question can be asked of him.

However, during the last 10 years or so, in the courts of Punjab and Haryana, particularly, a doctor is required to give evidence based on the documents prepared by his colleague/ juniors.

This query was posted on various Whatts App groups and some very learned responses were received from colleagues from all over the country. These have been compiled and various other sources were perused for this editorial.

### Who is an Expert Witness?

As per S. 45 of the Indian Evidence Act,<sup>1</sup> Expert witness is a person who is specially skilled in that particular field where the court has to form an opinion regarding a particular fact in question. The fields, as per the Act, are Foreign Law, Science, Art, Hand Writing and Finger Prints. The expert gives his opinion based on facts observed by him or the facts that have been put before him through documents or otherwise. This opinion is 'Pure Expert Opinion'.<sup>2</sup> The value of the expert opinion rests on the facts on which it is based and his competency in framing a reliable opinion. It depends, to a

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LM no. LM/IAFM/1343

DOI: 10.5958/0974-0848.2018.00048.9

large extent, on the accuracy and the quality of the facts put to him. Hence, an expert's opinion is only as good as the data which forms the basis of the opinion.<sup>2</sup> That is one of the reasons why an expert does not come forward to give his opinion based on the facts observed by others.

In *re Gopessu Dutt*,<sup>3</sup> it was observed that when a medical man gives his opinion based on facts observed by another medical man and not by himself, such evidence has less value than when an opinion is based on facts observed by himself. Even when a doctor has not examined the patient and his evidence is based on probabilities, still he is an expert witness and is entitled to *answer all hypothetical questions* put to him.<sup>4</sup>

However, before the expert is asked to give opinion on hypothesis, sufficient foundation for it must be laid by substantive evidence.<sup>5</sup> Again, "Medical evidence is not conclusive evidence as it is essentially an evidence of opinion and not of fact. A doctor's evidence can never be certain as regards to the duration of injuries. The doctor who has examined the deceased and conducted the postmortem examination, is the *only competent witness* to speak about the nature of the injuries".<sup>6</sup>

Where there are alleged eye witnesses to a particular instance of violence resulting in the death of a person, the evidence of the medical expert witness, put forth by the prosecution, acts only as a corroborative evidence. It can only prove that the injuries produced by the said act of violence can cause death and, hence, the evidence of the eye witness is confirmed. The medical evidence, on its own, cannot prove the prosecution case.<sup>7</sup>

As regards the *medico-legal documents* prepared by the doctors, the courts have said this: "A medico-legal document is a document prepared by the medical officer in discharge of his duties and usually, in obedience to a requisition by a police officer or a court. They are usually referred to in criminal courts in cases relating to offences against the human body. They are not evidence by themselves and the truth of

their contents must be proved by the officer preparing them, in a court of law".<sup>8</sup>

### Medical Evidence:

Evidence of a medical man is mainly of two broad categories; his description of injuries and other observed particulars as the testimony of an ordinary witness (*data evidence*), and his opinion as to cause of death and other ancillary opinions as pure expert testimony (*opinion evidence*). However, this distinction is more academic than practical, as, he observes the facts as an expert and with the trained and experienced eye of an expert. Hence, almost invariably, facts and opinions are both necessarily the products of expert witnesses.<sup>2</sup>

However, predicament arises when facts are observed by a doctor who now is untraceable, and hence another doctor is summoned to furnish his opinion based on facts observed by the former. For instance, when, a doctor is called upon to base his opinion on superficial and inaccurate description of injuries by another unskilled witness, then it may result in serious handicap to his expert opinion on probable cause of death.<sup>2</sup> Deprive the expert of expert's data and you deprive the court of the valuable assistance that expert opinion affords. Hence, experts at times are averse to extend their expert opinion on data observed by else one witness. This is particularly so when an institution has a significant ~~footfall~~ of in-training doctors who leave the institution after their short tenures. This concern was also raised by the Delhi High Court,<sup>9</sup> It said that that resident doctors, because of short tenure, are not available for recording evidence due to delay in trial process.

The Delhi High Court laid down following guidelines for summoning another doctor in place of the doctor who had prepared the medico-legal report and had since left the department: [Crl. M.(M) 2018/98 and Crl. Misc. 4010/98 vide order dated 11.8.00]<sup>9</sup>

- i. In the first instance, the trial court shall issue summons in the name of the

- doctor who prepared and signed the M.L.C. The summons to be served on the doctor through the Medical Superintendent of the Hospital - In case the said Doctor had left the service of the Hospital or is no more in the Hospital than the Medical Superintendent will furnish the last known address of the doctor on the Summons itself.
- ii. After receipt of the summons with the endorsement giving last known address of the doctor, the trial court will issue summons in the name of the doctor at the last known address given by the Medical Superintendent.
  - iii. In case the doctor is not traceable even at the last known address, then in that eventuality, the Trial court shall issue summons directing the Medical Superintendent to depute the record clerk, who can identify the signatures of the doctor on the M.L.C. In case the trial court requires opinion of a doctor, then the trial court, while issuing the summons, will indicate in the summons itself that the opinion of the doctor is required by the court. In that case, the Medical Superintendent will, besides deputing the record clerk, also depute a doctor of the specified discipline to give opinion on the basis of the notes.

This was affirmed by the Sessions Court, Delhi, thus: "It may be made clear first of all, that the division bench of the Hon'ble High Court of Delhi had passed directions for the trial court in Crl. M.(M) 2018/98 and Crl. Misc. 4010/98 vide order dated 11.8.00, that in case the doctor is not traceable at the last known address then in that eventuality, the trial court shall issue summons directing the Medical Superintendent to depute the record clerk who can identify the signatures of the Dr. on the MLC and in case the trial court requires the opinion of a Dr., then a trial court while issuing summon will indicate in the summon itself that opinion of the Dr. is also required in the court. In that case, the Medical Superintendent, besides deputing the record clerk will also depute a doctor of the specific

discipline to give opinion on the basis of the notice. It may be mentioned here that a copy of this order was circulated amongst all the judicial officers in Delhi.

Thus, the argument that the *doctor who medically examined the complainant was not examined as a witness in court does not hold good* in view of the above directions passed by the Hon'ble High Court of Delhi and the fact that the doctor who medically examined PW2 could not be traced at her last known address."<sup>10</sup>

Now, the debatable question is, whether an expert's opinion is admissible, if he is relying his opinion upon facts observed by a third party? Legal cure can be elaborated as follows:

- a. Facts proved Aliunde: [Aliunde: From Another Source]<sup>11</sup> The evidence of an expert is not confined to facts which he actually observed; he may give his opinion on facts proved aliunde. For instance, if it were required to determine whether a man died of any particular disease, symptoms of which have been proved by other witnesses at trial, a Doctor may be called upon to give in evidence merely his opinion as to the disease of which the deceased died. Similarly, in a case of murder where deceased's wounds being described, a Doctor may be called upon to give in evidence whether the deceased died as a consequence of injuries.<sup>2</sup> Even where a Doctor has not examined the patient, he, as an expert, is entitled to answer all hypothetical questions put to him.<sup>4</sup>
- b. Hypothetical questions: An expert witness may testify to facts within his knowledge or may give his opinion based upon assumed facts. If the opposing parties agree upon all the facts in the case, then it is simple matter to set those facts before the physician and ask him whether, based on those facts, he can opine on the matter concerned.<sup>2</sup> It is infrequent, however, that all the facts involved are agreed upon between the parties.

Very commonly, there is sharp dispute as to what the facts are. For this reason, a set of hypothetical statement embodying all the contentions of the fact in question is framed for procuring the medical expert's opinion. 'Hypothetical questions' is a tool of extracting evidence of opinion based on assumed facts, it is usually reserved for expert witness who do not have firsthand knowledge of the facts under consideration. It is now gaining wider acceptance that hypothetical statement of facts must be dispensed with where the medical expert has firsthand knowledge of the facts upon which he is to base his opinion. It is a settled rule that the problem of hearsay in expert evidence can be cured by providing independent evidence on which the opinion is based.<sup>12</sup>

c. 'Hearsay evidence': The witness is supposed to testify as to what he saw or heard himself, not what someone else reported he had seen or heard. Hearsay embraces written and oral evidence in which the information presented consists of an assertion made by someone other than the witness.<sup>13</sup> However, experience and necessity have dictated few exceptions to the hearsay rule. One classical example of hearsay evidence recorded by Doctor is the dying declaration. However, testimony pertaining to contents of the dying declaration cannot be considered as expert evidence, as, no medical opinion is inferred from it and it can be deposed by a layman in same fashion.<sup>14</sup> Another exception of the hearsay evidence is related to public records & hospital records. Generally, public records like birth & death certificates are accepted as such, as per Sec 34 of Indian Evidence Act (IEA).<sup>15</sup> Similarly, hospital records are admitted for proving matters of hospital routine, such as time of admission, time of discharge/ death, etc as they fall within the broad category of '*business records*', which is an exception to hearsay rule.<sup>16</sup> However,

matters pertaining to validating the diagnosis of the patient or according with the medicolegal opinion are admissible by Courts only when expert witness substantiates it.<sup>2</sup>

As discussed above, medical evidence consists of data evidence and opinion evidence.<sup>15</sup> It is an established legal position that data documented by a doctor, e.g. a postmortem report, is not substantive evidence. The Doctor's statement in Court is alone the substantive evidence.<sup>2</sup> The postmortem report can be used only to refresh his memory under S. 159 IEA.<sup>15</sup> It is generally held that one expert may not base his opinion upon hearsay opinion of other experts,<sup>17</sup> facts observed by an expert must be deposed by the same expert along with his evidence of opinion. However, medical evidence remains incomplete when a doctor who has prepared the examined document is dead or untraceable. The Orissa High Court has held that such evidence is admissible under S. 32, IEA and observed that data of postmortem report cannot be brushed aside merely because the Doctor who has prepared it, has not been examined.<sup>18</sup> S. 32 (2) of IEA provides that when a statement, written or verbal, is made by a person in the discharge of professional duty whose attendance cannot be procured without an amount of delay, the same is relevant and admissible in evidence.<sup>15</sup> The practice of admitting such evidence without data being proved, may sometimes lead to strange results, since the interested party may at some stage validly take objection to any fact which was not specifically sworn to.<sup>2</sup> Hence, the Supreme Court, under S.32 (2) of IEA, admitted that *such data evidence must be proved by another Doctor who is also conversant with the handwriting of absent doctor*.<sup>19</sup> It rectified the error of High court in another similar case, in which High court brushed aside evidence of Doctor Aqas he had not himself examined injuries of the victim.<sup>20</sup>

d. **Signature:** Commonly, it has been observed that a Doctor is simply called to court to identify the signatures of his professional colleague. Identification of signature is covered under S. 47 of IEA which states that "When the court has to form an opinion as to the person by whom any document was written or signed, the opinion of any person acquainted with the handwriting of the person by whom it is supposed to be written or signed that it was or was not written or signed by that person, is a relevant fact."<sup>15</sup> From the construction of the provision itself, it is clear that "any person" may give testimony regarding the handwriting or signature and it is not restricted to experts.<sup>12</sup> To curb the practice of summoning a Doctor to identify the signature of his colleague, the Delhi High court laid down guidelines that identification of signature must be done by a record clerk, and a doctor must be summoned only if evidence of opinion is required in pertaining case.<sup>9</sup>

**The Criminal Procedure Code,**<sup>21</sup> Cr PC states that:

As per S. 173 (8) Cr PC, carrying out a further investigation and collection of additional evidence even after filing of charge-sheet is a statutory right of the police and for that prior permission of the Magistrate is not required. If during the course of such further investigation additional evidence, either oral or documentary, is collected by the Police, the same can be produced before the Court in the form of supplementary charge-sheet. The prime consideration for further investigation and collection of additional evidence is to arrive at the truth and to do real and substantial justice. The material collected during further investigation cannot be rejected only because it has been filed at the stage of the trial.

As per S 231 Cr PC, the prosecution is entitled to produce any person as a witness

even though such person is not named in the charge-sheet.

As per S. 311 Cr PC, any Court may, at any stage of any trial under the Code, summon any person as a witness, or examine any person in attendance, though not summoned as a witness, or recall or re-examine any person already examined; and the Court shall summon and examine or recall and re-examine any such person if his evidence appears to it to be essential to the just decision of the case. Under this provision also wide discretion has been conferred upon the Court to exercise its power and paramount consideration is just decision of the case. Under this provision, it is permissible for the Court even to order production of a document before it, if it is essential for the just decision of the case.

It is well settled in law that the goal of a criminal trial is to discover the truth and to achieve that goal the best possible evidence is to be brought on record. In view of the aforesaid legal positions, it is clear that additional evidence, oral or documentary, can be produced during the course of trial if in the opinion of the Court production of it is essential for the proper disposal of the case.

### **Conclusion:**

The position of law may, therefore, be summarized thus - a doctor in his capacity of an expert witness may be properly be asked to state his opinion, in the absence of another doctor who had witnessed the facts and prepared the report. Such facts may be proved aliunde, or put forth in hypothetical statement, or as an exception to hearsay evidence. The purpose is to give the courts the benefit of an informed opinion to help them determine, as accurately as possible, an issue beyond their competence as laymen. What weight it would carry with a Court of fact is altogether a different question. Its probative value would depend on the facts and circumstances of each case. Medical professionals must present as expert witness because of paramount interest of the state in securing justice. They must answer the questions put to them in the court and form an expert opinion based on the facts put forth to

them, even if they were primarily summoned to recognize the signatures of their colleagues.

**Acknowledgement:**

The authors, particularly the First Author, would like to thank all the learned members of the various Whatts App groups who posted learned answers to the queries put to them regarding the topic.

**Conflict of Interest:** None

**Financial Assistance:** Nil

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## Original Research Paper

# A Cross-Sectional Assessment of Knowledge, Attitude and Practice along- with Awareness About Medico-legal Aspects of HIV Among Medical Undergraduate Students

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### Abstract:

**Background** - Knowledge, attitude and practice (KAP) is one of the corner stones in instituting appropriate preventive measures to fight against the STD. University students are one of the most vulnerable to infection due to lack of adequate knowledge, attitude and practice regarding the same. **Materials and Methodology** - This was a cross-sectional study carried out on 200 (100 male and 100 female) medical undergraduate students aged between 17.20 years of Parul University Vadodara, Gujarat. Pre-tested questionnaire was administered to the students to obtain information about their KAP on HIV. Data were analyzed using SPSS version 24.0. **Results**- All the respondents were aware of HIV. Most of the respondents had positive views about HIV infected people. Students with good level of knowledge were more likely to display positive attitude. Although statistically not significant, we found that as knowledge increases, the ability of respondents to have positive attitude and non risky behaviour towards HIV also increases. It was found that few of them were unaware about all the medicolegal aspects of the disease. **Conclusion**- Students had a satisfactory level of knowledge about HIV, but had a positive attitude towards HIV patients. A person having adequate knowledge also implies engaging in safe practices. This study focuses at misconceptions which need to be corrected by reinforcing sex education in curriculum at school as well as at the university level to increase awareness. Not only to medical undergraduates, but also awareness is compulsory among the public about the medico-legal aspects of HIV.

**Key Words:** Attitude, HIV, Knowledge, Practice

### Introduction:

The youth are much more prone to HIV

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DOI: 10.5958/0974-0848.2018.00049.0

infection as well as other sexually transmitted diseases (STD) because of the lack of knowledge, as they may engage in risky practices and may have lack of access to adequate reproductive health services.<sup>1</sup> Every day, 5000 young people in the world become infected with HIV, which translates to almost 2 million new infections per year.<sup>2</sup> The Centre for Disease Control (CDC), estimates that 5.5% of all HIV persons are employed in the health care field.<sup>3</sup> Knowledge, attitude and practice (KAP) studies are representative of a specific population to collect information on what is known, believed and performed in relation to a particular topic.

Many prevention programmes have focused on increasing the knowledge on transmission of STD so as to overcome misconceptions that could prevent behavioural

change towards safe practices and also reduce the stigma against people living with HIV.<sup>4</sup> Stigmatizing attitudes have been shown to be strongly associated with misconceptions on HIV transmission and are regarded as negative attitudes towards people living with HIV.<sup>5,6</sup> An assessment of KAPs among any population is highly necessary in planning the management and prevention of HIV and as baseline to evaluate the success of prevention strategies.

Information on KAP among secondary school students is important in designing intervention strategies to protect them from infection. This is very necessary and prepares them for the university when they leave home and are no longer under parental guidance and may take wrong decisions due to poor knowledge, increasing their risk of infection. This study was motivated by a desire to determine the level of understanding of youth at Parul University, in medical undergraduate students, to identify their behaviours which could pose a risk to infection with HIV and evaluate their attitudes towards people living with the disease.

Knowledge, attitude, and practice are the most frequently used study tools in health-seeking behaviour researches.<sup>5,6</sup> Questions included in knowledge assessment are related to causes, symptoms, transmission and the management of the disease or infection condition under investigation.<sup>7</sup> Attitude is a learned predisposition to think, feel and act in a particular way towards a given object or class of objects.<sup>8</sup> Practices in KAP surveys usually inquire about the use of preventive measures or different healthcare options.

Complementary and alternative medicine (CAM) options (homoeopathic practitioners, traditional and spiritual healers) lead to inappropriate or delayed healthcare, resulting in undesirable outcomes.<sup>9</sup> Therefore, the purpose of the present study was to assess KAP among public in order to use the data in developing information, education and communication activities for the patients as well as community. Such activities will be helpful in the prevention and control of HIV in a developing country like India.

## Materials and Methodology:

This study was a cross-sectional descriptive study carried out from December 2017 to January 2018. Medical undergraduate students of Parul Institute of Medical Sciences and Research, Parul University, Vadodara, Gujarat, were selected after they signed an informed consent form. The primary version of the questionnaire was developed through an extensive literature review in English.<sup>10</sup> The questionnaire was then piloted with 30 respondents for its acceptability and consistency. Few modifications were needed after the pilot testing. Total 200 students for further study were selected by systematic quota random sampling technique (100 male and 100 female). Data from the pilot study was not included in the final analysis. Pre-tested questionnaires were then administered to students to obtain information about their knowledge, attitudes and practices regarding HIV. Students were informed of the purpose of the study. Ethical clearance was obtained from the Ethics Approval Committee of the university. Information provided by the participants was anonymous and was kept confidential.

To evaluate, the respondents were required to provide answers as %yes+, %no+ or %don't know+. A score of 1 was assigned for a correct answer, 0 for a wrong answer and 99 for don't know answer. Levels of knowledge were categorized into %low+ for respondents who scored 50 % and below, %moderate+ for those who scored between 51 and 74 % and %high+ for those who scored 75 % and above. Levels of attitude and practice were categorized into %very bad+ for respondents who scored 50 % and below, %bad+ for those who scored between 51 and 74 % and %good+ for those who scored 75 % and above.

Data was analyzed using Statistical Package for the Social Science® (SPSS), version 24.0. Both qualitative and quantitative data was collected. Quantitative variables were summarized by median and interquartile range (IQR)<sup>11</sup> or by mean and standard deviation (SD). For qualitative variables the number and percentage of subjects in each category were given.

Bivariate Spearman's rho correlation tests<sup>11</sup> at 95 % confidence intervals (CIs) were

calculated through a logistic correlation model to determine association between levels of knowledge, attitude and practice. Correlation is significant at the 0.05 level (2-tailed).

The Friedman’s ANOVA test<sup>11</sup> (at 5% level of significance) was done to determine distribution pattern of KAP.

Inferential statistics (Kruskal Wallis tests,  $p < 0.05$ )<sup>11</sup> (at 5% level of significance) were used if there was a variation of KAP between boys and girls in the study population.

**Results:**

With regards to knowledge-related questions based on this, 69.7 % were qualified as having moderate level of knowledge with a knowledge score of 51 to 74 % score regarding HIV. However knowledge about route of transmission was 80.3%, about prevention and control it was 64.71% and for miscellaneous aspects along with medico legal aspects it was 63.7%. However misconceptions about transmission such as the believe that infection could be transmitted by mosquito bites, sharing a meal with an infected person were observed among a small proportion of participants. But they were aware about spreading that kind of infection intentionally is a punishable offence.

Of the 200 participants 90.2 % respondents indicated willingness/ positive attitude towards HIV-positive persons. With a high score of 91.2 %, participants reported good level of safe practice from the questions on

sexual practice/behaviour regarding HIV. (Table-1)

**Table -1 Participant’s responses to questionnaire for KAP**

	Correct	Incorrect	Don't Know
Knowledge in toto	69.66%	21.48%	8.86%
Knowledge about root of transmission	80.29%	12.82%	6.89%
Knowledge about prevention and control	64.71%	19.50%	15.79%
Knowledge about miscellaneous and medico legal aspects	63.66%	28.58%	7.76%
Attitude	90.19%	6.31%	3.50%
Practice	91.17%	5.08%	3.75%

Bivariate Spearman’s rho correlations showed a weak positive, non significant relationship between knowledge and attitude ( $r = 0.019$ ,  $P = 0.791$ ). This shows that respondents with high knowledge were likely to have positive attitude than those with low level of knowledge. A weak positive correlation was found to exist between knowledge and behaviour/practice but it was non-significant ( $r = 0.073$ ,  $P = 0.302$ ). A positive correlation was found to exist between attitude and behaviour/practice which was significant ( $r = 0.176$ ,  $P = 0.012$ ). This result reaffirms the relationship between knowledge, attitude and practice of infection control measures. (Table-2)

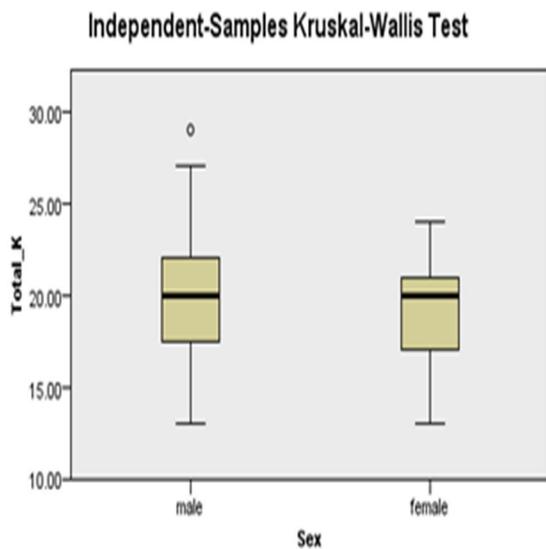
**Table 2 Spearman’s rho Correlation between Knowledge, Attitude and Practice**

Correlations					
			Total_K	Total_A	Total_P
Spearman's rho	Total_K	Correlation Coefficient	1.000	.019	.073
		Sig. (2-tailed)	.	.791	.302
		N	200	200	200
	Total_A	Correlation Coefficient	-.019	1.000	.176*
		Sig. (2-tailed)	.791	.	.012
		N	200	200	200
	Total_P	Correlation Coefficient	.073	.176*	1.000
		Sig. (2-tailed)	.302	.012	.
		N	200	200	200
*Correlation is significant at the 0.05 level (2-tailed).					
K =Knowledge, A = Attitude, P=Practice, N= number of subjects					

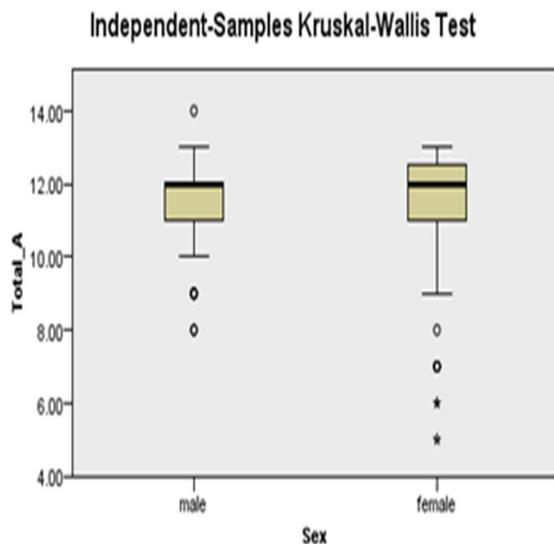
As per the related samples, Friedman's ANOVA test (at 5% level of significance) was done and it was found that distribution pattern between knowledge - attitude, attitude . practice and knowledge . practice was different which reject the null hypothesis.

After applying the Kruskal Wallis 1-way test (at 5% level of significance), it was concluded that across the categories of sex (male and female) the distribution of knowledge, attitude and practice were non-significant means sex of a person doesn't make any difference as far as KAP are concerned. (Graphs 1,2 and 3).

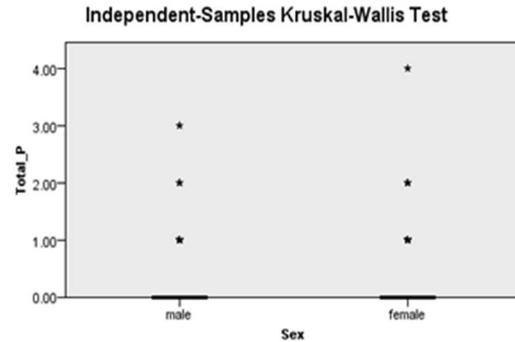
**Graph 1**



**Graph 2**



**Graph 3**



**Discussion:**

With respect to HIV, students exhibited mixed attitudes displaying positive attitudes on some of the issues and negative attitudes on others. Overall, 90.2 % of participants had a positive attitude towards HIV. This means that a greater majority accepted the fact that HIV positive students could be allowed to continue their education and that an infected teacher should continue teaching. A positive correlation was observed between knowledge and attitude showing that good knowledge could contribute to positive attitude as it could mean a better understanding of transmission.

Knowledge, attitude and practice studies are very useful tools prior to any intervention to assess the extent to which individuals or communities are ready to adopt risk-free behaviours. This implies that the school and society was a common source of HIV and STD information which augers well for school based HIV and STD programmes. With the exception of radio (16.4 %) the media (TV and newspapers) had the lowest ratings as sources of information.

A primary reason of this attitude is linked to the lack of communication between the healthcare professional and the patient, so that patient may not receive adequate information. Healthcare professionals should disseminate information regarding HIV and present themselves as a primary source of information for students. This will provide evidence-based knowledge to students, which will improve student's compliance towards their attitude and practice to further spread of infection.

The positive correlations between knowledge-attitude, knowledge-practice and attitude-practice in this study reaffirm the relationship between knowledge, attitude and

practice with infection control measures. It is concluded that adequate knowledge can lead to a positive attitude, resulting in good practices.

During awareness, it was explained to all medical undergraduates that no any government doctor can deny treatment of HIV positive person. A person testing positive for HIV cannot be isolated/quarantined on the basis of their disease and as well as he cannot be removed from service if person is fit to discharge his respective duties in order. If a man knowingly transmits HIV infection to anybody (even wife) is a legally punishable offence as per the law(S. 269 and S. 270, I.P.C.). People who are infected with HIV through medical treatment can seek claims under tort law either in a civil court or in a consumer dispute redressed forum.<sup>12</sup>

### **Conclusion:**

The findings of this study indicate that public lacked an understanding of infection control and proper management. The level of knowledge regarding HIV transmission, prevention and control was considered satisfactory. However, some misconceptions about HIV transmission, discriminatory attitudes and risky behaviours were observed among participants that call for concern and must be addressed promptly.

School education, peer groups and mass media remain the main ways by which students learn about STDs. However, there is urgent need to introduce sexual education at the school as well as at the university level in order to increase students' awareness about the problem and prevention of STDs including HIV. Extensive health education campaigns should be provided to HIV patients in both hospital and community settings using a patient-centric approach. Physicians, pharmacists and nurses should play a role in developing a collaborative care model to provide education to the patients.

Empowering the students and society not only about the transmission, prevention, management but also about the medical and legal aspects of the spreading of the disease will be helpful in controlling the further spread of infection to the healthy population.

**Conflict of interest:** None

**Financial assistance:** Nil

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## Original Research Paper

# Sexual Dimorphism from Proximal Epiphysiseal Measurements of Adult Dry Humerus Bone

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### Abstract:

Sex determination is the first essential step for positive identification when a decomposed body is recovered. Taking into consideration the population aspect of sexual dimorphism of the skeleton, the present study was undertaken to create a sex identification technique using osteometric standards, derived from a central Indian population. Proximal epiphysis of total 200 dry humerus bones were measured according to standard osteometric techniques. The differences between the mean in males and females was significant ( $p < 0.001$ ). About more than 82% of the cases were correctly classified when all measurements were applied jointly. The most effective single dimension was transverse diameter and girth of humerus head (both 82%). The current study provides standards for a population that has not been represented so far in the existing databases. It demonstrates that the humerus is an effective bone for the estimation of sex because even in a fragmentary state it can give high classification accuracy.

**Key Words:** Sexual Dimorphism, Humerus Bone, Epiphysis

### Introduction:

Of the human skeleton, the humerus often remains in good condition and is especially favorable for metric sex determination.<sup>1</sup> The length of the humerus, among the long bones of the human body, is a good predictor, but the vertical head diameter of this bone is also an accurate predictor of gender.<sup>2,3</sup> Identification is the determination of the individuality of a person based on certain physical characteristics.<sup>4</sup>

The question of identification in living persons arises in criminal cases such as in those accused of assault, murder, rape etc., in interchange of newborn babies in the hospital and in impersonation. In civil cases like marriage, inheritance, insurance claims, disputed sex etc. identification plays an important role,<sup>5</sup> when establishing the identity of an individual, primary characteristics of identification are sex, age, and stature.<sup>4</sup> One of the cardinal parameters for identification is determination of sex.

Determination of sex from the human skeleton is among the most important aspect of establishing the biological profile of unknown individuals. In case of mass-disasters such as armed conflicts, terrorist massacres, airplane crashes, war related crimes etc. when badly decomposed, mutilated or damaged human remains consisting of only a few bones or their fragments are recovered from the site; in such cases, it becomes crucial to establish the biological identity, especially the sex of a missing individual because of differences in the age of epiphyseal fusion and difference in formulae for stature estimation in both sexes.<sup>6</sup> Accurate sex determination thus, provides

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DOR: 09/01/2018 DOA: 24/10/2018

DOI: 10.5958/0974-0848.2018.00050.7

valuable evidences to a forensic scientist with regard to identification of remains. Many bones have been previously used for the identification of sex, and such studies emphasize that sexual dimorphism starts to appear after puberty. The humerus has less been tapped as a site for sex determination, though it has often demonstrated an even greater accuracy than other long bones such as the femur. In present study we have used measurement of various epiphysis of proximal end.

**Materials & Methodology:-**

The present study was conducted in the Department of Forensic Medicine and Toxicology, Gandhi Medical College Bhopal over a period of 2 years from January 2013 to December 2014. The study was carried out on 200 adult dry humerus bones. The samples for the study were collected from the department of Forensic Medicine and Toxicology and department of Anatomy, Gandhi Medical College, Bhopal and department of Anatomy Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh.

**Table 1: Showing Bony Points Used for Measurements along with Application of Instrument**

	<p>Breadth of proximal epiphysis denotes the maximum distance between most medial point of head of humerus to most lateral point of greater tubercle. We use osteometric board for measuring it.</p>
	<p>Maximum transverse diameter of the head denoted, maximum width between two points on the head of the humerus in horizontal plane. With the help of vernier caliper these measurements have taken.</p>
	<p>Maximum vertical diameter of the head means Maximum distance between two points on the head of the humerus, in the plane of the tip of greater tuberosity. Vernier caliper used for taken this measurement.</p>
	<p>Girth of head means circumference of head of humerus. With the help of thread these measurements have taken.</p>

The study material comprised of processed and clean 200 adult humerus dry bone of known sex. All the bones were without soft tissue and cartilage, in completely dry condition and in intact form. Bone with any pathology, any deformity, any fracture and fragmented bone were excluded from study. The bones so collected are studied for various morphometric parameters of various distal epiphysis using departmental sliding scientific vernier caliper which was calibrated and verified. All measurements were taken on a standard metric scale twice by same observer to decrease metric error due to observer measurements. (Table 1)

Data so collected was analyzed using SPSS software (IBM SPSS Version 20) to find out if there is any significant difference between the various morphometric characters of adult male and female humerus bone. Inferential statistics based on an independent t-test was used for analysis of sex-related difference in measured variables.

**Statistical Methods Used**

**1. Mean**

- a) Arithmetic mean was calculated by dividing the total number of individual observations by number of cases.
- b) Mean =  $\frac{x}{n}$
- c) Where  $\Sigma x$  = summation of individual observation
- d) n = Number of cases.

**1. Standard Deviation**

- a) It is the square root of the arithmetic average of the square of the difference between the observations and their mean. The formula is given as:

$$\sqrt{\frac{\sum(x - \bar{x})^2}{n}}$$

- b) S.D. =  $\frac{\sum(x - \bar{x})^2}{n}$
- c) Where  $\Sigma(x - \bar{x})^2$  = summation of each squared deviation & n= number of cases

**2. Level of Significance (‘ t ’ test)**

- a) This test was used to find out any significant difference between the

means of different groups. It was calculated by the formula, given below:

- b) S.E. = Standard error (SE) is the standard deviation of the sampling distribution of a statistic.
- c) Standard error of the mean (SEM) is the standard deviation of the sample mean estimate of a sample size mean.

$$SE_{\bar{x}} = \frac{s}{\sqrt{n}}$$

- d)
- e) S= Sample of standard deviation.
- f) n = Number of the sample.

**Probability (p-value)**

P < 0.05 = significant

**Significance:**

If two mean differ by more than twice the value of standard error of the difference, the difference is said to be %significant±

**Degrees of freedom (DF):**

In statistics, the number of degrees of freedom is the number of values in the final calculation of a statistic that are free to vary. Accuracy of test was derived from value through master chart was put to SPSS software( IBM SPSS version 20) and automated calculation of accuracy was given by software application.

**Observations:**

**Number of Selected Cases in our Study**

Study **Table no. 02** shows the sample size of male and female, in present study.

**Table 01- Sample Size of Male and Female**

Sex	No. of Cases	Percentage
Male	121	60.5
Female	79	39.5

**Breadth of Proximal Epiphysis**

The mean value of breadth of proximal epiphysis of male and female were 4.877 & 4.365 cm, respectively. The breadth of proximal epiphysis p-value was <0.001, i.e., the difference in maximum length between two variables was extremely significant. The mean standard deviation, t-test and sig. (2- tailed), suggested that 81.5% of the original grouped cases were

correctly classified, shown in **Table no. 02 and 03.**

**Table 02- Sex Wise Analysis of Breadth of Proximal Epiphysis of Humerus Bone**

Group Statistics					
	Sex	N	Mean	Std. Deviation	Std. Error Mean
Breadth of Proximal Epiphysis	Male	121	4.877	.251	.023
	Female	79	4.365	.329	.037

**Maximum Transverse Diameter of Head**

The mean value of maximum transverse diameter of head of male and female were 3.943 & 3.491 cm, respectively. The maximum transverse diameter of head p-value was <0.001, which means that the difference in maximum length between two variables was extremely significant. The mean standard deviation, t-test and sig. (2- tailed), suggests that 82% of the original grouped cases are correctly classified. (**Table no. 04 & 05**).

**Table 03- Independent Samples Test of Breadth of Proximal Epiphysis of Humerus Bone**

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Breadth of Proximal Epiphysis	Equal variances assumed	4.758	.030	12.429	198	.000	.511	.041	.430	.592
	Equal variances not assumed			11.751	135.681	.000	.511	.043	.425	.597

**Table 04- Sex Wise Analysis of Maximum Transverse Diameter of Head of Humerus Bone**

Group Statistics					
	Sex	N	Mean	Std. Deviation	Std. Error Mean
Maximum Transverse Diameter of Head	Male	121	3.943	.228	.021
	Female	79	3.491	.279	.031

**Table 05- Independent Samples Test of Maximum Transverse Diameter of Head of Humerus Bone**

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Maximum Transverse Diameter of Head	Equal variances assumed	3.522	.062	12.570	198	.000	.453	.036	.382	.524
	Equal variances not assumed			12.052	143.123	.000	.453	.038	.378	.527

**Maximum Vertical Diameter of Head**

The mean value of maximum vertical diameter of head of male and female humerii were 4.320 & 3.827 cm, respectively. The maximum vertical diameter of head p-value was <0.001 which means that the difference in maximum length

between two variables was extremely significant. The mean standard deviation, t-test and sig. (2-tailed), suggests that 81.0% of the original grouped cases were correctly classified. (**Table no. 06 & 07**).

**Girth of Head**

The mean value of girth of head of male and female were 13.546 & 12.130 cm, respectively. The girth of head p-value was <0.001, i.e., the difference in maximum length

between two variables was extremely significant. The mean standard deviation, t-test and sig. (2-tailed), suggests that 82.0% of the original grouped cases are correctly classified. (Table no. 08 & 09).

**Table 06- Sex Wise Analysis of Maximum Vertical Diameter of Head of Humerus Bone**

Group Statistics					
	Sex	N	Mean	Std. Deviation	Std. Error Mean
Maximum Vertical Diameter of Head	Male	121	4.320	.241	.022
	Female	79	3.827	.368	.041

**Table 07- Independent Samples Test of Maximum Vertical Diameter of Head of Humerus Bone**

Independent Samples Test											
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
										Lower	Upper
Maximum Vertical Diameter of Head	Equal variances assumed	12.778	.000	11.443	198	.000	.493	.043	.408	.578	
	Equal variances not assumed			10.514	121.566	.000	.493	.047	.400	.586	

**Table 08- Sex Wise Analysis of Girth of Head of Humerus Bone**

Group Statistics					
	Sex	N	Mean	Std. Deviation	Std. Error Mean
Girth of Head	Male	121	13.546	.671	.061
	Female	79	12.130	.824	.093

**Table 09- Independent Samples Test of Girth of Head of Humerus Bone**

Independent Samples Test											
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Conf Int. of the Difference		
										Lower	Upper
Girth of Head	Equal variances assumed	3.784	.053	13.317	198	.000	1.416	.107	1.206	1.626	
	Equal variances not assumed			12.759	142.776	.000	1.416	.111	1.197	1.636	
Tests of Equality of Group Means											
				Wilks' Lambda	F	df1	df2	Sig.			
Breadth of Proximal Epiphysis				.562	154.481	1	198	.000			
Maximum Transverse Diameter of Head				.556	158.011	1	198	.000			
Maximum Vertical Diameter of Head				.602	130.942	1	198	.000			
Girth of Head				.528	177.343	1	198	.000			

Table 10- Comparison Of Our Study With Various Author Breadth Of Proximal Epiphysis Discussion:

Study by various author.	Present study	Lokanadham S, et al <sup>21</sup>	Girish Patil, et al <sup>22</sup>	Reddy. et al. <sup>23</sup>	Sanjana Devi. et al. <sup>16</sup>	Magdy M. et al. <sup>24</sup>	Kshirsagar . et.al <sup>25</sup>
No. of. Cases	200	100	100	120	50	100	212
Breadth of proximal epiphysis	Y	Y	-	Y	-	-	-
Maximum transverse diameter of the head	Y	Y	-	Y	-	-	-
Maximum vertical diameter of the head	Y	Y	Y	Y	Y	Y	Y
Maximum vertical diameter of the head	Y	Y	Y	Y	Y	Y	Y
Girth of head	Y	Y	Y	Y	-	Y	-

Correct identification is not only important in living person; it becomes far more important after his/ her death. Positive identification involves matching of an "unknown" individual to a "known" individual. The identification of skeletal and other decomposed human remains is very important for legal and humanitarian reasons. In identification, sex determination is the one of the main objective. Basing sex determination on the shape of skeletal features is unreliable and can lead to divergent opinions according to individual experiences. Thus, an impartial metric method for sex determination is essential.

Determination of sex is the first and a crucial step in the process of establishing identity of human/ skeleton remains in the forensic setup. While pelvis and skull are definitely the elements given first preference for determinant of sex, but availability of these bones cannot always be ensured. In the absence of pelvis and cranium, morphometric analysis is frequently carried out on the remains of the long bones of the individual in anthropology and forensic science investigations.<sup>7-12</sup> Hence, it is important to develop a technique for sex determination for as many bones of the body, as possible. This is in general agreement with other studies.<sup>13-20</sup>

In present study, an attempt was made to study the humerus bones of Bhopal region of Central India to evaluate how the morphometric parameters help to discriminate between two sexes and to compare the studies with other studies, done previously. This was done after taking due clearance from institutional ethics committee.

The metric analysis of the humerus bone is a valuable technique in sex determination of skeleton. In the present study, 200 adult humerus bones were taken (121 males and 79 females). However, cases were not grouped according to the side (right and left) because bones of both sides were not taken from the same individual. Sixteen parameters were taken for analysis of sexual dimorphism because often fragmented bones are found in a skeletonised case. Therefore, study of concerned fragmented part of bone could be used for dimorphism .

**Following Parameter were measured on humerus bone:**

1. Breadth of proximal epiphysis.
2. Maximum transverse diameter of the head.
3. Maximum vertical diameter of the head.
4. Girth of head.

In present study, the mean breadth of proximal epiphysis of the males was 4.876 cm, standard deviation, 0.260 cm with a standard error mean 0.0228 and that of the female was 4.365cm, standard deviation of 0.3293 cm and standard error mean 0.0370 with a t-value 12.429. The p-value was < 0.001; which is extremely significant, suggesting that definite dimorphism exists between breadth of proximal epiphysis of the males and the females. In our study, 81.5% of original grouped cases were correctly classified on basis of breadth of proximal epiphysis of humerus.

Lokanadham S, et al<sup>21</sup> found that the mean breadth of proximal epiphysis in male was 4.719, standard error mean 0.034 and in females were 4.167, standard error mean 0.049, t value 8.733, p-value is < 0.001. Reddy, et al<sup>24</sup> found that the

mean of breadth of proximal epiphysis of right side in males was 4.63 cm, with a standard deviation of 0.28 cm and that of females was 4.4cm with a standard deviation of 0.36 cm, t value 2.2. Breadth of the proximal epiphysis p-value was < 0.05, which is considered significant suggesting that definite dimorphism exists between males and females. They found mean of breadth of proximal epiphysis of left side in male was 4.4cm, with a standard deviation of 0.29cm and that of females was 4.22 cm with a standard deviation of 0.41 cm, t value 1.8. p-value was < 0.05, which is considered significant suggesting that definite dimorphism exists between male and female breadth of proximal epiphysis.

When we compared our study with other studies, we found that the mean breadth of proximal epiphysis in our study matches with the study of Lokanadham S, et al<sup>21</sup> but the results were quite dissimilar compared to study of Reddy et al,<sup>23</sup> which may be due to the difference in sample size and also distributed cases on the basis of side (right and left).

**Maximum Transverse Diameter of the Head**

In present study, mean of the maximum transverse diameter of the head of males was found to be 3.943 cm, standard deviation of 0.228 cm with a standard error mean 0.021 and that of females was 3.491 cm, standard deviation of 0.279 cm, standard error mean 0.031 with a t value 12.570. p-value was < 0.001; which is extremely significant suggesting that definite dimorphism exists between male and female maximum transverse diameter of the

head. In our study, 82.0% of original grouped cases were correctly classified, for transverse diameter of the head of humerus.

Lokanadham S, et al<sup>21</sup> found that the mean maximum transverse diameter of head in males was 4.378; standard error mean 0.420; in females, it was 3.492, standard error mean 0.042, t value 1.343. Reddy, et al<sup>24</sup> found that the mean of transverse diameter of the head of right side in males was 3.96 cm, with a standard deviation of 0.26 cm and that of females was 3.7cm, with a standard deviation of 0.38 cm, t value 2.2. Transverse diameter of the head p-value was < 0.02, which is considered significant suggesting that definite dimorphism exists between male and female girth in the middle of shaft.

They found that the mean of transverse diameter of the head of left side in males was 3.91 cm, with a standard deviation of 0.24 cm and that of females was 3.7cm with a standard deviation of 0.36 cm, t value 2.4. p-value was < 0.01, which is considered significant suggesting that definite dimorphism exists between male and female transverse diameter of the head.

When we compared our study with other studies, we find that the mean transverse diameter of the head of humerus in our study matches with the study of various authors but results are quite dissimilar compared to t value study, which may due to the difference in sample size. Our study revealed that this parameter is highly significant in contrast to Lokanadham S. et al. study who did not find this parameter significant.

**Table 11- Showing Comparison of Value of Breadth of Proximal Epiphysis (Present & Past Studies)**

S. N.	Name of Investigator	Year	Sample Size	Male			Female			t-value	P-value
				Mean (cm)	Std. Dev.	Std. Error Mean	Mean (cm)	Std. Dev.	Std. Error Mean		
1	Present Study	2014	M-121 F-79	4.876	0.251	0.023	4.365	0.329	0.037	12.429	0.000
2	Lokanadham S et al.	2012-13	M - 71 F -29	4.719		0.034	4.167		0.049	8.733	<0.001
3	Reddy. et al.		Right	4.63	0.28		4.4	0.36		2.2	
			Left	4.4	0.29		4.22	0.41		1.8	

**Table 12- Showing Comparison of Value of Transverse Diameter of the Head (Present & Past Studies)**

S. N.	Name of Investigator	Year	Sample Size	Male			Female			t-value	P-value
				Mean (cm)	Std. Dev.	Std. Error Mean	Mean (cm)	Std. Dev.	Std. Error Mean		
1	<i>Present Study</i>	2014	M-121 F-79	3.943	0.228	0.021	3.491	0.279	0.031	12.570	0.000
2	Lokanadham S. et al.	2012-13	M - 71 F -29	4.378		0.420	3.492		0.042	1.343	0.182
3	Reddy. et al.		Right	3.96	0.26		3.7	0.38		2.2	
			Left	3.91	0.24		3.7	0.36		2.4	

**Maximum Vertical Diameter of the Head**

In present study, the mean of maximum vertical diameter of the head of male was found to be 4.320 cm, standard deviation of 0.241 cm with a standard error mean 0.022 and that of the female was 3.827 cm, standard deviation of 0.368 cm, standard error mean 0.041 with a t value 11.443. Total humerus length p-value was < 0.001; which is significant suggesting that definite dimorphism exists between male and female maximum vertical diameter of the head. In our study 81.0% of original grouped cases correctly classified, for vertical diameter of the head of humerus. Lokanadham S. et al<sup>21</sup> found that the mean maximum vertical diameter of head in male was: 3.266, standard error mean 0.031, in females, it was: 2.96, standard error means 0.0416, t value 5.492. Patil et al<sup>23</sup> found that the mean of maximum vertical diameter of the head of males was 4.34 cm, with a standard deviation of 0.48 cm, standard error mean 0.06, and that of females is 4.13 cm with a standard deviation of 0.40 cm, standard error mean 0.06, t value 2.37. Breadth of distal epiphysis p-value is <0.005, which is significant suggesting that definite dimorphism, exists between male and female maximum vertical diameter of the head. Devi et al<sup>25</sup> studied 50 bones of which 25 were of males and 25 were of females among western Rajasthan population. They found that the mean vertical diameter of the head in male was 4.6012, standard deviation 2.25 and in female were 3.934, standard deviation 3.058, t value 8.79. In their study, 92.0% of original grouped cases correctly classified for vertical diameter of the head. Reddy. et al<sup>23</sup> found that the mean of

vertical diameter of the head of right side in males was 4.2 cm, with a standard deviation of 0.38 cm and that of females is 3.8cm with a standard deviation of 0.55 cm, t value 2.37. Vertical diameter of the head p-value is < 0.02, which is considered significant suggesting that definite dimorphism exists between male and female maximum vertical diameter of the head. They found mean of vertical diameter of the head of left side in male is 3.87 cm, with a standard deviation of 0.38 cm and that of female is 3.9 cm with a standard deviation of 0.45 cm, t value 2.79. p-value is < 0.01, which is considered significant suggesting that definite dimorphism exists between male and female vertical diameter of the head. Ashmawy, et al<sup>26</sup> found mean of vertical diameter of the head of right side in males to be 4.35 cm, with a standard deviation of 0.48 cm, standard error mean 0.06 and that of females to be 4.13 cm with a standard deviation of 0.40 cm, standard error mean 0.06, t value 2.37. p-value was < 0.05 which is considered significant suggesting that definite dimorphism exists between male and female vertical diameter of the head. In their study, 58.0% of original grouped cases correctly classified for vertical diameter of the head.

On comparing our study with various studies, we found that the mean minimum diameter in the mid shaft in our study was quite similar to the other studies. However, results of t value are quite dissimilar compared to various studies, which may due to the difference in sample size and Reddy et al<sup>23</sup> distributed cases on the basis of side (right and left).

Table 13- Showing Comparison of Value of Vertical Diameter of the Head (Present & Past Studies)

S. N.	Name of Investigator	Year	Sample Size	Male			Female			t-value	P-value
				Mean (cm)	Std. Deviation	Std. Error Mean	Mean (cm)	Std. Deviation	Std. Error Mean		
1	Present Study	2014	M-121 F-79	4.320	0.241	0.022	3.827	0.368	0.041	11.443	0.000
2	Lokanadham S. et al.	2012-13	M - 71 F -29	3.266		0.031	2.96		0.0416	5.492	<0.0001
3	Girish Patil et al.	2010-11	M-54 F-46	4.34	0.48	0.06	4.13	0.40	0.06	2.37	<0.005
4	Anil Kumar Reddy. Et al.		Right	4.2	0.38		3.8	0.55		2.37	
			Left	3.87	0.38		3.9	0.45		2.79	
5	Sanjana Devi. et. al.		M- 25 F - 25	4.6012	2.25		3.934	3.058		8.79	
6	Magdy M. Ashmawy. et al.	2006	M - 54 F -46 right side	4.34	0.48	0.06	4.13	0.40	0.06	2.37	<0.005
6	Magdy M. Ashmawy. et al.	2006	M - 54 F -46 right side	4.34	0.48	0.06	4.13	0.40	0.06	2.37	<0.005
7	Kshirsagar et al		Right	6.25	3.67		5.48	2.62			
			Left	6.10	3.24		5.40	3.16			

Table 14- Showing Comparison of Value of Girth of Head (Present And Past Studies)

S. N.	Name of Investigator	Year	Sample Size	Male			Female			t-value	P-value
				Mean (cm)	Std. Deviation	Std. Error Mean	Mean (cm)	Std. Deviation	Std. Error Mean		
1	Present Study	2014	M-121 F-79	13.546	0.671	0.061	12.130	0.824	0.093	13.317	0.000
2	Lokanadham S. et al.	2012-13	M - 71 F -29	12.96		0.091	11.521		0.1190	8.897	<0.0001

**Girth of the Head of Humerus:**

In the present study, the mean of girth of the head of male humerus was found to be 13.546cm, standard deviation of 0.671 cm with a standard error mean 0.061 and that of females was 12.130cm, standard deviation of 0.824 cm, standard error mean 0.093 with a t value 13.317. Total humerus length p-value is < 0.001; which is extremely significant suggesting that definite dimorphism exists between male and female girth of the head. In our study, 82.0% of original grouped cases were correctly classified, for girth of head of humerus. Lokanadham S, et al<sup>21</sup> found that the mean girth of head in males was 12.96, standard error mean 0.091, in female was 11.521, standard error mean 0.1190, t value 13.317. When we compared our study with

Lokanadham S et al's study, t value are quite similar, both studies were significant.

**Summary and Conclusions:**

The present study, was carried out at Department of Forensic Medicine and Toxicology, Department of anatomy, Gandhi Medical College, Bhopal, and the department of Anatomy, NSCB Medical College, Jabalpur, during the year 2013-2014. In this study, 200 dry humerus bones (129 male and 71 females) were examined and analysed. In our study, sixteen osteometric parameters were measured on each humerus bone and bisexual variation of various parameters was observed. The data was analysed by using computer program (SPSS

Version 20 IBM). The following conclusions were drawn from the study:-

1. Breadth of proximal epiphysis of humerus: 81.5% of original grouped cases were correctly classified statistically significant parameter for sex differentiation.
2. Transverse diameter of the head of humerus is statistically significant parameter for sex differentiation. The accuracy rate for this parameter is 82% significant parameter for sexual dimorphism.
3. Vertical diameter of the head of humerus is statistically significant parameter for sex differentiation. The accuracy rate for this parameter is 81.0% significant parameter for sexual dimorphism.
4. Girth of the head of humerus is statistically significant parameter for sex differentiation. The accuracy rate for this parameter is 82.0% significant.

The present study, when compared with previous researchers, shows a marked variation in absolute values of parameters of the humerus bone reported from different part of world as well as in different region and population of India, but the sexual dimorphism could be made out irrespective of race or demographic profile and it was found to be more or less the same. It can be concluded that morphometry in adult human humerus is population specific. Hence, it is suggested that we should not use the statistics of one region on the bones of the other region. For drawing a precise conclusion, data should be region specific. We had taken 200 humerus bones in central Indian population and parameters from proximal epiphyses were taken to enhance authenticity of study. More studies incorporating a larger sample should be undertaken to make the data more accurate and useful in term of anthropological and medicolegal application.

**Conflict of interest:** None

**Financial Assistance:** None

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## Original Research Paper

# Statistical Assessment and Influential Effect of Alcoholism on Drink and Drive Cases on Various Age Groups

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### Abstract:

Alcohol consumption enunciates edge cutting consequences on both the adult youth and the adults. The research undergone is a quantitative study contemplating cases of drink and drive to compare the pattern of alcoholism between the adult youth and the adults of 5 Central Districts of Himachal Pradesh, India. The sample group consisted of 170 adult youth and adults, who tested positive for concentration of alcohol in blood. Data collection was done using the drink and drive cases registered in the year 2016 of the central districts of Himachal Pradesh (Mandi, Bilaspur, Kullu, Manali and Hamirpur). Analysis was conducted using a statistical software to obtain comparative results of the samples. The proposed findings are expected to provide a pattern analysis of alcohol consumption or alcoholism between the adult youth and the adults.

**Key Words:** Alcoholism, Drink and drive, Sudden deaths

### Introduction:

Alcohol and its malignant consequences have been in human civilization right from its use, and since then, has taken a serious toll on human survival. Numerous temptations are faced at present in most of the defining areas of society, one of them being Drinking and Driving. In India, the per capita consumption is 2 L/adult/year (calculated from official 2003 sales and population figures).<sup>1</sup> The present study is an effort to analyse the effects of alcohol dependence on various age groups, if any, on the basis of real samples obtained, of a particular geographical area of India.

India is generally regarded as a traditional 'dry' or 'abstaining' culture.<sup>2</sup> A recent National Household Survey of Drug Use in the country, the only systematic effort to document the nation-wide prevalence of drug use, recorded alcohol use in the past year in only 21% of adult males.<sup>3</sup> Expectedly, this figure cannot mirror accurately the wide variation that one obtains in a large and complex country such as India.<sup>3</sup> The most appalling form of alcohol, also called as Alcohol Use Disorder (AUD) and alcohol dependence syndrome, involves the inability to manage drinking habits. Alcohol use disorder considers three categories: mild, moderate and severe. Each category has various symptoms and can cause harmful side effects. If left untreated, any type of alcohol abuse can spiral out of control.<sup>4</sup> The term 'alcoholism' is commonly used but poorly defined. The WHO calls alcoholism a term of long standing use and variable meaning and the use of the term was disfavoured by a 1979 WHO Expert Committee. The Big Book (from Alcoholics Anonymous) states that once a person is an alcoholic, they are always an alcoholic, but does not define what is meant by the term "alcoholic" in this context. In 1960, Bill W., co-founder of

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L. M. No: Not a Member

DOR: 02/05/2018 DOA: 24/10/2018

DOI: 10.5958/0974-0848.2018.00051.9

Alcoholics Anonymous (AA), said: "We have never called alcoholism a disease because, technically speaking, it is not a disease entity. For example, there is no such thing as heart disease. Instead there are many separate heart ailments, or combinations of them. It is something like that with alcoholism. Therefore we did not wish to get in wrong with the medical profession by pronouncing alcoholism a disease entity. Therefore we always called it an illness, or a malady- a far safer term for us to use." In professional and research contexts, the term "alcoholism" sometimes encompasses both alcohol abuse and alcohol dependence.<sup>5</sup> Talbot (1998) observes that alcoholism in the classical disease model follows a progressive course: if a person continues to drink, their condition will worsen. This will lead to harmful consequences in their life, physically, mentally, emotionally and socially. A 1960 study by E. Morton Jellinek is considered the foundation of the modern disease theory of alcoholism (Alcohol Explored (1942) and The Disease Concept of Alcoholism (1960)). Jellinek's definition restricted the use of the word "alcoholism" to those showing a natural history. The modern medical definition of alcoholism has been revised numerous times since then.

Expectedly, in such a situation where traditional social regulation of drinking has been supplanted by centuries of temperance or prohibitionist controls, no prescribed patterns of behavior exist to regulate drinking behaviors. This is known to predispose to deviant, unacceptable and asocial behavior, as well as chronic disabling alcoholism.<sup>6</sup> Repeated observations have documented that more than 50% of all drinkers satisfy criteria for hazardous drinking. The signature pattern is one of heavy drinking, typically more than five standard drinks on a typical occasion.<sup>7-9</sup> There is surprisingly little difference between the amount consumed by men and women. Although a large proportion of drinkers of both the genders drink daily or almost daily, the frequency is significantly higher in men. Under-socialized, solitary drinking of mainly spirits, drinking to intoxication and expectancies of drink-related inhibition and violence add to the hazardous patterns.<sup>10,11</sup>

Alcohol is a major factor in traffic crashes, and crashes involving alcohol are more likely to result in injuries and deaths than crashes where alcohol is not a factor.<sup>12</sup> The proportion of alcohol to blood in the body is referred to as the blood alcohol concentration (BAC). A person's BAC is determined by his or her drinking rate and by the body's absorption, distribution, and metabolism of the alcohol. When alcohol is consumed, it passes from the stomach and intestines and is absorbed into the bloodstream. As it circulates in the bloodstream, alcohol distributes itself evenly throughout all the water in the body's tissues and fluids. Because of the way alcohol distributes itself throughout body fluids, it is possible to measure a person's alcohol level by testing the urine, saliva, or water vapor in the breath, as well as by testing the blood. Within a few seconds after ingestion, alcohol reaches the liver, which begins to break it down, or metabolize it. Any BAC measurement therefore reflects not only a person's drinking rate but also his or her rate of metabolism. The human body metabolizes alcohol much more slowly than it absorbs alcohol, so the concentration in the body increases when the person consumes additional drinks before earlier drinks have been metabolized. Factors that influence BAC during and after drinking a given amount of alcohol include age, gender, the proportion of body mass made up by fatty tissue, and whether food is eaten with the alcoholic beverage.<sup>12</sup> Although individual rates can vary, on average, a 170. pound man who has four drinks in an hour on an empty stomach, or a 135. pound woman who has three drinks under similar conditions, would reach a BAC of 0.08 percent (NHTSA 1992).<sup>12</sup>

Existing legislation relating to controls on availability and marketing, restrictions on advertising, and especially minimum drinking age, need to be enforced rigorously. Simulations have demonstrated that implementing a nationwide legal drinking age of 21 years can achieve about 50.60% of the alcohol consumption reducing effects of prohibition.<sup>13</sup> Each year that drinking is delayed significantly reduces the likelihood of developing alcoholism and the life-time risk of alcohol abuse.<sup>14</sup> Increased taxation has been used in other countries, to reduce

consumption.<sup>8,15</sup> In India, the impact of such measures is weak as consumers have easy access to undocumented (illicit and excise-evaded) alcohol, beyond the purview of taxation. There is also concern that alcohol as a commodity is relatively price-inelastic and therefore an increase in its price would simply increase the expense of alcohol consumers aggravating the economic hardship of their family members, without necessarily reducing any of the other negative impacts.<sup>8,15</sup> Regulatory laws pertaining to hours of sale, sale to minors and drunken driving are observed in the breach. The Indian Motor Vehicles Act<sup>16</sup> specifies a blood alcohol cut-off of 30 mg% for drivers, which is arguably one of the strictest in the world. However, a recent study in Bangalore city across a calendar month found that 40% of drivers were over the legal limit<sup>17</sup>.

The present study is an attempt to discern the varying effects of alcoholism if any, on the adult youth and the adults and thus to identify any spectre observed in the drink and drive cases of 5 districts of Himachal Pradesh under study. This study can be helpful to understand the age groups under maximum influence of alcoholism. Also, the drink and drive cases encountered due to alcoholism and its negative impacts can be scrutinized at larger levels.

**Materials & Methodology:**

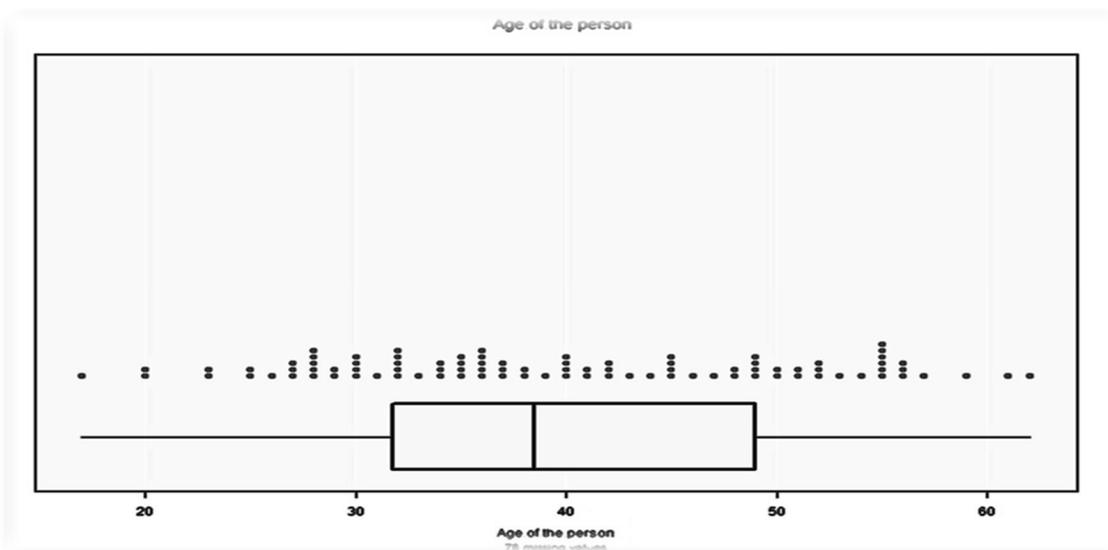
Sample size: In all, 170 samples were collected from the drink and drive cases registered in the year 2016, reported at Regional Forensic Laboratory, Mandi, Himachal Pradesh. The age group of 18-30 was considered as the adult youth while 31 and above were considered as adults.

Statistical Analysis: Software iNZight is used for analysis of the data obtained.

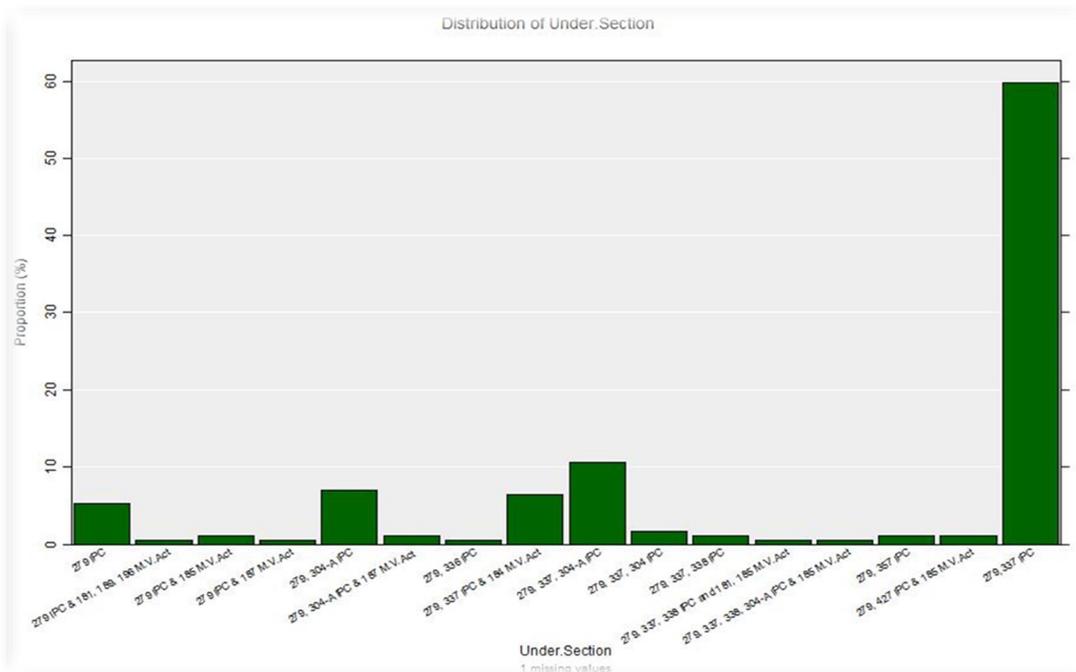
**Observation and Results**

All the samples were analysed with proper cure and the results so obtained were gathered on the basis of different age groups (adult youth and adults). The following observation were taken:

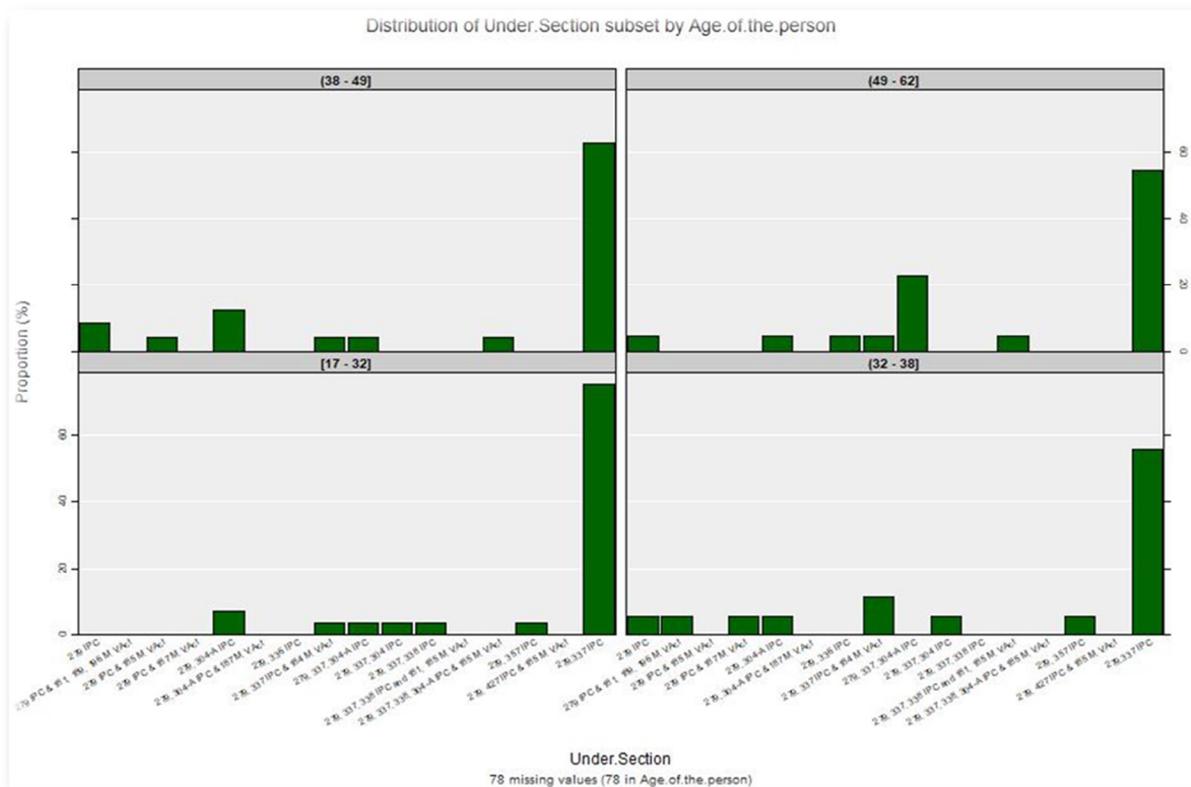
The **graph 1** represents the effect of Alcohol Dependency on different age groups. It also outlines that the number of cases encountered regarding alcohol dependency is more among the adults than the adult youth. Among the analysed samples, the adult age group, under the influence of alcohol, was more involved in the drink and drive cases. The above observations show that people of the adult age group were more to be held in the drink and drive cases. Altogether, the graph depicts that alcohol dependency has largely affected the adult age group over the years, following their involvement in drink and drive cases at substantial levels.



**Graph 1: Graphical representation of Alcohol Dependency on different age groups**



Graph 2: Influential effect of Alcohol on various crimes.



Graph 3: This graph demonstrates the relationship of age groups with respect to cases filed.

**Graph 2** shows the distribution of cases registered under various sections of the Indian Penal Code (IPC) committed under the influence of alcohol. Among all, offences under S. 279 and S. 337 of the IPC top the list. Other sections of IPC having notable levels S. 304A and S. 184 of the Motor Vehicle Act<sup>18</sup>. The observed values on the graph explain the prevalence of drinking and driving in the central districts of Himachal Pradesh.

**Graph 3** showcases 4 sections of age groups (17-32), (32-38), (38-49) and (49-62), with respect to the cases filed. It can be clearly observed from the graph that S. 279 & S. 337 of IPC stand out in each age group; followed by S. 279 & 304-A IPC, in combination, in the age group (17-32) and (38-49). In the age group (32-38), S. 279, 337 IPC & S. 184 Motor Vehicle Act come next, while in the age group (49-62), S. 279, 337 and 304A of IPC follow the offences under S. 279 and 337 IPC.

### Conclusion

It can be concluded from the results shown above that the Drink and Drive cases registered under the S. 279 & 337 of the IPC are predominated by the adults (31 and above). The analysis also indicates the influence of alcohol as one of the major factors in the Drink and Drive cases and the Adult age group is primarily found to be responsible. Bhullar, et al said that 25% of the cases had suffered from road accidents while under the effect of alcohol.<sup>19</sup> In another study, the statistical results of the questionnaire showed that most of the participants admitted that they were affected by alcohol on many aspects.<sup>19</sup> Under the influence of alcohol, drivers exhibited the characteristics of being impulsive, sensation-seeking, adventurous, and moving faster. At the same time, the ability of judgment, recognition, reaction, and operation were impaired. Therefore, drinking driving will produce a high probability to serious accidents.<sup>20</sup>

These conclusions are based on the study of alcohol dependency and its effect on drink and drive cases. Ultimately, the results of this research can be relied upon undisputedly to agree upon the fact that alcohol dependency has a negative impact on the driving state of the

driver leading to road accidents and other fatal crimes.

**Conflict of Interest :** None

**Financial Assistance:** None

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## Original Research Paper

# Gross and Microscopic Study of Pituitary Gland in Cases of Alleged Suicidal Deaths

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### Abstract:

**Introduction:** The pituitary gland lies in the pocket of the sphenoid bone at the base of the brain. It is divided into two parts: the anterior pituitary and the posterior pituitary. The anterior pituitary secretes Growth hormones, Prolactin, ACTH, TSH, FSH and LH; whereas posterior pituitary secretes Oxytocin and Vasopressin. The average weight of pituitary gland in healthy adults is around 0.5 g.

**Aims & objectives:** To study and correlate the weight and morphology of the pituitary glands in suicidal and non suicidal cases.

**Materials and Methodology:** The pituitary were collected from dead bodies brought for medico-legal postmortem examination conducted by the department of Forensic Medicine and Toxicology from Dec. 2015 to Sep. 2017. After removal, the weight of the gland was recorded and then the gland was preserved in 10 % formalin for more than 2 weeks for fixation. After the period of fixation, grossing of the gland was done and slides were prepared and studied.

**Results:** In the study group, maximum weight of pituitary gland was 0.7 grams and minimum was 0.4 grams; whereas in the control group, maximum weight was 0.55 grams and minimum was 0.43 grams. There was no significant difference between the weight of the pituitary gland in the suicidal and the non suicidal groups (SD- 0.49, p=0.54 ). Morphologically, in the study group, 10% cases revealed significant pathological finding of hypophysitis. In control cases, none of the 50 cases showed any pathological finding.

**Key Words:** Pituitary Gland, Hypophysitis, Suicide, Weight, Depression

### Introduction:

More than one lakh persons (1,33,623) in our country lost their lives by committing suicide during the year 2015.<sup>1</sup> It is one of the leading causes of death among teenagers and adults under 35 years of age.<sup>2</sup>

It is ranked among the top 13 causes of death of individuals of all ages, worldwide, by the World Health Organization.<sup>3</sup> It is believed that the most dramatic increase in suicide mortality will be observed in third world countries because of the socioeconomic and behavioral factors.<sup>4</sup> Indians comprise 17% of the total deaths due to suicide, worldwide.<sup>5</sup> In the last 45 years, the rate of suicide has increased by 60% worldwide.<sup>6</sup> Suicide is among the three leading causes of death among people aged 15-44 years in both sexes; these figures do not include the suicide attempts, which are up to 20 times more frequent than completed suicide.<sup>6</sup>

While the relationship between suicide and mental disorders (in particular, depression and alcohol use disorders) is well established in high-income countries, many suicides happen impulsively in moments of crisis with a breakdown in the ability to deal with life's

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DOR: 15/03/2018 DOA: 04/11/2018

DOI: 10.5958/0974-0848.2018.00052.0

stresses, such as financial problems, relationship break-ups, chronic pain, other family problems and illness.<sup>7</sup> In one study conducted in Chandigarh, a relation between adolescent students and suicidal ideation was done, in which the students with academic problems and unsupportive environment at home perceived life as a burden and had higher rates of suicidal ideations.<sup>8</sup> It is estimated that around 30% of global suicides are due to pesticide self-poisoning, most of which occur in rural agricultural areas in low- and middle-income countries. Other common methods of suicide are hanging and firearms.<sup>7</sup>

The pituitary gland is called the master gland as it controls all other endocrine glands.<sup>9</sup> If pituitary is involved in systemic disease and infectious processes then other endocrine glands gets affected. The infectious and inflammatory condition of pituitary gland is called hypophysitis. Lymphocytic hypophysitis (LH), also known as autoimmune hypophysitis, commonly affects the adenohypophysis, but cases with neurohypophyseal involvement are rarely seen.<sup>10</sup> The signs and symptoms of insufficiency of specific hormone produced as a result of hypophysitis vary from incidental diagnosis to severe depression and suicidal death. Macroscopically, infundibulum or the stalk of pituitary gets thickened and adenohypophysis is replaced by fibrous tissue.<sup>11</sup> Microscopically, the adenohypophysis is infiltrated by numerous lymphoid follicles with germinal centres, neutrophils and eosinophils. This infiltration changes the normal glandular architecture into scarring and fibrosis. This inflammatory process also involves neurohypophysis focally.<sup>12</sup>

The pituitary gland, or hypophysis, lies in a pocket of the sphenoid bone at the base of the brain.<sup>13</sup> It is a coordinating centre for control of many downstream endocrine glands. It can be divided into 2 parts: the anterior pituitary and the posterior pituitary. The anterior pituitary, which has five types of secretory cells: somatotropes, which secrete the Growth hormone; lactotropes which secrete Prolactin; corticotropes, which secrete ACTH; thyrotropes, which secrete TSH; and gonadotropes, which secrete FSH and LH. It receives almost all of its blood supply from the portal hypophysial vessels. It is made up of

interlacing cell cords and an extensive network of sinusoidal capillaries. The endothelium of the capillaries is fenestrated, like that in other endocrine organs. The cells contain granules of stored hormone that are extruded from the cells by exocytosis. Their constituents then enter the capillaries to be conveyed to target tissues.<sup>14</sup> The posterior pituitary consists predominantly of nerves that have their cell bodies in the hypothalamus, and stores Oxytocin and Vasopressin in the termini of these neurons, to be released into the bloodstream. In the posterior lobe, the endings of the supraoptic and paraventricular axons can be observed in close relation to blood vessels. Pituicytes, stellate cells that are modified astrocytes, are also present.<sup>15</sup>

### **Aims and Objectives**

To study and correlate the weight and morphology of pituitary glands in suicidal and non-suicidal cases.

### **Materials and Methodology:**

The pituitary glands for this study was taken from the 100 cases that were brought for medico-legal postmortem examination performed by the department, after approval from the institutional Research and Ethics Committee. Informed consent was taken from the relatives of the deceased for removal of the glands. Of the 100 cases, 50 were the study subjects and 50 were controls. The study subjects included those cases in which death was due to alleged suicide by hanging, poison, burns etc. The control cases included deaths other than suicide cases like vehicular accidents, assaults, or natural deaths etc. After removal, the weight of the gland was recorded and then the gland was preserved in 10 % formalin for more than 2 weeks for fixation. After the period of fixation, grossing of gland was done and slides were prepared and studied.

### **Results**

**Age:** The age range of the cases was from 12 to 90 years. The age wise distribution of the cases is shown in **Table 1** which shows that the age group 21 to 30 years was the commonest involved in suicide, followed by the age groups 31-40 and 11-20 yrs, whereas the

age groups 41-50 followed by 21-30 and 31-40 was commonly involved in non suicidal deaths. The mean age of the 'suicidal' group was 34.56+14.60 yrs, whereas the mean age of the non-suicidal group was 42.82+17.43 yrs.

**Sex:** Of the 50 study cases, 36 (72%) were male while in the 50 control cases, 38 (76%) were male.

**Manner of death:** Both, the test and the controls were chosen as per the manner of death i.e., 50 suicidal cases and 50 (unnatural and natural) sudden deaths. Of the 50 suicidal cases, 32 were of asphyxia due to hanging (64%), 17 of alleged poisoning cases (34%) and only 1(2%) was of burns. Of the 50 non-suicidal cases, 31 were of road traffic accidents (62%),

18 were of sudden natural deaths (36%) and only 1 case (2%) was of homicide (**Table 2**).

**Gross findings of the Pituitary Gland:**

In study cases, maximum weight was 0.7 grams and minimum was 0.4 grams. In control cases maximum weight was 0.55 grams and minimum was 0.43 grams. The mean weight of the pituitary gland in the suicidal group was 0.49 grams and the standard deviation was 0.05 grams, whereas the mean weight of the pituitary gland in the non-suicidal group was 0.49 grams and the standard deviation was 0.03 grams (**Table 3**). So there was no significant difference between the weight of the pituitary gland in the suicidal and the non-suicidal group.

**Table 1: Age- wise distribution of cases**

Age Group	Study cases	Percentage	Control cases	Percentage
11-20 years	10	20%	6	12%
21-30 years	15	30%	9	18%
31-40 years	10	20%	9	18%
41-50 years	7	14%	12	24%
51-60 years	5	10%	7	14%
61-70 years	3	6%	4	8%
71-80 years	0	0	2	4%
81-90 years	0	0	1	2%

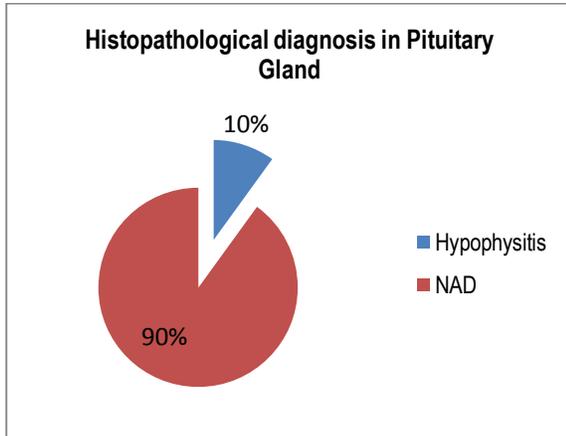
**Table 2: Distribution of cases as per Manner of Death**

Group	Manner of death	No. of cases	Percent	% of Total Deaths (n=100)
Suicidal deaths (n=50)	Burns	1	2%	1%
	Hanging	32	64%	32%
	Poisoning	17	34%	17%
Non-Suicidal deaths (n=50)	Accidental	31	62%	31%
	Homicidal	1	2%	1%
	Natural	18	36%	18%

**Table 3: Weight of the Pituitary Gland**

Pituitary Gland Weight (Gms)	N	Mean	Std. Deviation	P Value
Suicidal	50	0.49	0.05	0.54
Non-Suicidal	50	0.49	0.03	

**Microscopic findings in pituitary gland:** Of the 50 test cases, only 5 cases (10%) revealed significant pathological findings and the rest 45 cases (90%) were histologically normal (Fig.1).

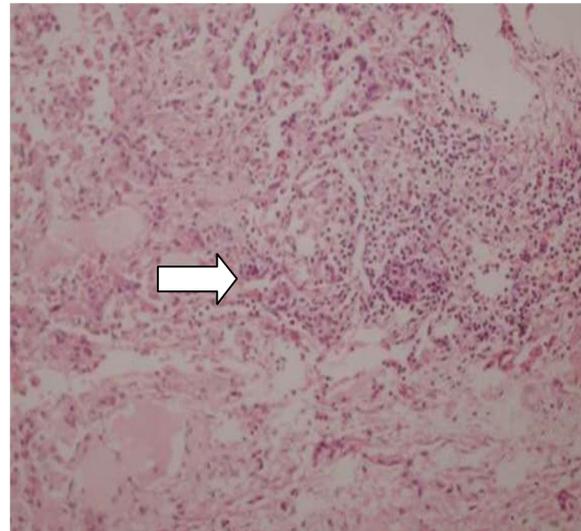


On the basis of histopathological changes, the diagnosis of Hypophysitis (Photo 1) was made in these 5 cases (10%) as they showed lymphomononuclear cell infiltration with lymphoid follicles and destruction of pituitary parenchyma. Of these five cases, three were male (60%) and two were female (40%). All the cases belonged to the age group of 21-30 and 11-20 yrs (young adults). On the other hand, none of the 50 control cases showed any pathological finding of hypophysitis in the pituitary gland. In some cases tiny cyst filled with cholesterol cleft were seen in space between the anterior and posterior pituitary gland. By Fischer exact test, there was a significant statistical correlation for the presence of findings of hypophysitis in the test group.

**Discussion:**

The pituitary gland is rarely involved in systemic and infectious diseases. In our study: of the 50 study cases, 5 (10%) were diagnosed with hypophysitis and no case of hypophysitis was diagnosed in the control group. This shows significant prevalence of pituitary hypophysitis (10%) in the suicidal cases and gives direct relation of the pituitary hypophysitis and suicide. In control cases, although the death was random due to accidental and by some diseases, but deaths caused by disease were not directly related to the pituitary gland and thus this did not

alter the results. This finding in the present study is consistent with the study conducted by Serbro, et al<sup>16</sup> and it differs with the study done by Furgal-borzych, et al.<sup>17</sup>



**Photo 1: Photomicrograph showing hypophysitis with lymphomononuclear cell infiltration and destruction of pituitary parenchyma (H&E, X200).**

Srebro Z, et al<sup>16</sup> conducted a study aimed to determine the histopathological changes in the pituitary gland in suicide victims and concluded that there is partial destruction by inflammation in the pituitary gland which causes the mood disturbance leading to the suicide. We could not find any such destruction of the pituitary gland due to inflammation.

Our study differs with the study done by Furgal-Borzych, et al<sup>17</sup> in which he evaluated 151 cases: 70 cases of suicide and 81 accidental/ non-suicidal cases and concluded that the significance of findings of pituitary adenoma in suicidal cases are high as compared to accidental/ non-suicidal cases. Pituitary adenoma was found in 32 cases (47.7%) in the suicide group as compared to non-suicidal group where 15 cases (18.3%) had pituitary adenoma, and the p value came out to be 0.00, with relative risk ratio of 1.9. All these gave a clear association between the pituitary adenoma and suicide. We could not find even a single case of pituitary adenoma in our study.

**Conclusion:**

In our study 10% (5 cases ) cases of suicidal groups showed the microscopic finding of hypophysitis which was significant when compared to non-suicidal cases in which not even one case of hypophysitis was diagnosed. So there was a statistical significance of the presence of findings of hypophysitis in the test group. The weight of the pituitary gland in the suicidal group (mean = 0.49, SD=0.05 and p=0.54) and non-suicidal group (mean=0.50 and SD=0.03) was not statistically significant. There is paucity of studies that could correlate the association of histopathological changes in pituitary gland in suicidal and non-suicidal cases. But in the present study we tried to find such a correlation.

**Conflict of interest:** None

**Financial Assistance:** None

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## Original Research Paper

# Study of Pattern of Pathological Changes In Liver In Autopsy Cases

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### Abstract:

In certain cases where cause of death is unknown, gross examination of the organ and its histopathological examination can give us opinion regarding cause of death. Liver is one of the vital organs of the body and the main site of metabolism. As a result, it also becomes site for large number of diseases, of which most have specific symptoms and can be diagnosed, while few liver diseases are diagnosed on autopsy and histopathology. A large number of primary as well as secondary diseases involve liver.

Aim of the study was to correlate histopathological findings in the liver with gross examination. In the present study, 80 autopsy cases of liver were studied. The liver specimen was examined grossly and microscopically to find out any liver disease. Most of the cases were in age group between 31- 40 year (30%). Males accounted for 77% cases. Chronic venous congestion, fatty liver and congestion were the main findings. Others included Tuberculosis, Cirrhosis, Carcinoma, Hepatitis and Liver necrosis.

**Key Words:** Autopsy, Liver Pathology, Medico-Legal, Fatty Change

### Introduction:

All medico-legal autopsy cases deal not only with criminal, suspicious, accidental or suicidal deaths, but also a wide range of deaths from natural causes. Many of these are sudden, unexpected, clinically unexplained or otherwise obscure, even though there need be no unnatural element in their causation.

Residing at the crossroads between the digestive tract and the rest of the body, the liver has the enormous task of maintaining the body's metabolic homeostasis.

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DOR: 31/08/2017 DOA: 30/09/2018

DOI: 10.5958/0974-0848.2018.00053.2

Thus, it is not surprising that the liver is vulnerable to a wide variety of metabolic, toxic, microbial, and circulatory insults. In some instances, the disease process is primary to the liver. In others, the hepatic involvement is secondary, often to some of the most common diseases in humans, such as heart failure, diabetes, and extra hepatic infections.<sup>1</sup> Almost all alcohol is detoxified by the liver, only 2. 10% being excreted unchanged by the kidneys, lungs, sweat, salivary and mammary glands. This means that a heavy drinking session places a great metabolic burden upon the liver and is the cause of hepatic damage after long-standing drinking.<sup>2</sup>

Alcohol abuse generally leads to three pathologically distinct liver diseases; these are fatty liver, hepatitis and alcoholic cirrhosis. Any one or all the three can occur at the same time, in the same patient.<sup>3</sup>

The cardinal hepatic manifestations of significant right sided heart failure are sinusoidal dilatation and congestion. These changes are clearly zonal, with the centrilobular area being

most severely affected. This condition has been referred to as the Chronic Passive Congestion and is closely related to elevated pressure in right atrium or with other condition leading to an increase in systemic venous pressure.<sup>4</sup> The central regions of the hepatic lobules, viewed on gross examination, are red-brown and slightly depressed (owing to cell loss) and are accentuated against the surrounding zones of uncongested tan, sometimes fatty, liver - Nutmeg Liver.<sup>1</sup>

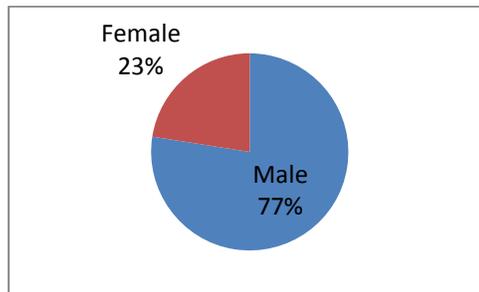
**Materials & Methodology:**

The present study was carried out in the department of Forensic Medicine & Toxicology, B. J. Medical College, Ahmedabad. Eighty liver specimens were taken for study in the age group 20-90 years. Gross examination of the liver was done, taking in to account the weight, surface, colour, consistency, etc. After proper sectioning, it was fixed in 10% formalin for 3 days and after that the processing was done in tissue processor and paraffin blocks were prepared. Sections were prepared and stained with H & E stain. Microscopic examination was done and findings were recorded and analysed.

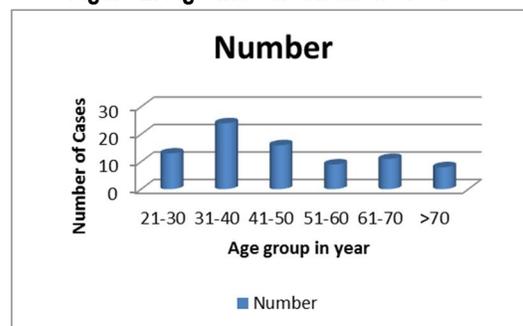
**Results & Observations:**

- In the present study, of the 80 cases, 77% were male. (Figure 1). Maximum number of cases were in the age group 31- 40 years. [Males: 19 & Females: 5] (Figure 2).

**Figure 1: Sex-wise distribution of cases**



**Figure 2: Age-wise distribution of cases**



- Hepatomegaly was most commonly seen in males as compared to females. About 50% of total case were of normal weight and in 9 cases (11.3%), the weight of liver was below 1000 grams, as shown in **Table no. 1**
- As per the histopathology of the Liver (**Table 2**), CVC was the most common finding (37.5% cases), followed by Fatty change (30%), while 16.3% cases showed no remarkable change.

**Table No. 1 Sex wise distribution of weight of Liver**

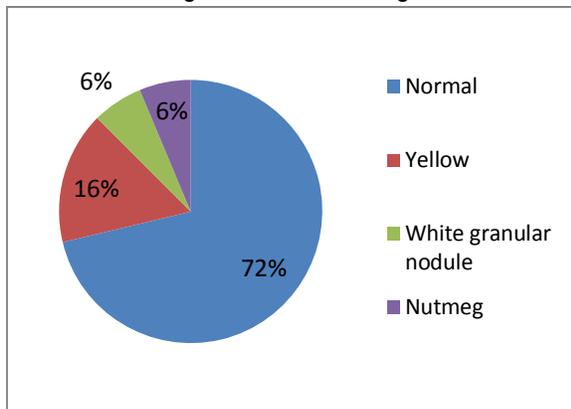
S.No.	Weight of Liver in Grams	Male	Female	Total ( Out of 80 cases)
1	Normal(1000-1500)	34	7	41
2	1501-2000	19	3	22
3	2001-2500	5	1	6
4	>2500	2	0	2
5	<1000	5	4	9

**Table No. 2 Histopathological Diagnosis**

S.No.	Histopathological diagnosis	Male	Female	Total (n = 80)
1	Circulatory disorder(CVC)	24	6	30 (37.5%)
2	Fatty Change	18	6	24 (30%)
3	Tuberculosis	4	0	4 (5%)
4	Hepatitis	3	0	3 (3.75%)
5	Carcinoma	2	0	2 (2.5%)
6	Liver necrosis	2	0	2 (2.5%)
7	Cirrhosis	2	0	2 (2.5%)
8	No remarkable change	8	5	13 (16.25)

- On the basis of gross findings, in 72% cases, liver appeared normal in the outer and cut surface; in 16% cases, the surface of liver appeared yellow where as in 6% cases, white granular nodules were seen both in outer and cut surface and in another 6% of cases, liver showed nutmeg appearance. (Figure No.3)

Figure 3 - Gross findings



**Discussion:**

In the present study, we found that the incidence of liver disease was maximum in the 3<sup>rd</sup> & 4<sup>th</sup> decade of life, which is similar to the observations of Pathak A, et al.<sup>5</sup> As per the observations of other workers,<sup>3,6,7</sup> liver disease is maximum in male population, which was also reported by us. This can be due to the fact that males are more addicted to alcohol and smoking.

The most common finding was chronic venous congestion, 30 (37.5%) cases, which is similar to observation by Sameer, et al,<sup>6</sup> where circulatory disorder (CVC) was the most common finding, 31.3%. These can occur due to conditions leading to increased systemic venous return, such as in right heart failure.<sup>5,10</sup>

The second most common finding was fatty change in liver, 30% , mostly seen in the age group between 31-40 years, which is similar to the observation by Bal MS, et al.<sup>3</sup> Alcohol consumption is the most common cause of fatty liver. Daily intake of 40-80 gm of alcohol increase liver weight and frequency of fatty changes.<sup>11</sup>

There were 4 (5%) cases of caseating granulomas with Langhan’s Giant cells in our nt

study, mainly seen in 3<sup>rd</sup> decade of life. It is a due to military tuberculosis and the deceased had tuberculosis in spleen also. This is due to the fact that liver has rich supply of blood. Devi Ph. M, et al<sup>8</sup> observed 2% of hepatic granulomatous lesions, which is lesser than our study. Primary hepatic tuberculosis is rare because low oxygen tension in liver is unfavourable for growth of mycobacterium, as per Zheng Wu et al.<sup>8</sup>

In the study conducted by Bal, et al,<sup>3</sup> they observed hepatitis in 3% of cases, which is similar to our observation of 3.8%, while Prashant, et al<sup>9</sup> reported 1% cases of hepatitis. Again, only 2 (2.5%) cases of cirrhosis were seen, which is lower as compared to Sameer et al (7.3%).<sup>6</sup> As long term alcohol consumption leads to cirrhosis of liver, this can be due to the fact that alcohol is not easily available in our region , being a 'dry state'.

Neoplasm of liver can either arise from epithelial or mesenchymal and it can be both benign & malignant. Most common hepatic neoplasm are metastatic carcinoma with colon, lung, and breast heading the list of the primary sites. Primary hepatic malignancies are almost all hepatocellular carcinomas.<sup>11</sup> In our study, one case of metastatic carcinoma was seen arising from adenocarcinoma of lung and one case was of Hepatocellular carcinoma.

**Conclusion:**

In the present study, the most common finding was chronic venous congestion, followed by fatty liver and normal parenchyma. The age group between 31 - 40 years was mainly affected, with male predominance. Histopathology plays a vital role in medico-legal autopsy cases in which cause of death is not known and gross examination alone may lead to missing some important pathological findings.

This Study was performed only on specimens collected during autopsy and may differ from the actual incidence of liver disease in the region. Histopathological examination is very beneficial to find out silent liver disease such as venous congestion, fatty changes, cirrhosis and malignant tumors.

**Conflict of Interest:** None.

**Financial Assistance:** None

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## Original Research Paper

# A Comparative Study of Estimation of Stature by Bertillon's System among Individuals of Different Regions of India

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### Abstract:

The "Bertillonage" system was based on the finding that several measures of physical features, such as the dimensions of bony structures in the body, estimation of stature from these, etc remain fairly constant throughout the adult life. Bertillon concluded that when these measurements were made and recorded systematically, every individual would be identifiable. 'Bertillonage' exhibited certain defects and was gradually supplanted by the system of fingerprints and then, by genetics. Bertillon originally measured variables he thought were independent - such as forearm length and leg length.

The present study was conducted on 100 subjects of age group 18yrs-25yrs, both male and female, though not in equal numbers. Only the subjects with heights falling within a certain range were made a part of the study.

The study showed that the Humerous bone length was in the decreasing order as: South>East>North>Central, the forearm length: Central>South>North>East, Hand length: North>East>South>Central, Femur length: East>South>North>Central, Tibial length: South>East>North>Central and Foot length: East>North>South>Central.

**Key Words:** Bertillonage system, Stature, Height, Bone Length

### Introduction:

In 1883, Frenchman Alphonse Bertillon introduced a system of identification that was named after him.<sup>1</sup> The "Bertillonage" system was based on the observations that various physical features, such as the dimensions of bony structures in the body, that remain fairly constant throughout adult life, when measured and recorded systematically, would be of immense use in identification.

Bertillonage exhibited certain defects and was gradually supplanted by the system of fingerprints and, latter by genetics. Bertillon originally measured variables he thought were independent - such as forearm length and leg length.

Anthropometry is the study of measurements of various parameters like length of bones and/ or diameter of waist/ head etc. and has been a very useful tool in the field of Forensic Medicine. The mutilated bodies and amputated body-parts (especially bones) have been often used to bring back the identity of the individual to some extent.<sup>2</sup> The knowledge of anthropometry has been used by the forensic experts all over the world in establishing the identity of individuals.

One instance where this method of identification has been used in the past is in Captain K. Nagaraju's case,<sup>3</sup> a doctor in the Indian Army who murdered his wife and daughter and dismembered their bodies. The pieces of limbs and trunk found by the investigation team were used to determine the stature of his wife through the knowledge of anthropometry. Later, the use

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DOI: 10.5958/0974-0848.2018.00054.4

of superimposition technique also helped in solving the case.<sup>3</sup>

This study focussed on certain parameters for estimation of stature and their accuracy in estimation of the stature in individuals belonging to different regions of India. These parameters have been talked about under the **Methodology** section.

Several researches have been conducted in India focusing on anthropometrical measurements of a specific area or region, but without taking the individuals of different states for study into consideration.<sup>4</sup> Prediction of the stature of an individual is an important aspect of forensic examinations and anthropological studies. Stature provides important evidence in the forensic investigation process to the establishment of personal identification.<sup>5</sup>

As per a study conducted in Srinagar, dimensions of hand provides a good parameter in estimation of stature.<sup>6</sup> The estimation of stature can be helpful to law enforcement agencies and other related with police sciences.<sup>7</sup> Estimation of stature is based on a principle that every body part bears more or less a constant relationship with the height of an individual. Various studies in the past have utilized various body parts, such as upper and lower extremities, including hand and foot dimensions for the estimation of stature.<sup>8</sup>

This study, was conducted on individuals of different regions of the country, with an aim to provide broader information regarding the use of Bertillon System.. This study can be therefore used by forensic experts all over India to study the accuracy of anthropometric measurements in determination the height of individuals of different regions of the country.

**Materials and Methodology:**

This was a cross-sectional and quantitative type of study, which also included comparison of measurements of individuals of different regions of India. The regions included here are - North, South, East & Central. West India was Not included as most of it is concentrated in the state of Rajasthan as Thar

Desert and is scarcely populated and thus may render the conclusions varied.

**Sample Size:**

The study was be conducted on 100 subjects of the age group 18-25yrs. The sample contained both males and females, though not in equal number. Only the subjects with height falling within a certain range were part of the study.

**Study Design:**

The subjects were be informed and explained properly about the project and a written consent was be taken from them prior to the procedure. A small group of individuals were taken for measurements of hand-length, foot-length, arm-length, femur, hand and tibial length along with their weight. Since the anthropometrical variations due to time of the day are almost negligible, diurnal variations will not be taken into account.

**Inclusion Criteria:**

1. The study was conducted on subjects of Indian Nationality, of the age group 18-25yrs.
2. Subjects falling under a specific range of height were included.

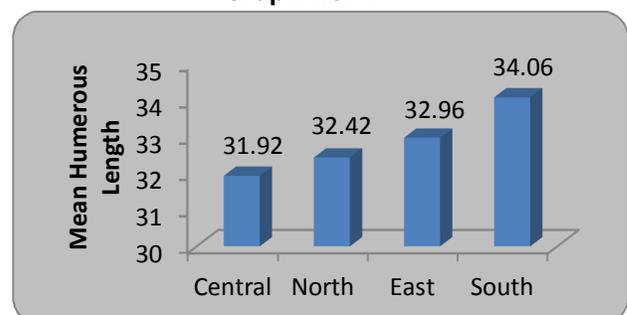
**Exclusion Criteria:**

Subjects with congenital bone deformities/ diseases - Ones suffering from bone malformations/ deformities, or who have had a recent fractures of their limbs were excluded.

**Observations & Results:**

As shown in the **Table & Graph No.1**, the mean length of humerus was the longest for South Indians, in comparison with those of the other regions and was measured at 34.06 with SD of 3.22

**Graph No: 1**



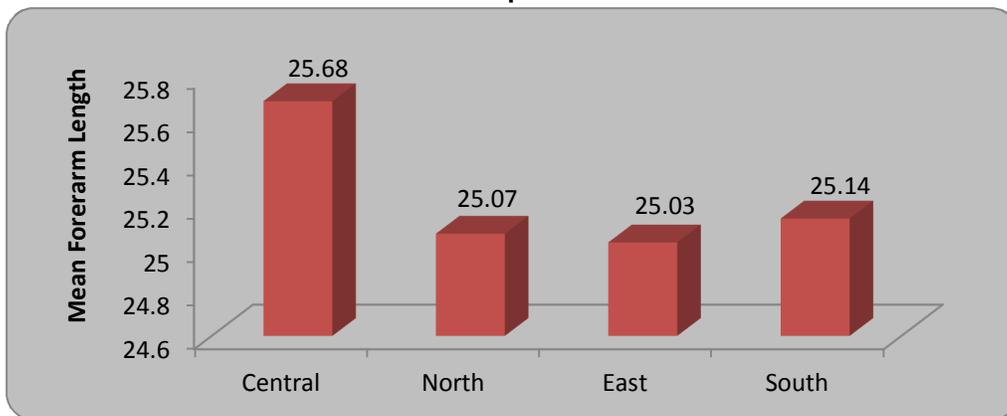
As shown in **Table & Graph No. 2**, the mean length of the forearm bones was the longest for

the residents of Central India, closely followed by the rest of the parts. It was measured at 25.68 with SD of 2.05

**Table No. 1**

Region	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Central	19	31.92	3.65	0.83	30.16	33.69	26.00	38.00
North	31	32.42	4.11	0.73	30.91	33.93	17.00	41.00
East	21	32.96	2.85	0.62	31.66	34.26	26.80	38.00
South	28	34.06	3.22	0.60	32.81	35.31	28.50	40.50

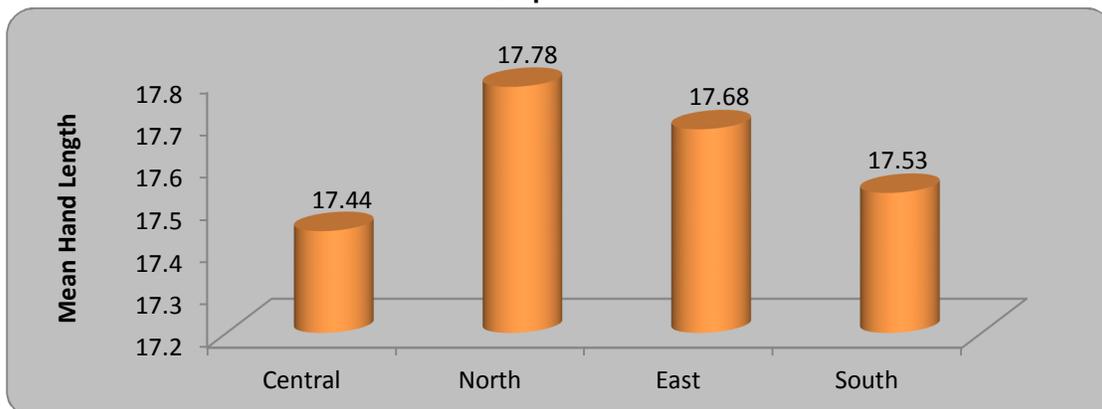
**Graph 2**



**Table No. 2**

Region	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Central	19	25.68	2.05	0.47	24.69	26.67	22.80	30.50
North	31	25.07	2.12	0.38	24.28	25.85	20.00	29.80
East	21	25.03	2.00	0.43	24.12	25.95	22.00	29.20
South	28	25.14	2.08	0.39	24.33	25.95	21.00	29.00

**Graph No. 3**



The length of the hands (palm) was not seen to be a good parameter of measurement as it was measured at roughly 17cm for all the regions. (Table & Graph No. 3)

Length of the femur bone was seen to be the highest in the East Indians, closely followed by South Indians. The SD was of 3.78 and 4.20 for East and South respectively. (Table & Graph No. 4)

Table No. 3

Region	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Central	19	17.44	1.87	0.43	16.53	18.34	14.00	21.50
North	31	17.78	1.79	0.32	17.12	18.43	12.20	21.20
East	21	17.68	0.90	0.19	17.27	18.09	16.40	19.30
South	28	17.53	1.47	0.27	16.96	18.10	15.00	21.00

Graph No. 4

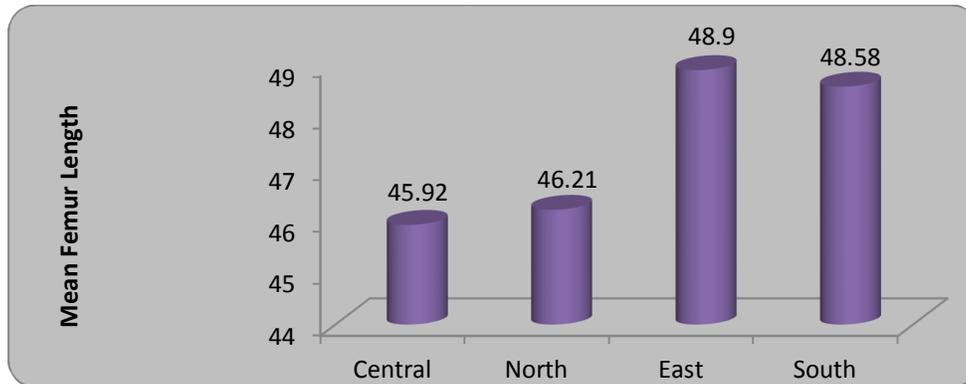


Table No. 4

Region	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Central	19	45.92	5.17	1.18	43.42	48.41	37.30	56.00
North	31	46.21	4.61	0.82	44.52	47.90	33.00	53.60
East	21	48.90	3.78	0.82	47.18	50.62	41.20	55.00
South	28	48.58	4.20	0.79	46.95	50.21	38.50	57.50

Graph No. 5

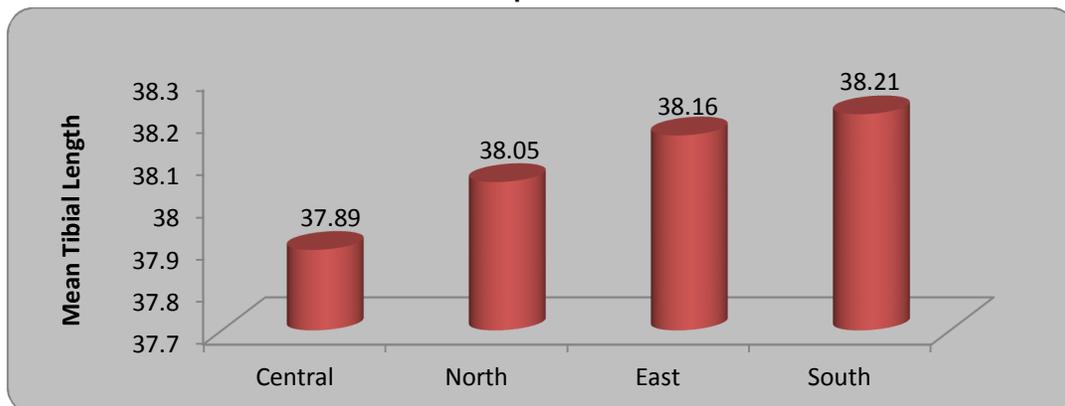


Table No. 5

Region	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Central	19	37.89	4.41	1.01	35.76	40.02	27.00	45.00
North	31	38.05	3.01	0.54	36.95	39.16	31.00	44.00
East	21	38.16	2.24	0.48	37.14	39.18	34.00	42.00
South	28	38.21	3.31	0.62	36.92	39.50	29.00	44.00

Graph No. 6

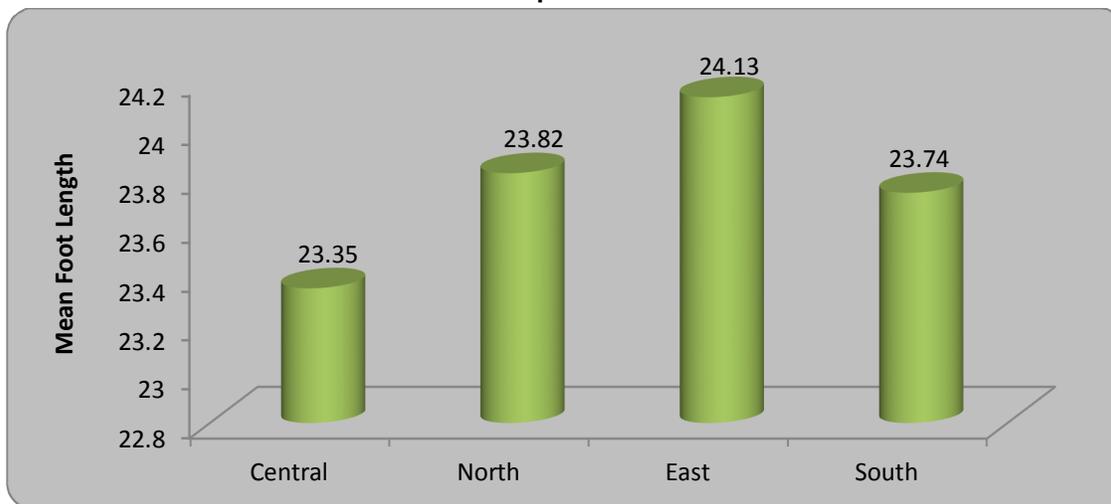


Table No. 6

Region	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Central	19	23.35	1.68	0.38	22.54	24.16	21.00	27.20
North	31	23.82	2.03	0.36	23.08	24.57	20.00	28.00
East	21	24.13	1.90	0.41	23.27	25.00	21.00	27.00
South	28	23.74	2.79	0.52	22.66	24.82	20.10	33.20

As shown in **Table & Graph No. 5**, the tibial length was also not a good parameter as it did not give clear results after measurements.

The foot length was measured to be the highest for North Indians but was also not a good parameter. (**Table & Graph No. 6**)

- The study has shown that the humerus bone length is in the decreasing order as: South>East>North>Central, ranging from 31cm-34cm
- The forearm length is seen as Central>South>North>East, with a narrow range of 25-26cm

- The Hand length is seen as North>East>South>Central, with a narrow range of 17-18cm
- The Femur length is seen as East>South>North>Central with a range of 45-49cm
- The Tibial length is seen as South>East>North>Central with a range of 37-39cm.
- The Foot length is observed as East>North>South>Central with a range of 23-25cm

**Discussion & Conclusion:**

As a general observation and nature's rule, male bones are longer than female bones

due to the effect of several hormones like that of Growth Hormone or Androgens. Similarly, female homeostatics like estrogen are responsible for their short and feminine stature. Several studies have shown the different factors responsible and playing a role.<sup>9</sup>

In the above study, we focussed more on geographical variations causing the difference.

From our study, we concluded that-

- **Humerous length variation** is highest in North Indian Region, and maximum length is observed in the people dwelling in South India.
- **Forearm length variation** is highest in North Indian Region and maximum length is observed in the Central Region is India.
- **Hand Length variation** is highest in the North Indians and maximum length is also seen amongst the same.
- **Femur Length variation** is maximum in North Indians and maximum length is observed in the East Indians.
- **Tibial Length variation** is maximum in Central Indians and maximum length is seen in South Indians, closely followed by East Indians.
- **Foot Length Variation** is maximum in South Indians and the length is maximum in the dwellers of East India.

The Hand length is the least specific parameter for differentiation amongst the individuals.

**Conflict of Interest:** None

**Financial Assistance:** None

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## Original Research Paper

# Gender Identification from hyoid bone - An autopsy study

<sup>1</sup>Astha Guliani, <sup>2</sup>Prateek Rastogi, <sup>3</sup>MS Kotian, <sup>4</sup>Raghavendra Babu YP

### Abstract:

**Background** - Sexual dimorphism represents a group of morphometric characteristics that differentiate males from females. Limited data is available related to the significance of hyoid bone in sex determination. The objective of this study was to evaluate the utility of hyoid bone for the same.

**Methodology** - An autopsy based cross sectional study was carried out at Kasturba Medical College, Mangalore, by measuring dimensions of Hyoid bones from deceased individuals above 18 years of age, excluding those with fracture and other anomalies. The total outer length, distance between two cornu, length of cornu, anteroposterior length, body height, and body width of hyoid bone were recorded using a digital caliper, by placing the hyoid bone on a flat horizontal surface. The sample size was calculated to be 46 with a 95% confidence level and 90% power with respect to anteroposterior length of the hyoid bone. Ethics committee clearance was obtained for the same.

**Results** - The probability of a person being a male or female was highest by using total outer length. In man, the hyoid bone was larger in total outer length, length of cornu, anteroposterior length, height of body, width of body. Maximum error of estimate was shown by body width followed by distance between two cornu and the minimum error was shown by total outer length. Maximum coefficient of correlation was shown by total outer length followed by anteroposterior length and minimum by width of body. Maximum predictive value was shown by total outer length followed by cornu length and minimum by body width.

**Conclusion** - The need for reliable methods distinguishing males from females based upon various skeletal elements is evident in cases of commingled, eroded and/or missing remains. Sex differentiation is important in the medico-legal system but if the integrity of the body has been compromised, it becomes difficult. Present study clearly shows that hyoid bone is of great importance in forensic medicine practice and can be used efficiently for sexual dimorphism and identification.

**Key Words:** Sexual Dimorphism, Hyoid Bone, Autopsy Sample, Forensic Medicine

### Introduction:

Sex determination is an important

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DOR: 28/08/2017 DOA: 03/11/2018

DOI: 10.5958/0974-0848.2018.00055.6

parameter in forensic identification as it narrows down the target population by almost 50%. Many studies have been conducted previously to determine the utility of bones like skull, femur, pelvic bone, etc. in the determination of sex.<sup>1,2</sup> But limited data is available related to the significance of hyoid bone in sex determination. The objective of this study was to evaluate the utility of hyoid bone in sex determination.<sup>3</sup>

The hyoid bone is situated in the neck at the level of the C3 vertebra, between the root of tongue and thyroid cartilage. Mylohyoid, omohyoid and thyrohyoid muscles and the stylohyoid ligament are attached with this bone.<sup>1</sup>

According to a study on Bengali population, hyoid bone was larger in men regarding width, anteroposterior length, length of

greater cornu, body width and distance between the lesser cornu. The slope of the axis of the cornu did not show significant difference between the two sexes.<sup>1</sup>

Keeping this study in mind, we planned to undertake a study to analyze sexual dimorphism of hyoid bone in autopsy sample at our center. The results, if significant can go a long way in forensic identification of the dead especially when other parameters of sexual identification cannot be made applicable.

**Materials and Methodology:**

A cross sectional study was carried out in the Department of Forensic Medicine and Toxicology, Kasturba Medical College, Mangalore, after receiving approval from the Institutional Ethics Committee. The samples of hyoid bone were collected from the dead bodies received in the mortuary at Kasturba Medical College, Mangalore for medicolegal autopsy. Informed consent of the relative of the deceased was taken before collecting the sample of hyoid bone. Hyoid bones from individuals was collected after excluding those with fracture and other anomalies. The hyoid was dissected out from the dead bodies by enmasse removal of organs. The soft tissues attached to the hyoid were carefully dissected out and the bone was stored in 10% formalin for 72 hrs. After 3 days, it was cleaned and dried. The total outer length, distance between two cornu, length of cornu, anteroposterior length, height of body, and body width of hyoid bone were recorded using a digital caliper, by placing the hyoid bone on a flat horizontal surface. The sample size was

calculated to be 46 with a 95% confidence level and 90% power with respect to anteroposterior length of the hyoid bone.

**Results and Discussion:**

Total number of samples collected was 46 of which males were 33 and females were 13. The age of males ranged from 18-78 years and the range of age for females was 18-85 years, while in another study conducted on Bengali Population, the sample size was 50 adult bones (38 men and 12 women), with age ranging from 19 to 70 years.<sup>1</sup> In the study on Turkish population, the hyoid bones of 85 cadavers of known sex and age were extracted and 33 measurements were made with a computer program following photography with a camera.<sup>2</sup>

In present study, the length of hyoid bone ranged between 7.4 cm to 11.3 cm, while in another study on south Indian population,<sup>4</sup> the length of the hyoid bone ranged between 3 cm and 4.5 cm; again, in this study, the smallest hyoid bone belonged to a male victim aged 4 years, while in present study it was of a female aged 55 years.

**Table 1** shows that for males, the maximum standard deviation was shown by distance between two cornu (0.906), followed by anteroposterior length (0.883) and minimum was shown by height of body (.506). For females, the maximum standard deviation was shown by total outer length (0.768), followed by distance between two cornu (0.751) and anteroposterior length (0.751) and minimum was shown by width of cornu (0.376).

**Table 1: Descriptive Statistics for Hyoid Bone Measurements:**

Parameters	Sex	Mean	Demarcating Point	Stand Dev	P value	Sexual dimorphism
TOL	Males	9.909	9.147	0.723	<0.001	6.33
	Females	8.385		0.768		
DC	Males	3.848	3.578	0.906	0.063	1.907
	Females	3.308		0.751		
LC	Males	3.121	2.8295	0.6	0.004	3.074
	Females	2.538		0.519		
AP	Males	4.97	4.639	0.883	0.023	2.38
	Females	4.308		0.751		
HB	Males	1.545	1.388	0.506	0.055	1.455
	Females	1.231		0.439		
WB	Males	2.879	2.865	0.65	0.866	0.172
	Females	2.85		0.376		

(TOL= Total Outer Length, DC= Distance between two cornu, LC= Length of cornu, AP= Anteroposterior Length, HB= Height of Body, WB=Width of Body)

The table shows that the probability of a person being a male or female is highest by using the total outer length (6.33%). The hyoid was larger in men regarding total outer length, length of cornu, anteroposterior length, body height, body width, in accordance with other studies.<sup>1</sup> The demarcating points of single variables representing the level of cut off for males and females were obtained by dividing the sum of the means of the two sexes by 2. The demarcating points for total outer length, distance between two cornu, length of cornu, anteroposterior length, body height, body width were 9.147, 3.578, 2.8295, 4.639, 1.388, and 2.865, respectively while that in the Bengali population for width, anteroposterior length, cornual length, body width of hyoid and distance between the lesser cornua were 39.22, 34.67, 27.95, 10.50 and 25.19, respectively.<sup>1</sup> The demarcating points were accurate enough for the evaluation of gender for the unknown hyoid bone.

In **Table 2**, the maximum error of estimate representing the maximum difference between the point estimate and actual parameter is shown by width of the body (0.460), followed by the distance between two cornu (0.442); and the minimum error is shown by the total outer length (0.333). Maximum coefficient of correlation i.e. the maximum strength of linear relationship between two variables is shown by the total outer length (0.690), followed by the antero-posterior length (0.338) and minimum by width of body (0.026). Maximum predictive

value, which is the measure of times that the value is the true value, is shown by the total outer length (0.477), followed by length of cornu (0.177) and the minimum by width of body (0.001).

In the above table, the maximum error of estimate is shown by the width of the body (0.460), followed by the distance between two cornu (0.442) and the minimum error is shown by the total outer length (0.333). Maximum coefficient of correlation is shown by the total outer length (0.690), followed by the anteroposterior length (0.338) and minimum by the width of body (0.026). Maximum predictive value is shown by the total outer length (0.477) followed by the length of cornu (0.177) and minimum by the width of body (0.001).

Combination of 3 variables that have good correlation i.e. total outer length, length of cornu and anteroposterior length gives a good multiple correlation. (**Table 3**)

**Conclusion**

Sex estimation is for an accurate identification of unknown skeletal elements. The need for reliable methods distinguishing males from females based upon various skeletal elements is evident in cases of commingled, eroded and/or missing remains. Sex differentiation is important in the medico-legal system but if the integrity of the body has been compromised, it becomes difficult.

**Table 2: Linear Regression Equation for Hyoid Bone Measurements**

Equation: Sex=	Standard error of estimate	R	R <sup>2</sup>
4.246-0.313 *TOL	0.333	0.69	0.477
1.804-0.141 *DC	0.442	0.276	0.076
2.180-0.303 *LC	0.418	0.42	0.177
2.107-0.172 *AP	0.433	0.338	0.114
1.657-0.257 *HB	0.441	0.284	0.081
1.340-0.020 *WB	0.46	0.026	0.001
4.247-0.386 *TOL -0.015 *LC +0.054 * AP	0.338	0.696	0.484

(TOL= Total Outer Length, DC= Distance between two cornu, LC= Length of cornu, AP- Anteroposterior Length, HB- Height of body, WB= Width of Body).

**Table 3: Multiple Regression Equation for Hyoid Bone Measurements**

Equation: Sex=	Standard error of estimate	R	R <sup>2</sup>
4.247-0.386 *TOL -0.015 *LC +0.054 * AP	0.338	0.696	0.484

(TOL= Total Outer Length, DC= Distance between two cornu, LC= Length of cornu, AP- Anteroposterior Length, HB- Height of body, WB= Width of Body).

Present study clearly shows that hyoid bone is of great importance in forensic medicine practice and can be used efficiently for sexual dimorphism and identification. Hyoid was larger in men regarding total outer length, length of cornu, anteroposterior length, height of body, width of body, a finding that was similar to other studies. The probability of a person being a male or female is highest by using total outer length.

**Acknowledgements:**

The authors would like to express their appreciation to the non-teaching staff of Forensic Medicine and Toxicology, KMC Mangalore for helping with the sample collection.

**Conflict of Interest:** None

**Financial Assistance:** None

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## Original Research Paper

# Profile of Suicidal Deaths in Married Female- A Cross Sectional Study

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### Abstract:

Suicidal death is one type of violent death which is caused by a deliberate act of the decedent with the intent to kill himself. Data on such suicidal deaths in a particular geographic area can give the reflection of social and mental status of the people. A rapid increase in suicidal deaths in married females, especially in their first few years of married life, was observed in our society in last few years, which is a dark spot on the noble tradition of our society. Oppression, physical and mental abuse by husbands and relatives often preceded suicides. Another important reasons behind such deaths is the unending demands of dowry by their husbands and/or in-laws. At the same time, lack of education, freedom, women empowerment, independent decision taking authority etc. also are responsible for this massive number of suicidal deaths. In this study, we have tried to find out various factors and to analyze the pattern and socio-etiological factors responsible for increasing incidence of suicidal death in our society. We studied 124 cases of suicidal deaths in married women. The autopsies were conducted at the mortuary of Shimoga Institute of Medical Science (SIMS), Karnataka, during the year of 2013 and 2014. Maximum incidence of suicidal death was found in the age group of 21 to 30 years, mostly due to demand of dowry and marital discord, among victims with lower educational status, and where their husbands were unemployed. Commonest cause of death was poisoning, followed by hanging and burns. Based on the findings of our study, we have formulated suggestions to the concerned authorities to decrease the incidence of suicidal death..

**Key Words:** Suicidal Death, Dowry, Autopsy, Crimes Against Women Cells

### Introduction:

*To be liberated, woman must feel free to be herself; not in rivalry to man but in the context of her own capacity and her personality.* +  
 . Indira Gandhi<sup>1,2</sup>

From the ancient times, women are the indispensable part of the Indian cultural heritage and constitute nearly about half of its population. Even after being an important part, most of them are suffering under the socio-cultural, political and religious bindings.

Throughout the generations, various forms of crimes against women, both inside and outside of her home keep happening and are increasing in intensity day by day. To decrease the crime rates and domestic violence against them, they should be made independent and there should be social security and women empowerment. According to the UNFPA (United Nations Fund for Population Activities), lack of education and thereby economic instability are the main barriers to achieve proper women empowerment. From birth onwards, at every stage of life the position of women in our society is always perceived as dependent in relation to the man. This concept has given birth to different social customs and practices. Another important manifestation of these customs and practices has been that of dowry. The amount of dowry is regulated by factors like educational qualification, job, salary, socioeconomic status,

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DOR: 14/07/2017 DOA: 04/11/2018

DOI: 10.5958/0974-0848.2018.00056.8

physical appearance and social prestige of the groom, the bride and their families. The endless demands for cash or kinds by the groom's family slowly brings inevitable sorrows for the girl. All these factors provide a cumulative effect to increase the number of suicidal deaths in married female.

**Materials and Methodology:**

**Source of data -**

It was a descriptive cross-sectional study. Data was collected from autopsies conducted on dead bodies of married females at the mortuary of Shimoga Institute of Medical Science (SIMS), Karnataka during the year of 2013 and 2014. All cases of suicidal deaths which were registered under section 304 (B), 306 or 498 (A) of IPC and those cases where inquest was conducted by magistrate or police under 174 or 176 CrPC, were included in the sample studied. During this period a total of 1688 autopsies were conducted, of which 124 suicidal deaths in married women were noted, after taking clearance from the Institutional Ethics Committee.

The details of the cases were obtained from the police inquest, history from the relatives of both parties regarding age, education, socio-economic status, duration of married life, any demand for dowry, time of incidence, site of occurrence, nature of harassment etc., hospital records, dying declarations, suicide notes, postmortem examination and chemical examination report etc. The data so collected were entered in a pre-designed proforma, compiled, tabulated and were analyzed by using suitable statistical methods:

1. Standard statistical method like proportion.
2. Representing the data in the form of appropriate tables and graphs, to draw the correlation between the different factors and outcome.

**Exclusion criteria**

- É Manner of death concluded as natural after autopsy.
- É Unidentified female bodies due to lack of proper history and proper socioeconomic background.
- É Decomposed female bodies where injury marks are obscured totally.

**Observation and Result**

The present study comprised 124 (7.35%) cases of suicidal deaths of married women out of total 1688 autopsies. The number of suicidal deaths were maximum in the 3<sup>rd</sup> decade with a share of 40.3% of total cases, followed by 4<sup>th</sup> decade of life which constituted 30.7% of cases. Less number of cases were seen in 2<sup>nd</sup> and 5<sup>th</sup> decade of life (**Table No.1**).

**Table no.1: Distribution of cases according to Age**

Age group (Years)	No. of suicidal deaths	Percentage (%)
10-19	6	4.84
20-29	50	40.32
30-39	38	30.65
40-49	28	22.58
>=50	2	1.61
<b>Total</b>	<b>124</b>	<b>100</b>

There were more cases seen in rural region (66.2%) than urban (33.8%). Hindus (85.5%) comprised the single largest category, followed by Muslims (11.3%). Only 4 cases were Christians (**Table No.2**).

**Table No.2: Distribution of cases according to religion**

Religion	No. of deaths	Percentage (%)
Hindu	106	85.49
Muslim	14	11.29
Christian	04	03.22
<b>Total</b>	<b>124</b>	<b>100</b>

Most of the victims were literate, 62.9%, of whom 29.8% studied up to secondary school, 23.3% up to higher secondary, 8.8% up to graduation and 1% cases were graduates (**Table No.3**).

Highest numbers of cases, 54.8% were seen in class IV Socio-economic status, followed by 43.6% and 1.6 % cases in class III and class II, respectively. No cases were present in class V and class I (**Table No.4**).

Housewives constituted the largest single category, amounting nearly 71.8% followed by labourers, 13.7%. Very few cases were seen in employed women (**Table No.5**).

On the other hand, maximum cases of alleged suicidal deaths due to pressure of dowry were found where the deceased's husband was

either unemployed, small vendor or labourer, 44.4%, followed by business man 29.0%, and least cases, 3.2% were found where deceased

husband was a government or private employee (Table No.6).

**Table No.3: Distribution of cases according to educational status**

Educational status		No of death	Percentage (%)
Literate	Up to secondary school	37	29.8
	Up to higher secondary school	29	23.3
	Up to graduation	11	8.8
	Graduate	01	1
Illiterate		46	37.1
<b>Total</b>		<b>124</b>	<b>100</b>

**Table No. 4: Distribution of cases according to socioeconomic status**

Socioeconomic status	No. of suicidal deaths	Percentage (%)
Socioeconomic Status V	00	00.00
Socioeconomic Status IV	68	54.83
Socioeconomic Status III	54	43.55
Socioeconomic Status II	02	01.62
Socioeconomic status I	00	00.00
<b>Total</b>	<b>124</b>	<b>100</b>

**Table No. 5: Distribution of cases according to occupation of the deceased**

Occupation	No. of deaths	Percentage (%)
Agriculture	16	12.9
Business	2	1.6
Housewife	89	71.8
Labourer	17	13.7
<b>Total</b>	<b>124</b>	<b>100</b>

**Table No.6: Distribution of cases according to husband’s occupation**

Occupational status	No of death	Percentage (%)
Unemployed	18	14.6
Small vendor	21	16.9
Labourer	16	12.9
Business man	36	29.0
Govt. & private sector	4	03.2
Others	29	23.4
<b>Total</b>	<b>124</b>	<b>100</b>

**Table No. 7: Distribution of cases according to occupation of the deceased**

Cause of death	Total No of deaths	No of death in different age group (years)					Percentage (%)
		10-19	20-29	30-39	40-49	>=50	
Poisoning	60	03	16	18	22	01	48.39
Hanging	34	02	14	13	04	01	27.42
Burns	26	01	19	05	01	0	20.96
Drowning	04	0	01	02	01	0	03.23
<b>Total</b>	<b>124</b>	<b>6</b>	<b>50</b>	<b>38</b>	<b>28</b>	<b>02</b>	<b>100</b>

Poisoning (48.39%) was most common cause of death, followed by hanging and burns. In the 20-29 year age group, burns was the most common cause of death, accounting for 38% of total deaths in that age group, followed by

poisoning and hanging. Poisoning was the most common cause in 30-39 years of age group. Only 3.23% cases were found in deaths due to drowning (Table No. 7).

Maximum number of suicidal deaths were seen where the motives were marital disharmony (24.2%), physical illness (25.8%), or dowry related torture (25.8%). Women with known history of depression or mood disorders, with or without treatment, accounted for 11.3% cases. Regarding marital disharmony, quarrel with husband, alcoholism of husband and torture were the sole reasons (Table No. 8).

**Discussion:**

During the study period, a total of 1688 autopsies were conducted by the department, of which 266 cases were of unnatural deaths in married women and 124 deaths out of these 266 were suicidal in nature. So our study group constituted a share of 7% (n= 124) of total cases autopsied (Figure: 1)

Age related distribution of the cases was consistent with the finding of other authors.<sup>2-9</sup>

Married females in the age group of 20 to 29 years outnumbered the other age groups due to the very fact that, maximum number of suicides could be attributed to dowry, marital disharmony, and that is why this age forms the most important and crucial part of woman's life. The cases were less after 40 years, probably as the age advances, the women become mature and handle the situation in much efficient manners in life.

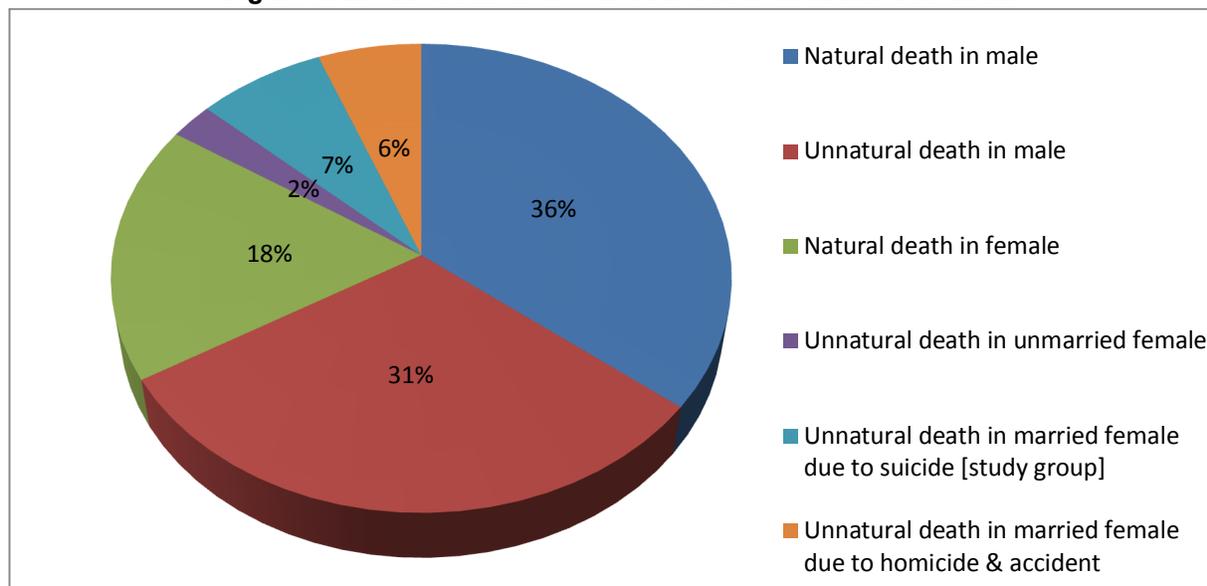
In our study, maximum number of cases belonged to rural population. This finding was consistent with the findings of other authors.<sup>7,4,11</sup> In the study by Sharma BR,<sup>10</sup> most cases were from urban region, which was totally in disagreement with our observations.

Regarding religion, our observations were consistent with the findings of other authors.<sup>3-7</sup> Marital discords related to

**Table No. 8: Distribution of the cases according to motive of death**

Motive of death	Duration of marriage				Percentage (%)
	>7 years		0-7 years		
Dowry related	2	02.63%	30	62.49%	25.80
Extramarital affair	2	02.63%	2	04.17%	03.22
Family problem	6	07.89%	0	00.00%	04.85
Financial problem	4	05.26%	0	00.00%	03.22
Infertility	2	02.63%	0	00.00%	01.62
Marital disharmony	18	23.69%	12	25.00%	24.19
Mental illness	12	15.79%	2	04.17%	11.29
Physical illness	30	39.48%	2	04.17%	25.81
<b>Total (n=124)</b>	<b>76</b>	<b>100%</b>	<b>48</b>	<b>100%</b>	<b>100</b>

**Figure 1: Distribution of the suicidal deaths in married women.**



dowry problems were less in Muslim due to simple rituals and practice of "Mehr"/ "dower", instead of the practice of "dowry". Low population, different cultural practices and higher professional qualification may be responsible for less number of cases been reported from Christian population. On contrast, Rahim M,<sup>2</sup> in his study had observed that 95.5% of the unnatural deaths were Muslims, 4.3% Hindu and 0.1% were Christians. Reason behind such finding is that Bangladesh is an Islamic country. Most of the victims were literate, most studied up to secondary school, and least number of cases were found in graduates. This may be because of the change in life style, awareness, economic stability and independency of the highly educated group than rest of the victims. So, they choose dissolution of marriage than to become victims of cruel social customs and marital problems. This finding was consistent with the findings of Kailash UZ<sup>11</sup> but some authors<sup>3,4,6,7</sup> showed that illiterate women were most vulnerable.

The findings of our study regarding distribution of cases according to socioeconomic status are consistent with the findings of Srivastava AK,<sup>6</sup> Kulshrestha P<sup>3</sup> and Kailash UZ<sup>11</sup> in their study showed that class IV socioeconomic class was the most vulnerable, while in the study by other authors,<sup>4,7,10</sup> class V socio-economic class were mostly involved. Dowry related torture leading to suicides was also found more commonly where the deceased husband was unemployed, small vendor or labourer, with least economic security. Majority of the victims were housewives because they were dependent on their husbands or in-laws and they were forced to tolerate tortures and violence. This finding was consistent with the findings of others.<sup>1,3,6,7,11</sup>

Regarding the cause of death, our study was consistent with the statistics of NCBI 2010.<sup>1</sup> Consumption of poison, hanging, burns and drowning were the prominent means of committing suicides. Poisoning was the commonest cause of suicidal deaths in rural population in contrast to the urban population, where hanging was the more commonly adapted technique. In the poisoning cases, most common poison used was organophosphate

group of pesticides. Kerosene oil, match sticks, and other cooking material, being easily available in houses, made burns a preferred method. According to Sharma BR. et al,<sup>10</sup> females preferred self-immolation (burns) to end their lives. In contrast to our study, Rahim M, et al<sup>2</sup> and Srivastava AK,<sup>6</sup> in their studies observed that hanging was the most common cause of death.

Dowry related suicides were more commonly found in first 7 years of married life, while family problems, financial insecurity, infertility became important factors after 7 years of marriage. Marital disharmony took a toll of good number of cases in both sections of married life and our observations match with those of Geeta S.<sup>7</sup> Sometimes, the physical illness due to which the women committed suicide, corresponding to the history given by police or family members could not be observed at autopsy. Other authors,<sup>6,11</sup> in their study showed that ill-treatment by the in-laws, excessive pressure for dowry and negligent behavior of husband were the main reasons behind suicidal deaths, which corresponds to the present study. Another author<sup>8</sup> stated that depression, insecurity and excess work load were responsible for the high incidence of suicidal deaths.

### **Conclusion:**

From the present study, it is clearly implied that law enforcing authorities in spite of their efforts and amendments, failed to control the crimes against women. These are because of vague statutory language, faulty enforcement, cultural attitude, marital infidelity and economic discrimination against women. So naturally, the incidence of suicidal deaths in married female is increasing day by day, irrespective of educational and socioeconomic strata. We have come up with the following recommendations that might help in decreasing the burden of suicidal deaths thereby to build a healthy society.

### **Recommendations:**

1. National monitoring of suicides and 'suicidality' should be improved. Effective measures are needed to be taken by the

government, non-governments, voluntary organizations and law enforcing authorities to prevent and control crimes against women.

2. Illiteracy is the main barrier to achieve proper women empowerment. Effective measures should be taken to promote education among the women.
3. Crimes against women cells (CAWC) should be opened in large number to tackle the immediate provocation.
4. Special Police Unit for Women and Children (SPUWAC), should come in to action for the safeguard of the rights of women in difficult circumstance.
5. Government should provide financial and technical support to nongovernment women organization to give proper service for victims.
6. Because the primary care providers are often the first and the only medical contact of suicidal patients, recognition of the causes and screening of the patient and collection of proper history and dying declaration in need, is a very important step.
7. Anti-dowry laws should be suitably amended at regular intervals and following amendments should be considered.
8. Proper counselling centers should be constituted to pacify the suicidal provocation and to motivate these women so that they become more and more confident in their life.
9. Early marriage of women should be discouraged to prevent them from exposure to innate stressful events at an early age.

**Conflict of interest:** None

**Financial Assistance:** None

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## Original Research Paper

# Evaluation of the Impact of an Additional Teaching Module Developed for Issuing Wound Certificate

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### Abstract:

**Background:** Wound certificate writing is taught conventionally through a lecture with case scenarios based on real or hypothetical circumstances for the students in II<sup>nd</sup> year MBBS, by the department of Forensic Medicine. Then the students are assessed through written and viva voce during examinations. This method lacks standardization and reliability, because of the difference in perception among students. So we intended to resolve this issue by exposing them to an additional teaching module using photographs, video, and simulators. **Material and Methods:** The researcher selected 80 students of II<sup>nd</sup> year MBBS students at Aarupadai Veedu Medical College and Hospital, Puducherry. All 80 students first underwent conventional teaching, and later, an additional teaching module, for issuing of wound certificate. Both teaching methods were assessed independently to find the impact of students in writing wound certificate. These results were then compared using student paired %± test. **Results:** The statistical analysis of the assessments before and after the implementation of the additional module showed significant improvement in answering the structured viva voce on issuing a wound certificate. The writing part of wound certificate, however did not show significant changes. **Conclusion:** Additional teaching module equips students, in a better way, to understand the intricacies of medical and legal issues related to wound certificate.

**Key Words:** wound certificate, conventional teaching, additional teaching module, structured viva voce, II<sup>nd</sup> year MBBS students

### Introduction:

When an injury is apprehensive, legal proceedings follow, which leads to issue of wound certificate by doctors. The main aim of these reports relating to suspicious injury is to accurately and justifiably express the medical opinion to the appropriate professionals.<sup>1</sup>

The wound certificate is an important Medico Legal document used in the court of law to prove or disprove the case. Many convictions are based on this piece of vital information. Many a times, acquittal has happened because of lack of clarity of the content in the wound certificate. Hence teaching the right way of preparing a wound certificate is vital for II<sup>nd</sup> year MBBS students,<sup>1</sup> so as to issue a valid and informative wound certificate.<sup>2,3</sup>

The II<sup>nd</sup> year MBBS students lack adequate exposure in writing a wound certificate. This could be due to the fact that in most of the medical colleges, conventional teaching of wound certificate is followed by giving hypothetical injuries and the students are taught to write wound certificate based on those findings. This conventional mode of teaching leads to the lack of interest and lacunae in writing wound certificate properly. Keeping the above factors in mind, an additional modular

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L. M. No: 1356/18

DOR: 05/09/2017 DOA: 04/11/2018

DOI: 10.5958/0974-0848.2018.00057.X

teaching was conceived in order to stimulate the students' interest in the subject and also to provide a comprehensive view of these topics. Modular teaching has been efficient in diverse subjects with success.<sup>4</sup> Additional modular teaching provides knowledge with ample stress on basics through a wide variety of learning activities.<sup>5</sup> In modular teaching experience, varied teaching methodologies like group discussions, photo demonstration, open discussion, quiz, video demonstration, panel discussion, panel forum and role play were utilized in addition to didactic lectures.<sup>5</sup> Additional modular teaching approach with strong clinical relevance captures students' attention and creates more excitement in learning, which is not in the case of conventional lectures.<sup>6</sup> Students trained with additional modular curriculum made more accurate diagnoses than did students trained in conventional curriculum.<sup>7</sup>

Based on the concept of additional modular teaching, very few studies were done in Forensic Medicine, especially in India. This study is undertaken with an aim to compare the effectiveness of conventional teaching method and its combination with additional modular teaching, for issuing wound certificate by II<sup>nd</sup> year MBBS students.

### **Materials and Methodology:**

Participants for the research project were the II<sup>nd</sup> year MBBS students, (n=80). The study was carried out by Department of Forensic Medicine, Aarupadai Veedu Medical College & Hospital, Puducherry, after obtaining the Institutional Ethics Committee clearance.

The first part of our study exposed all the 80 students to conventional teaching (large group teaching, using didactic lectures) on the following topics, 1 hour/day for 4 days:

- Hour 1: Definition & Classification of injury
- Hour 2: The nature and manner of injury
- Hour 3: Identification & consent of the person examined, weapon involved and age of injury.
- Hour 4: Writing a wound certificate

This was followed by assessing the students' ability to issue a wound certificate based on the history of the cases and relevant

photos of the injury. Students were subjected to structured oral examination for the same case.

In the second part of our study, the same 80 students were subjected to an additional modular teaching. All the students were divided into groups of 20 with one faculty acting as a facilitator. Each group was exposed to injury cases through photo/ video display and simulated patients. Student groups were assigned a case of injury for a time period of 3 hours in total, where with the help of a facilitator, they were to observe, learn to collect and discuss:

1. **From Simulated Patients (1hour):** crime number, details of the police station, preliminary data of the victim including ID marks, consent for examination and treatment, from the simulated case.
2. **From photo/ Video Demonstration (1hour):** to assess the details about the injuries along with description of it and filling up the wound certificate
3. **Case based discussions (1hour):** Assess and justify the injuries on the following themes; Type, nature, cause, manner, weapon/force involved and verbal re-creation of the scene of a crime.

Planning and execution of the additional module for issuing a wound certificate was done by the Department of Forensic Medicine, under the supervision of the Medical Education Unit at Aarupadai Veedu Medical College. After formulating the objectives for the module, the component topics and teaching methodology were finalized. Facilitators were identified among the faculty who volunteered for the same. The chief researcher was delegated to be the moderator for implementation of the module. The blue print of the module was prepared and the individual topics and the teaching methodology were discussed by the moderator with the facilitators. The purpose of having a discussion with all the facilitators was for them, to have an overall idea of the module and to limit themselves to their area concerned. The additional module was conducted during Forensic Medicine practical hours.

Assessment of students after the additional modular teaching was carried out in similar lines, as was done previously after the

completion of conventional teaching method by using structured oral examination.

Feed back was obtained from the students and the facilitators at the end of both assessments.

**Analysis of Data:**

Descriptive and analytical computation of data was done using SPSS v20 software. All the data was examined for distribution and tests of significance were employed accordingly. The significance of difference in marks between conventional teaching and conventional with additional modular teachings were tested by student's paired t test. The null hypothesis was rejected at a p value of 0.05.

**Results:**

The results computed in **Table 1** explain that p value (<0.05) is significant, so the null hypotheses that: there is no significant difference between students in answering structured oral examination at the end of the

session taught through the additional modular teaching and the conventional teaching, is rejected. In addition, the group taught through conventional and additional modular approach scored higher mean as compared to the conventional method alone.

In **Table 2**, it is shown that p value (0.498) is not significant and hence both methods had the same impact on making students write proper wound certificate.

In **Table 3**, p value (<0.05) showed that there is a definite positive impact on issuing wound certificate among students who were taught through conventional and additional modular approach as compared to the conventional method alone. This is significant, keeping in mind the hostility from the defense lawyer whose intention would be mostly to discredit the witness and the opinion offered, as a wound certificate becomes valid and serves its purpose only after deposition of the expert witness in the court of law.

**Table 1: Performance of students based on structured oral examination with Conventional teaching and Conventional with Additional Modular teaching**

S.No	Parameters	Conventional teaching M± SD	Conventional with Additional Modular teaching M± SD	'p' Value	95% CI
1	Type of Injury	0.61 ± 0.356	0.73 ± 0.286	0.007	-0.204 to -0.033
2	Nature of Injury	0.63 ± 0.344	0.750 ± 0.3182	0.025	-0.2224 to -0.0151
3	Weapon used	0.48±0.359	0.71 ± 0.284	0.0001	-0.3214 to -0.1411
4	Status of injury	0.41 ± 0.354	0.65 ± 0.302	0.0001	-0.3295 to -0.1455
5	Manner of injury	0.48 ± 0.323	0.63 ± 0.371	0.002	-0.243 to -0.057
6	Re-creation of SOC	0.41 ± 0.319	0.68 ± 0.278	0.0001	-0.365 to -0.185
7	Total Viva marks	3.019 ± 1.293	4.11 ± 1.242	0.0001	-1.3634 to -0.8116

**Table 2: Performance of students based on writing wound certificate with Conventional teaching and Conventional with Additional Modular teaching**

S.No	Parameter	Conventional teaching M± SD	Conventional with Additional Modular teaching M± SD	'p' Value	95% CI
1	Wound Certificate writing	2.82 ± 0.925	2.75 ± 0.6463	0.498	-0.1321 to 0.2696

**Table 3: Overall performance of students based on issuing wound certificate with Conventional teaching and Conventional with Additional Modular teaching**

S.No	Parameter	Pre test M± SD	Post test M± SD	'p' Value	95% CI
1	Grand total	5.8 ± 1.6623	6.85 ± 1.4373	0.0001	-0.14066 to -0.6934

The statistical analysis of the assessments before and after the implementation of the additional module using - paired %t- test showed significant improvement in answering the structured viva voce on issuing a wound certificate. The writing part of wound certificate, however did not show significant changes.

### Discussion:

Modular teaching has been applied in various subjects with great success.<sup>8</sup> Additional modular teaching will improve the knowledge with adequate stress on basic through learning activities. This was not a substitute for conventional teaching, which took place simultaneously.

The concept of modular teaching in Forensic Medicine is rare. There are very few studies like the one conducted by Murthy OP on modular teaching in %Faculty Development Training Workshops on Standard Operative Procedures (SOP) for Medico Legal Work and Modular Teaching in Forensic Medicine and Toxicology+.<sup>9</sup> In this, he has only created seven different modules related to Forensic Medicine and the impact was not studied.

In general, modules are designed for self-learning, wherein students study at their own pace and time.<sup>10</sup> However, in our setup, this was not a feasible option because of various reasons like lack of adequate faculties and facilities to prepare and execute modules and also to assess them. Hence, we introduced the modular teaching in addition to conventional teaching.

Earlier studies, comparing conventional versus modular teaching, found uncertain evidence to support the superiority of one method over another on attainment and withholding of knowledge or practice or both of them.<sup>11-13</sup>

The additional teaching module along with the existing conventional teaching is more efficacious as compared to either conventional teaching or modular teaching.<sup>14</sup>

The majority of the students who participated felt that additional modular teaching helped them to understand the subject much

better and increased their confidence level in answering the question.

### Conclusion:

It can be concluded that an additional modular teaching along with conventional teaching, ensures better performance and active students' participation. Various teaching methodologies can be used in integrated modules effectively. These modules can easily be incorporated into the curriculum, empowering the students to deal with legal issues in a better way. More such additional modules on various medico-legal aspects can be prepared and studied for its efficacy to be incorporated into the curriculum.

**Conflict of interest:** None

**Financial Assistance:** None

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## Original Research Paper

# A Toxicological Investigation of Victims of Fatal Road Traffic Accidents Brought to a Tertiary Care Hospital at Imphal

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### Abstract:

Alcohol and substance abuse significantly increase the possibilities of involvement of a person in road traffic accidents (RTA). This study was carried out to determine the relationship between alcohol and substance abuse, and RTA, in this part of the world. All the cases of fatal RTA brought for autopsy during a period of 2 years were examined. The samples of blood, urine and viscera were analysed for the presence of drugs and alcohol. Of the total 159 cases of RTA, alcohol was positive in 70.6% of the cases and drugs in 25.5%, and both drugs and alcohol in 3.9%. The blood alcohol level was >230mg% in 11.1% of the cases, while 22.2% of the cases had blood alcohol level of >80mg% - 130mg%. On the other hand, of the 15 cases that tested positive for drugs, 4 (26.7%) tested positive for nitrazepam and 73.3% tested positive for *Spasmoproxyvon*. The blood level of *Spasmoproxyvon* ranged from 1.2mg% to 4.9mg%.

It may be concluded from this study that drugs and alcohol could have played important roles in fatal RTA in this part of the country. Interestingly, in some of the victims, the blood alcohol concentration was at least 8 times the legal limit for driving in India.

**Key Words:** Road Traffic Accidents, Autopsy, Alcohol, Drugs

### Introduction:

Road traffic injuries are one of the leading causes of death all across the world. They are projected to become the 3<sup>rd</sup> largest contributor to global disease burden by 2020.<sup>1</sup> Different risk factors for incidence of RTA have been identified. Two main factors that increase the risk of RTA in drivers are the alcohol and substance abuse.<sup>2</sup> Substance abuse can increase the possibility of severe accidents by decreasing awareness and slowing reflexes of victims.<sup>3</sup>

At the individual level, there is a dose-response relationship between alcohol consumption and fatal road traffic accidents, with risk of death increasing non-linearly with increasing alcohol consumption.<sup>4</sup> In some countries, the law has made it an offence for a person to drive a motor vehicle above a specified blood alcohol level, and the statutory limit in India is 30 mg% (S.185, Motor Vehicle Act, 1988).<sup>5</sup>

In India, an estimated 7.5 crore persons are drug addicts.<sup>6</sup> In a study at the Regional Institute of Medical Sciences, Manipur, there were 300/1305 (229/1000) outpatient addicts as against the National level of 6/1000, and the number of addicts rose from 6% in 1972 to 23% in 1982; 60 per 1000 government employees of the State were found to be addicts, which is the highest in the country.<sup>7</sup>

Hence, this study was carried out to provide some idea about the relation between substance abuse and road traffic accidents in the state considering the limited number of studies in the past in this context.

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DOI: 10.5958/0974-0848.2018.00058.1

**Materials and Methodology:**

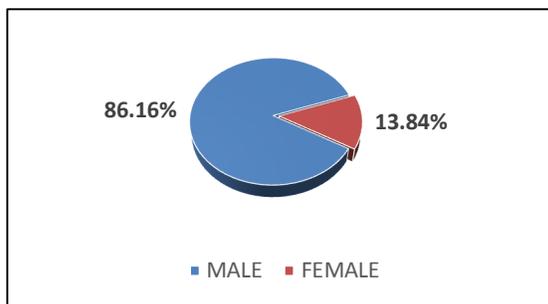
After obtaining approval from the Institutional Ethics Committee, a cross-sectional study was carried out in the Department of Forensic Medicine of a tertiary care teaching hospital in Imphal on all the cases of fatal RTA brought during a period of 2 years from 2013 to 2015. Decomposed bodies were excluded from the study. A detailed history of the case including the history of past drug and alcohol use, and any other relevant history were obtained from the relatives, accompanying persons, investigating police officer and also from the hospital records. After a meticulous postmortem examination, the samples of blood, urine and viscera were collected for chemical analysis. The samples were kept in the refrigerator at 4 degree till analysis. Detection and analysis of alcohol was done by Cavetto's method<sup>8</sup>.

For detection of drugs, thin layer chromatography (TLC) and high performance liquid chromatography (HPLC) were employed. The data was recorded and statistical analysis was done to evaluate the findings in term of percentages and proportions. Windows based statistical package for social science (SPSS) version 21.0 (Armonk, NY: IBM Corp) was used for statistical analysis.

**Results:**

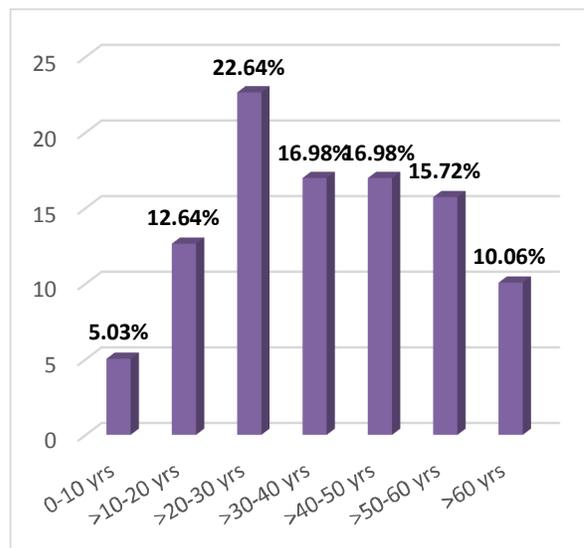
A total number of 478 cases were brought for autopsy during 2013 to 2015. Of these, 159 cases of RTA were considered for the study. The majority of the victims were males, 86.2%, the male : female ratio being 7.2 : 1 (Figure. 1)

**Figure 1: Showing the sex distribution of the victims**



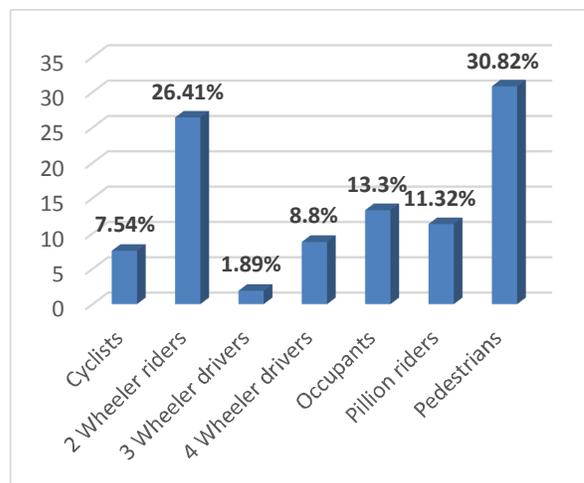
The highest number of victims were observed in the age group of >20-30years (22.6%), followed by the age groups of >30-40 years (17%) and >40-50years (17%) respectively, as shown in Figure 2.

**Figure 2: Showing the age distribution of the victims**



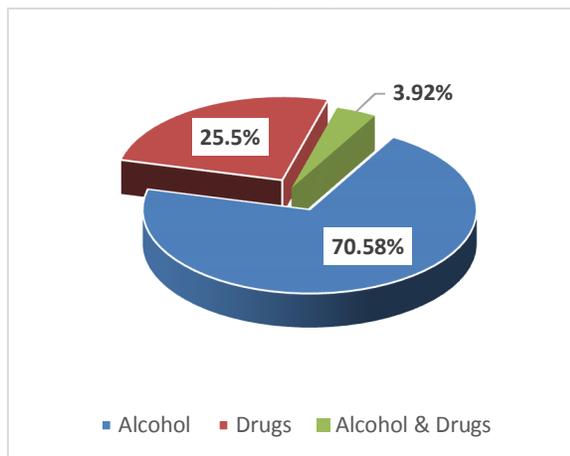
The highest number of victims of RTA in our study was the pedestrians (30.8%), followed by the two-wheeler riders, (26.4%). (Figure 3)

**Figure 3: Showing the types of the victims of road traffic accidents**



Of the 159 cases of RTA, 51(32.1%) tested positive for drugs and alcohol. Of these 51 cases, alcohol was tested positive in 70.6% cases, drugs in 25.5% and both drugs and alcohol in 3.92%. Figure 4

**Figure 4: Detection of alcohol and drug in the victims**



Of the 36 cases that tested positive for alcohol, 11.1% had a blood alcohol level of >230mg%, while 22.2% had blood alcohol level of >80mg% - 130mg% and 11.1% had blood alcohol level below 30mg%. **Table 1**

On the other hand, of the 15 cases that tested positive for drugs (inclusive of two cases tested positive for alcohol), 4 (26.7%) tested positive for nitrazepam, and the blood level of nitrazepam ranged from 1.1 mg% to 1.7 mg%, in these cases. The urine level ranged from 0.7

mg% to 2.1mg%, and in the liver, it ranged from 0.03 mg% to 1.5 mg%. **Table 2**

**Table 1. Levels of alcohol in the blood samples of the alcohol positive cases**

BAC	No. of cases	%
<30mg%	4	11.11%
>30-80mg%	9	25%
>80-130mg%	8	22.22%
>130-180mg%	4	11.11%
>180-230mg%	7	19.44%
>230mg%	4	11.11%
<b>Total</b>	<b>36</b>	<b>100</b>

Of the 11 cases that tested positive for *Spasmoproxyvon* (Paracetamol 400mg, Propoxyphen 65mg, Dicyclomine hydrochloride 10mg), the blood level ranged from 1.2mg% to 4.9mg%, whereas the urine level ranged from 2.5mg% to 15.6mg% and in the liver it ranged from 0.1mg% to 3.0mg%. However, in one case, it was detectable only in liver and kidney as shown in table 3. The two cases which tested positive for drugs (*Spasmoproxyvon*) and alcohol had BAC of >30-80mg%. (**Table No. 3**)

**Table 2. Showing the level of nitrazepam in the cases**

Sl. No.	Blood mg/dl	Urine mg/dl	Stomach mg/dl	Liver mg/dl	Kidney mg/dl
1	1.11	0.69	0.14	0.03	Not detected
2	1.72	1.05	0.32	0.18	0.02
3	1.3	0.76	0.23	0.19	0.02
4	1.37	2.12	0.50	1.5	0.10

**Table 3: Showing the level of spasmoproxyvon in the cases**

S. No.	Blood mg/dl	Urine mg/dl	Stomach mg/dl	Liver mg/dl	Kidney mg/dl
1	1.2	2.5	Not detected	0.7	Not detected
2	2.0	15.6	0.7	0.9	Not detected
3	1.6	10.1	0.5	0.1	Not detected
4	3.1	5.5	3.1	1.2	0.5
5	2.9	4.0	2.8	1.0	0.4
6	2.0	3.7	0.7	2.3	1.1
7	4.2	6.3	1.9	3.0	2.5
8	4.1	5.9	1.3	2.7	1.8
9	4.9	6.3	1.7	3.0	2.0
10	Not detected	Not detected	Not detected	1.2	0.6
11	4.1	5.0	3.2	2.9	2.6

## Discussion

Road traffic accidents are increasing every day and they have become the leading cause of death in developing countries. In this study, male RTA victims outnumbered the female victims in the ratio of 7.2 : 1. This is in agreement with the findings of workers like Millo, et al<sup>9</sup> and Gupta, et al.<sup>10</sup> This may be due to the fact that most of the males tend to stay outdoors using one or the other form of transportation, as compared to women, who are usually confined to household works.

In a study conducted by Elliott, et al<sup>11</sup> in the United Kingdom, the highest incidence was recorded in the age group of 17-24 years, as also in the study by Millo, et al,<sup>9</sup> who recorded it in the age group 21-30yrs, 38.2%. This is in consonance with our study. This could be due to the fact that younger people tend to be get involved in faster and reckless driving.

The commonest victims of RTA in our study were the pedestrians (30.8%), followed by two-wheeler riders (26.4%). This is in accordance with the findings of other workers.<sup>12-14</sup> Maximum incidence of pedestrians being the victims can be explained by the fact that there is lack of proper footpath with narrow roads due to encroachment by vendors and other commercial installation and the utter disregard for the traffic rules by road users.

In a study by Poulsen, et al,<sup>15</sup> 48% of the cases tested positive for alcohol and/or other drugs in the blood. Similarly, blood tested positive for alcohol and/or drugs in a study by Gjerde, et al.<sup>16</sup> (37.8%). In the present study, 51 cases, 32.1%, tested positive for drugs and alcohol. This high incidence of drug and alcohol abuse may be attributed to the increasing trend of substance abuse seen in this part of the country.

In another study by Elliott, et al,<sup>11</sup> it was observed that 54% of all victims of RTA were positive for drugs and/or alcohol, with the highest percentage of positive findings in pedestrians (63%). In contrast to their findings, the highest percentage of positive findings of alcohol or drugs (58.4%) was observed in two wheeler riders and four wheeler drivers, in our study.

Of the 51 cases who tested positive for alcohol and drugs in our study, 70.6% tested positive for alcohol, while 21.6% tested positive for *spasmoproxyvon* and the remaining for nitrazepam. A wide range of drugs were detected (e.g., drugs of abuse, anti-convulsants, anti-histamines, anti-inflammatories, anti-psychotics, cardiac drugs and over-the-counter products), but alcohol and cannabinoids were the most frequent substances detected across the victim group in a study Elliott, et al.<sup>11</sup> In another study by Jones, et al.<sup>17</sup> on 1403 victims of RTA, it was observed that a wide spectrum of pharmaceutical products, comprising sedative-hypnotics (N=93), opiates/opioids (N=69) as well non-scheduled substances, such as paracetamol (N=78) and antidepressants (N=93) were detected.

The concentrations of alcohol in blood and other body fluids are highly correlated, and measurements of both are widely used as evidence to prove the over-consumption of alcohol in forensic practice. In a study by Baruah and Chaliha,<sup>18</sup> the blood alcohol concentration of 68 cases (36.2%) was above 201 mg/dl with 38 cases (20.2%) and 36 cases (19.15%) between 51-100 mg/dl and 151-200 mg/dl, respectively, the mean BAC being 167.28 mg/dl. In our study, the blood alcohol concentration was >230 mg% in 11.1% of the cases. However, the mean BAC was 125.45 mg% in our study which was well beyond the permissible limit of driving of 30mg% in India.

In forensic and legal medical practice, the need to distinguish between antemortem ingestion and postmortem synthesis of ethanol persists. During the process of autolysis, bacteria from bowel invade the surrounding tissue and vascular system. Further, glucose concentrations increase in blood after death and this sugar is probably the simplest substrate for microbial synthesis of ethanol.<sup>19</sup> However, the possibility of such a confounding factor has been ruled out in our study as decomposed bodies were excluded, and the autopsies were conducted in postmortem intervals of less than 6 hours.

## Conclusion

Several factors are responsible for RTA and some of the victims of fatal RTA in this part

of the country tested positive for alcohol or drugs. Alcohol was the most commonly used intoxicant followed by drugs like *spasmoproxyvon*. Interestingly, in some of the victims, the blood alcohol concentration was at least 8 times the allowable limit for driving in India.

The present study was carried out only on the fatal cases RTA, and non fatal cases of RTA were not taken into account. There is a need for more research and evaluation to establish the relation between substance abuse and road traffic accidents in this part of the country.

**Conflict of interest:** None

**Financial Assistance:** None

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## Original Research Paper

# Estimation of Stature from the Length of Sternum: A two year Study

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### Abstract:

**Background:** Estimating stature is an important step in reconstructive identification of skeletonised and dismembered human remains; it is one of the four attributes of the biological profile obtained from human skeletal remains. The most reliable bones for reconstruction of stature are long bones, but since very often long bones are not available, the development of alternative methods, based on other distinct bones is necessary. **Aim:** The aim of this study was to verify the use of the length of the sternum as an estimator of adult height among south Indian population and to propose regression equations and test the formulae for determining adult stature. **Materials & Methodology:** The data consisted of measurements of length of sterna removed from cadavers of known stature. The sample comprised of sternum from 100 corpses, which included 50 males and 50 females between the age range of 20. 80 years old, collected during the autopsies carried out at Sri Devraj Urs Medical College, Kolar, Karnataka. **Results:** Majority of the subjects were in the age group 21 to 30 years and 31 to 40 years (27% respectively). Among the females, Mean length of the body was  $156.2 \pm 6.4$  cms and among the males, it was  $163.2 \pm 7.9$  cms. Similarly among the females, Mean length of sternum was  $15.1 \pm 1.5$  cms and among the males, it was  $16.1 \pm 1.9$  cms. **Conclusion:** There was significant positive correlation between Length of body and the Length of sternum, i.e. with increase in length of body there was significant increase in sternum and vice versa.

**Key Words:** Estimation of Stature, Sternum, Autopsy Study

### Introduction:

Identification of an individual is the mainstay in forensic investigations.

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DOR: 19/10/2017 DOA: 12/11/2018

DOI: 10.5958/0974-0848.2018.00063.5

Estimation of stature plays a significant role in establishing personal identity. This is

because every human body part has a more or less constant relationship with stature.<sup>1,2</sup> As a rule of thumb, larger the skeletal element, taller the individual is. This suggests that, theoretically, length of any bone of an individual reflects that individual's stature.<sup>3</sup> It is an aspect of forensic science which has not yet been completely resolved, mainly due to the need for an appropriate methodology to enable estimation from diverse bones and also to have recourse to a well studied data base of the reference population.<sup>4</sup> Contemporary India is composed of a sizable number of ethnic and indigenous populations having enormous amounts of ethnic and genetic diversity.<sup>5,6</sup> There exists a need for developing regression models for the estimation of stature from different body parts in various ethnic and population groups.<sup>7</sup> Hence, each ethnic group requires different forensic standards, for which a region-based study of subjects is necessary.<sup>8</sup> Regression equations are most commonly used to estimate stature and have been derived from numerous

bones.<sup>9</sup> Body ratios within specific population groups also changes over time due to changes in diet, lifestyle, genetic and environmental factors and socio-economic status, and therefore the present regression formulae may need readjustment to account for inherent population variations.<sup>10,11</sup>

Stature is shown to have a definite and proportional relationship with many parts of the human body such as the cranial<sup>12</sup> and facial bones, long bones,<sup>13</sup> fragments of long bones,<sup>14</sup> trunk, foot bones and also teeth.<sup>15</sup> Fully<sup>15</sup> predicted the total height of a skeleton by combining measurements of the skull, vertebral bodies from C2 to S1, femur, tibia and talocalcaneal joint, also in combination with a correction factor to account for soft tissues. Fully's method is significant for obtaining height, but requires a complete and well preserved skeleton which is very uncommon. Because of this, it is more useful to establish stature using mathematical methods.<sup>16</sup>

To verify whether length of sternum can be used to know the adult stature, we analysed the parameters from adult cadavers of known stature in order to obtain accurate regression equations for use in forensic contexts.

**Materials and Methodology:**

The present study was conducted at the Department of Forensic Medicine & Toxicology, Sri Devraj Urs Medical College, Kolar, during 2013-2014. 100 intact sternums of adults (50 males and 50 females, belonging to South Indian states of Karnataka, Andhra Pradesh and Tamil Nadu) aged above 20 years subjected for medico-legal autopsy were included for the study, after taking clearance from the Institute Ethics Committee and informed consent from the relatives of the deceased. The age of the individuals autopsied was obtained from the inquest forms and from the legal heirs of the deceased. Mutilated bodies and bodies with physical anomalies, affecting the stature were excluded from the study. The ethical clearance from the ethical committee of our institute and consent of the legal heir of the deceased was obtained prior to the study. The length of the cadaver was measured from the vertex of the

head to the heel using a steel measuring tape. During medico-legal post-mortem examination, sternum was removed by dislocating sternoclavicular joint and cutting the costo-chondral junction of the ribs. After removing as much of soft tissue as required to expose the bone, its length was measured from centre of jugular notch to the end of xiphoid process in sagittal plane by using spreading callipers. All the measurements were recorded by two people to minimize the error in measurement. Subsequently, the sternum was replaced in the body and returned to the legal heirs of the deceased.

**Statistical analysis:**

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. ANOVA (Analysis of Variance) was the test of significance to identify the mean difference between more than two groups for quantitative data. Pearson correlation was done to find the correlation between two quantitative variables and qualitative variables respectively.

**(Table 1)**

**Table 1: Interpretation of Correlation of Coefficient**

Correlation	Interpretation
0 - 0.3	Positive Weak correlation
0.3-0.6	Positive Moderate correlation
0.6-1.0	Positive Strong correlation
0 to (-0.3)	Negative Weak correlation
(-0.3) to (-0.6)	Negative Moderate Correlation
(-0.6) to - (1)	Negative Strong Correlation

**Regression:** Linear regression was done to find the regression equation and to estimate the unknown quantitative variables when one quantitative variable is known.

The regression equation is a linear equation of the form:  $y = b_0 + b_1x$

y = Dependent variable (Length of the body), x = Independent variable (Length of sternum),  $b_0 =$

Constant B Unstandardized Coefficients, b1 = Unstandardized Coefficients of Independent variable (Length of sternum). **p value** (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

**Results:**

Majority of the subjects were in the age group 21 to 30 years and 31 to 40 years (27%, each). (Table 2). Among the females, the Mean length of body was 156.2 ± 6.4 cms and among the males, it was 163.2 ± 7.9 cms. This difference in mean length of body between males and females was statistically significant (Table 3).

**Table 2: Profile of the subjects**

		Count	%age
<b>Age</b>	<20 years	4	4.0%
	21 to 30 years	27	27.0%
	31 to 40 years	27	27.0%
	41 to 50 years	16	16.0%
	51 to 60 years	15	15.0%
	61 to 70 years	9	9.0%
	>70 years	2	2.0%
	<b>Gender</b>	Female	50
Male		50	50.0%

**Table 3: Mean Length of body and length of sternum comparison between genders**

	Gender				P value
	Female		Male		
	Mean	SD	Mean	SD	
<b>Length of body</b>	156.2	6.4	163.2	7.9	<0.001*
<b>Length of sternum</b>	15.1	1.5	16.1	1.9	0.008*

Similarly, among the females, the Mean length of sternum was 15.1 ± 1.5 cms and among the males, it was 16.1 ± 1.9 cms. This difference in mean length of sternum between males and females was statistically significant. The Mean Length of the body was the highest among 41 to 50 years age group and lowest among >70 years age group (Table 4). This

difference in mean length of body with respect to age was statistically significant. the Mean Length of sternum was the highest among 41 to 50 years age group and lowest among >70 years age group. This difference in mean length of sternum with respect to age was not statistically significant. In the study, there was a significant positive correlation between the Length of body and Length of sternum. i.e. with increase in length of body there was significant increase in sternum and vice versa (Table 5).

**Table 4: Mean Length of body and length of sternum comparison between age groups.**

		Length of body		Length of sternum	
		Mean	SD	Mean	SD
<b>Age</b>	<20 years	151.8	2.4	14.0	.9
	21 to 30 years	157.3	6.7	15.4	1.5
	31 to 40 years	160.9	8.4	15.8	1.7
	41 to 50 years	163.7	8.4	16.3	1.7
	51 to 60 years	158.2	6.5	15.6	2.1
	61 to 70 years	163.3	7.4	15.7	2.2
<b>P value</b>		0.005*		0.061	

**Table 5: Correlation between Length of body and Length of sternum among study subjects**

Correlations			
		Length of body	Length of sternum
<b>Length of body</b>	Pearson Correlation	1	0.559**
	Sig. (2-tailed)		<0.001*
	N	100	100

\*\* Correlation is significant at the 0.01 level (2-tailed).

Linear regression equation to estimate Length of body (Dependent variable) when value of Length of sternum is known (Table 6).

In Females: Length of body (y) = 149.07 (b0) + 0.468 (b1) x Length of sternum.

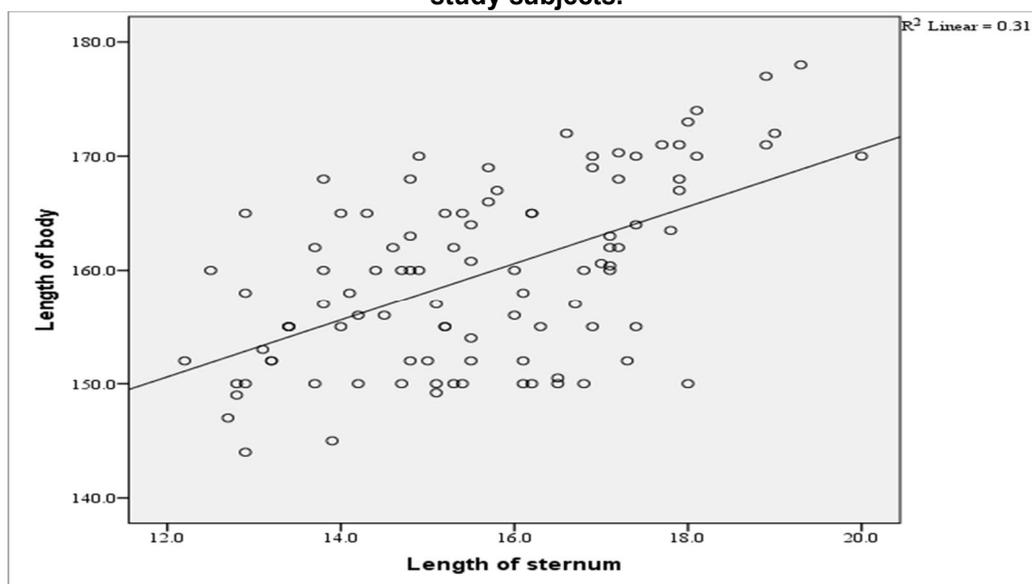
In Males: Length of body (y) = 112.89 (b0) + 3.128 (b1) x Length of sternum.

Over all (Irrespective of Gender): Length of body (y) = 120.61 (b0) + 2.499 (b1) x Length of sternum. (Figure 1)

**Table 6: Linear regression between Length of body (Dependent variable) and Length of Sternum (Independent variable)**

Model		Coefficients			t	P value
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta		
Female	(Constant)	149.072	9.293		16.041	<0.001*
	Length of sternum	0.468	0.611	0.109	0.766	0.447
Male	(Constant)	112.890	6.087		18.547	<0.001*
	Length of sternum	3.128	0.376	0.772	8.319	<0.001*
Overall	(Constant)	120.614	5.873		20.538	<0.001*
	Length of sternum	2.499	0.374	0.559	6.680	<0.001*

**Figure 1: Scatter plot showing Correlation between Length of body and Length of sternum among study subjects.**



**Discussion:**

Earlier studies<sup>2-8</sup> done on the North Western Indian population, South Indians and Portuguese have helped to develop population specific regression formula for estimation of stature of an individual from various parameters of sternum. The results obtained in the present study show that it was possible to predict with greater accuracy, stature from sternal length in males & females (R square linear 0.313).

The standard error of estimate was 0.376 for males and 0.611 for females; thus it cannot distinguish persons of nearly similar stature. Rather, it can be used to give preliminary discerning information regarding the stature. This is consistent with results from studies on Spanish population.<sup>17</sup> The correlation coefficient and standard error of the estimate values obtained in the current study are

generally comparable to those observed in previous investigations<sup>2-8</sup> that assessed the efficacy of sternal measurements for stature estimation in other population groups.

Marinho and colleagues<sup>18</sup> reported a correlation coefficient of 0.329 and a standard error of 6.59 cm for the length, including the xiphoid process, of fresh sterna in a male sample from Portugal. Similarly, Singh, et al,<sup>19</sup> in their study of a Northwest Indian population sample, obtained correlation coefficient values of 0.316 for males and 0.328 for females for regression models based on sternal length taken from dry bone specimens. The corresponding standard errors of the estimate for these regression models were 6.83 and 6.65 cm for males and females, respectively. Menezes, et al<sup>3</sup> obtained higher correlation coefficients and lower standard errors of the estimate for

regression models derived from the combined length of the manubrium and meso-sternum recorded from dry bone specimens in a South Indian sample.

**Conclusion:**

The present study concludes that the sternum can be a useful tool in the estimation of stature. Our study indicates that stature can be predicted from the sternal length by linear regression analysis. Further research in this field will add to the corpus of ever-growing knowledge in physical anthropology and Forensic Medicine.

**Conflict of interest:** None

**Financial Assistance:** None

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## Original Research Paper

# A Descriptive Analysis of Alleged Sexual Assault of Female Survivors in Chandigarh Region

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### Abstract:

Sexual violence is one of the most heinous crimes against women. The present prospective study was done with the aim to analyse the pattern of alleged sexual assault cases that were reported to the hospital during 1st Jan 2016- 31st April 2017.

Of the total cases of sexual assault, only the cases involving female survivors were included in this study. We found that a total of 76 cases reported to emergency of Govt. Medical College & Hospital, Chandigarh (GMCH), with history of sexual assault. Of these, 60 survivors gave informed consent for their medico-legal examination. The most commonly affected were of 16-20 years age group and 47.4% of the victims were students. Majority of them were unmarried (78.9%). Most of the victims belonged to low socio economical status. In 78.9 % cases, the assailant was known to the victims. Only a few cases (28.6%) were reported within 24 hours of the incident for medical examination. Simple injuries in the form of abrasions were found on the body of the survivors, including genital injuries (43.8 %).

We concluded that the vulnerable age group should be taken care of and if such case happens, both the government and non-government agencies should work together to create an atmosphere where such survivors are provided support to cope up with the agony of the incident. This will help in giving moral boost to the survivors to come forward and report, as well as pursue such cases without any prejudice so that culprits of such heinous crimes are punished.

**Key Words:** Sexual assault, Demographic Profile, Medico legal Examination

### Introduction:

Crime against women [CAW] is as old as the human civilization. The ancient societies counted rape among the crimes enumerated in their law codes and even the Bible contains stories of rape.<sup>1</sup>

Sexual violence occurs throughout the world and the available data suggests that in some countries, nearly one in four women may experience sexual violence by an intimate partner and up to one third of adolescent girls report their first sexual experience as being forced.<sup>2</sup> According to the National Crime Records Bureau (NCRB), rape cases in India have increased exponentially, the highest being from Assam, Andhra Pradesh, Bihar and Delhi. The increase in incidence may be reflecting the western influence in our society and a power play in our patriarchal system.<sup>3</sup>

The offences against women are dealt within the law in various sections of Indian Penal Code (IPC),<sup>4</sup> Criminal Procedure Code (Cr PC),<sup>5</sup> Indian Evidence Act (IEA),<sup>6</sup> The Protection of Women from Domestic Violence Act,<sup>7</sup> The Protection of Children from Sexual Offences Act 2012,<sup>8</sup> etc. Amendments are made periodically in these laws to accommodate vital changes to prevent the sexual offence crimes.<sup>9</sup>

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DOR: 13/03/2018 DOA: 13/11/2018

DOI: 10.5958/0974-0848.2018.00059.3

The survivors of rape belong to different age groups, but children, adolescents and young women constitute the main target group. The act of rape has a profound impact on the physical and mental health of the victim and is associated with an increased risk of a range of sexual and reproductive health problems, with both immediate and long-term consequences.<sup>1</sup>

Injury pattern and assault characteristics also differ according to the victim's relationship with the perpetrator and other various factors, as well as the various circumstances of each case. The biggest threat comes, not from strangers, but from known persons, near relatives, friends and neighbours.<sup>10</sup> As a general rule, the younger the individual, more likelihood of getting injuries like contusion, abrasion or laceration.<sup>11</sup>

Sexual assault cases need to be examined carefully and the whole body must be scrutinised for injuries including any old relevant injuries and considered as an important corroborative sign of use of force.<sup>12</sup> In cases of sexual assaults, various tests for detection of semen are to be conducted to prove or disprove the allegation. This report has a significant role in the outcome of the case during the trial. Various chemical tests i.e. Florence, Barberio, Acid phosphatase test or immunological method (Prostate specific antigen, P30) are done for semen detection, which mainly detect the presence of prostatic secretion elements of seminal fluid. This positive result is seen upto a period of 36 hours, with gradual disappearance in 72 hours, however if the body is refrigerated, the levels of Acid phosphatase doesn't change.<sup>11</sup> PSA is another component produced by prostate and is found in seminal plasma, blood and urine, but not found in any of the tissue or body fluid of the female. A positive PSA finding is a reliable indicator of semen, regardless of the presence of spermatozoa or elevated acid phosphatase level.<sup>12,13</sup>

Health services for survivors of sexual offence are recognised as a particularly neglected area of the health sector worldwide. This study will help to identify the pattern of injuries in female victims of sexual assault.

### **Materials and Methodology:**

This prospective study was conducted in Department of Forensic Medicine & Toxicology, in collaboration with the Department of Obstetrics & Gynaecology, GMCH. Ethical approval for the same was given by the Institutional Ethics Committee. The study group consisted of 60 cases that reported in the casualty with history of sexual assault and who/whose guardians gave informed consent (in case of minor) to be part of this study.

After obtaining consent, the complete history was noted by the lady doctor from the Dept. of Obstetrics and Gynaecology in the presence of the 1st author. After taking the complete history, as per the MED LEaPR Performa,<sup>14</sup> examination of injuries was conducted. The cases were profiled on the basis of following parameters:

Age, residence (rural/urban), religion, marital status, socio-economic status, occupation, education status, brought by, date and time of incident, place of incidence, information regarding assailant(s), cause of delay presentation of examination. Socio-economic status was calculated using modified Kuppuswamy Scale. The pattern of injuries (general & local) sustained (if any) including finding like disruption, tears, stains etc. on the clothes of the victim, were recorded. Investigations or interventions like vaginal smears, vaginal swabs, urine for pregnancy test, USG, etc, were sent to laboratory or CFSL.

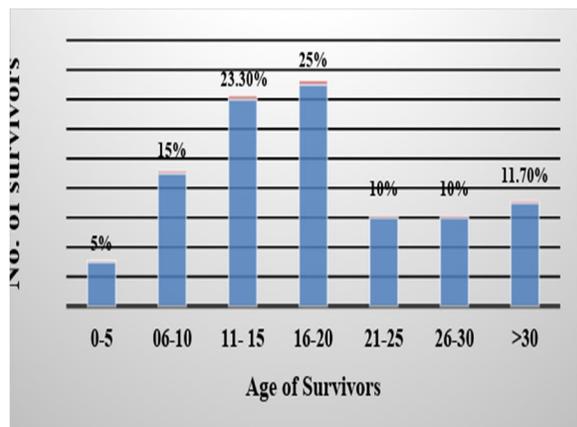
### **Observations and Discussion**

The present study was conducted on female survivors of sexual offence who brought for the examination to the GMCH, Chandigarh, during period of one and half year from December 2015 to April 2017. A total of 76 cases reported to the emergency with alleged h/o sexual assault, of which only 60 gave informed consent for examination. The findings of our study were compared with the findings of studies by other authors.

Of the 60 victims, maximum, 15 (25%), belonged to the age group of 16-20 years, followed by 14 (23.3%) cases in the age group of 11-15 years [Graph 1]. The findings in the present study were consistent with most of other studies.<sup>15-20</sup> They differed with the observations

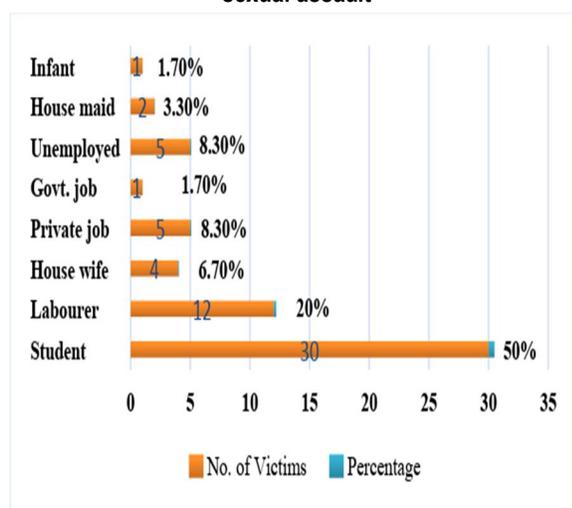
of Sukul B, et al<sup>21</sup> & Arpana S, et al<sup>22</sup> where most affected age group of survivors was more than 20 years, and with the observations of Jemal J, et al,<sup>23</sup> where most of the survivors were children under 15 years.

**Graph 1: Showing age wise distribution of survivor of sexual offence**



The maximum number of survivors, 30 (50%) were students, followed by labourers, 12 (20%). [Graph 2]. This observation is consistent with the study done by other authors.<sup>18,19,24,25</sup> Our findings differ from the study done by Jain R, et al,<sup>17</sup> in which majority of the survivors (43.5%) were housewives, followed by labourers (25%).

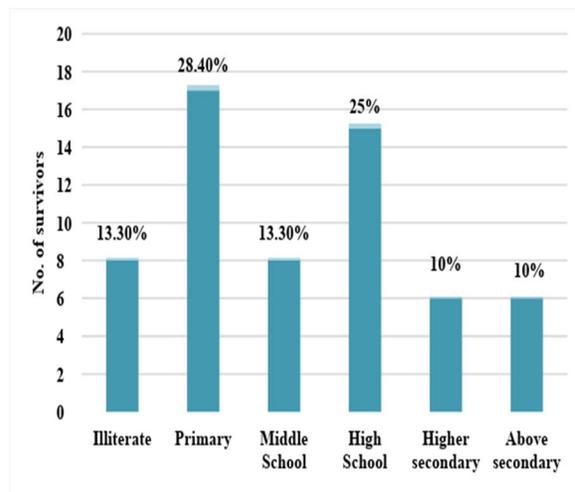
**Graph 2: Occupation wise distribution of survivors of sexual assault**



Again, 17 (28.4%) survivors studied up to primary level and 8 (13.3%) survivors were illiterate [Graph 3]. Our observations are almost similar to those of other workers.<sup>19,23,26</sup> who also

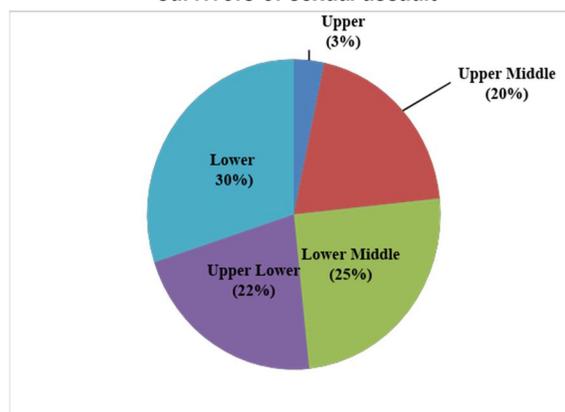
observed that maximum survivors were educated up to primary school.

**Graph 3: Bar chart showing education status of survivors**



In our study, majority of the victims, 18 (30%), belonged to lower/ Class V, followed by Lower middle/ Class III of SES, 13 (36.1%) cases. Least number of victims, i.e., 2 (3.3%) cases were from Upper/ Class I.[Graph 4] Our findings were in consonance with other studies,<sup>20,22,26</sup> where majority of survivors belonged to poor SES. Our observations slightly differ from that by Sujatha, et al,<sup>19</sup> in which majority of the survivors belonged to lower middle/Class III of SES.

**Graph 4: Pie chart showing socio-economic status of survivors of sexual assault**



78.3% of the survivors knew the alleged perpetrator, of whom, maximum were neighbours, 16 (27%), followed by boyfriend (20%) and close relative (13.2%). (Table 1).

Only in 21.7% cases, the alleged accused was a stranger. Our observations are consistent with those of the other studies.<sup>16-18,23,24,26</sup> In a study done by Bhaumik K, et al,<sup>18</sup> [13] and Tamuli RP, et al,<sup>25</sup> it was found that the most common offenders were boyfriends, followed by neighbours. In a study by Suri, et al,<sup>20</sup> the most common offenders were close family members or relatives, followed by neighbours of the victim.

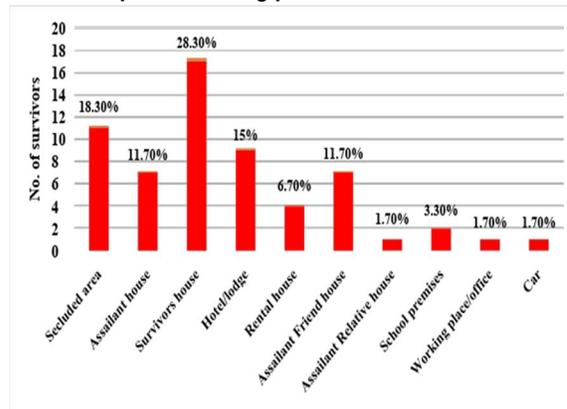
**Table 1: Relation of survivors to the perpetrator**

Relation	No. of survivors(n=60)	Percentage
Father	2	3.3 %
Cousin	3	5 %
In laws	2	3.3 %
Husband	1	1.6 %
Distant relatives	3	5 %
Boy Friend	12	20 %
Neighbour	16	27 %
Stranger	13	21.7 %
Acquaintance	3	5 %
Batchmate	1	1.6 %
Doctor	1	1.6 %
Teacher	2	3.3 %
House owner	1	1.6 %

Again, majority of the instances of sexual assault, 17 (28.3%), occurred in the survivor's house, followed by 11 (18.3%) instances, which occurred in a secluded area (**Graph 5**). The observations of our study were consistent with study done by other authors,<sup>20,26</sup> in which maximum cases occurred in the victim's house; and differ with the study done by Roy Chowdhury, et al,<sup>16</sup> who observed that in 77.5% of cases, the incidence occurred outside. Studies done by Tamuli, et al<sup>26</sup> and Sujatha, et al<sup>19</sup> showed that 20% & 40% of incidents occurred in rental house and assailant's house, respectively.

Majority of the survivors, 16 (26.6%), in our study, were examined between 24-48 hours, whereas 7 victims (11.7%) were examined 15 days after the alleged incident (**Table 2**). Similar observations were made in the other studies.<sup>21,25,26</sup> Our findings differed from those of Sweta Lal, et al,<sup>27</sup> in which maximum cases presented within 24 hours (58%) and Aparna S, et al,<sup>22</sup> in which maximum cases presented between 2 to 3 weeks after the incident.

**Graph 5: Showing place of sexual assault**



**Table-2: Time interval between examination of survivors and last incident**

Time Interval	No. of Victims(n=60)	%age
Within 12 hours	3	5 %
12- 24 hours	9	15 %
24- 48 Hours	16	26.6 %
48- 72 Hours	5	8.3 %
3- 5 days	10	16.7 %
5- 15 days	10	16.7 %
More than 15 days	7	11.7 %

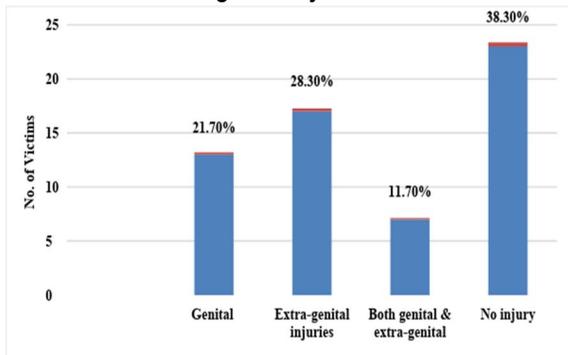
Majority of the assaults, 27 (45%), were committed by threatening/ inducing fear in the survivors. Of the weapons, knife was used in 8 cases (13.3%), while in 5 cases (8.3%), blackmailing was used and in 23.3% cases, verbal or other means were used. Amongst the total cases, 21.7 % were of statutory rape, 15% were of forcible sexual assault and 13.3% were cases with consensual sexual act. In 5% of cases, the survivors reported of being administered some unknown drugs (**Table 3**). These observations were consistent with many of other studies<sup>17,24,28</sup> where knife was the most common means to threaten the victims.

**Table 3: Showing different types of modus operandi used in the reported sexual assault**

Manner	No. of survivors	Percentage
Statutory	13	21.6%
Forcible	9	15%
By threatening /fear		
- Knife	8	45%
- Blackmailing	5	
- Other means	14	
Consensual	8	13.4%
Drug intoxication	3	5%
Total	60	100%

Only 38 victims (63.3%) of sexual offence in our study had bodily injuries, of which 7 (11.7%) sustained both extra-genital and genital injuries, 14 (23.3%) sustained only genital injuries and 17 (28.3%) had only extra-genital injuries (**Graph 6**). The observations were consistent with studies of other authors<sup>17,24</sup> while they differed from the study done by Sarkar SC, et al,<sup>26</sup> who reported that genital injuries more common than extra-genital injuries.

**Graph 6: Showing cases having genital and extra-genital injuries**



Again, 40% survivors sustained extragenital injuries (**Picture 1-4**) of which most of the injuries were present on upper limb (58.3%), followed by face, head and neck (54.2%) and lower limb (41.6%). [**Graph 7**]. The most common extra-genital injuries were bruises, seen in 79.1 % survivors, followed by abrasions seen in 16.6 % survivors. Our observations were similar to those of Hwa h, et al,<sup>29</sup> but differed from those of Jain R, et al<sup>17</sup> who found that the most commonly injuries were found on breast, 67%, and cheek, 33%.

**Picture 1: contusion over back of left arm & flank**



**Picture 2: Linear abrasion over front of abdomen & breast**

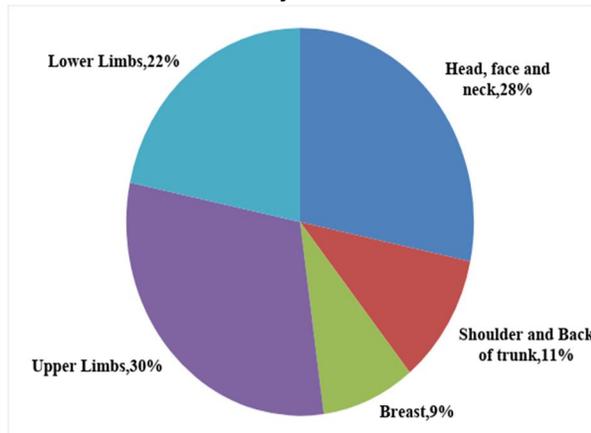


**Picture 3: Nail mark over front of left forearm**



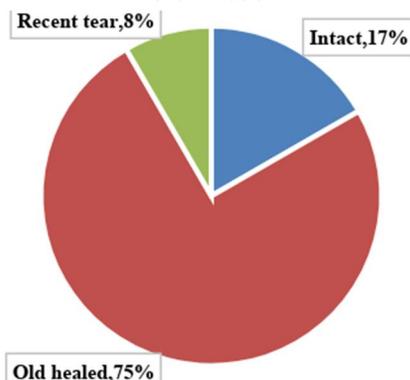
**Picture 4: Bite mark on back of left shoulder**

**Graph 7: Showing distribution of extra-genital injuries on the body of survivors**



In the present study, of the 20 (33.3%) survivors, who sustained genital injuries, bruise were the most common genital injury. Most bruises were seen on vaginal introitus (45%), followed by labia minora (35%). Most commonly, tear was found at posterior fourchette (25 %), followed by anal introitus (10%). [Graph 8]. The anatomical site of fixation of posterior fourchette to the perineal body lies posteriorly, thus the tissues here has maximum stress when forceful stretching occurs, as in the cases of sexual assault. So, mostly, the tears are present in and around this area. This was consistent with the study of Jain R, et al<sup>17</sup> who found that vaginal bruises were the most common genital injuries (82%). It differed from the study of Hwa H, et al,<sup>29</sup> who observed that the abrasions on labia (21.4%) were the most common genital injuries. Our observations also differed from the study by Sommer MS,<sup>30</sup> who found tears over posterior fourchette in 70 % survivors.

**Graph 8: Chart showing condition of hymen during examination**



We observed that 45 (75%) cases had old healed tears and 5 (8.3%) had recent tears of their hymen. Only 10 (16.7%) survivors presented with intact hymen [Graph 9]. The observations were in consonance with the study done by other authors<sup>16,21,22,25,26</sup> in which maximum cases presented with old healed tears of hymen; but differed from study done by Bhawmik K, et al<sup>18</sup> and Hwa H, et al<sup>29</sup> in which maximum cases presented with recent ruptures of hymen, 91.2% and 41.8%, respectively.

Most of the survivors presented with tears of the hymen at 6 o'clock position (50 %), followed by bilateral tear at 5 & 7 o'clock position (18 %). It could be because of the fact that anteriorly, hymen is supported by periurethral tissues buttress, but no such support is there for the posterior part of hymen. These findings were consistent with the studies done by Sujatha PL, et al<sup>19</sup> and Suri S, et al,<sup>20</sup> but differed from that done by Bhowmik K, et al<sup>18</sup> who observed that tears of hymen at 3 o'clock position ( 45.8 %) were slightly more common than those at 6 o'clock position (43.5 %).

Urine pregnancy test of survivors was negative in most of the cases. However, 10% survivors were pregnant at the time of examination. MTP was done in three cases and products of conception were sent for DNA analysis, results of which are still awaited. In 3 cases, survivors presented in advanced pregnancy but the court did not allow termination. (Table 4). These findings were consistent to the findings of the study of other authors,<sup>21,28</sup> who also found that many of the victims were pregnant at the time of examination.

**Conclusion:**

Our study showed that some survivors refused to consent for medico-legal examination due to social stigma, prejudice with regard to the chances of marriage, being considered immoral and responsible for the incident, embarrassment caused by trial in court, publicity in media, risk of losing the love and respect of society and family and that of husband, if married.

Educating the children about good & bad touch+ better prepares them to fend off unwanted

Chart 9: Showing position of tear of the hymen of survivors

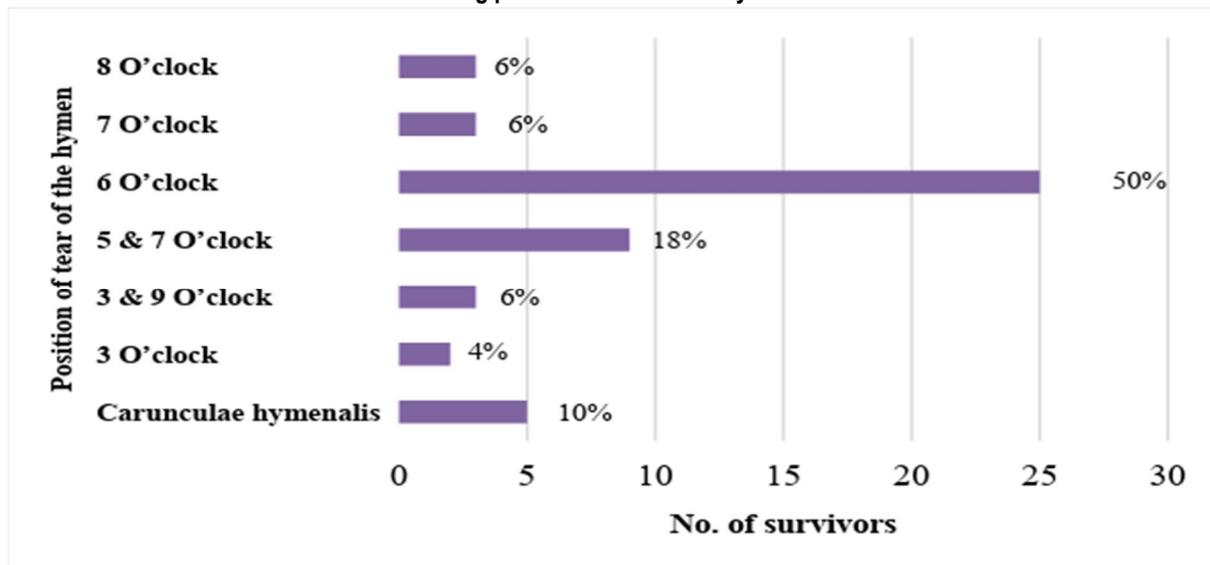


Table 4: Genital injury of survivors (n= 20)

Anatomical location	Classification of Genito-anal injuries		
	Abrasion	Contusion/ Bruise	Laceration/ Tear
Labia Majora	1	6	-
Labia Minora	1	7	-
Fossa Navicularis	-	-	1
Posterior fourchette	-	-	5
Vaginal Introitus	-	9	-
Anal Introitus	-	1	2

advances from acquaintances, who pose more risk than strangers.

Teaching women various tactics for preventing bad incidence, raising awareness about sexual assault and to be more empowered in defending themselves could substantially reduce their risk being raped.

Multidisciplinary approach encompassing emotional, medical, psychological and social support and forensic care is required in such cases. This will help in giving moral boost to the victims to come forward and report as well as pursue such cases without any prejudice so that culprits of such heinous crimes are punished.

**Conflict of Interest:** None.

**Financial Assistance:** None.

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## Original Research Paper

# Study of Pattern of Homicidal Deaths Autopsied at KIMS Hospital, Hubballi

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### Abstract:

**Background:** In the present age of urbanization and industrialization, homicidal crimes are inevitable part of all offences. Homicide is one of the leading causes of unnatural deaths. **Materials and Methodology:** This was a cross sectional, descriptive study that included all cases of death due to homicide during the period of January 2015 to December 2015, for which a postmortem was performed in the mortuary of the Department. **Results:** The study of deaths due to homicide showed a male predominance. Maximum number of cases was in the age group of 20-29 years, followed by 30-39 years. Overall, the most common motive was revenge. Blunt weapon injuries were commoner than sharp weapon injuries. In majority of the cases, death occurred on the spot or within first 24 hours and cause of death was haemorrhagic shock and head injury. **Conclusion:** Revenge, argument, financial disputes, infidelity, love affairs, poverty, easy accessibility of addictive substances and weapons of violent offences, poor temperament, unemployment etc, are some of the provocative circumstances for such type of violent offences.

**Key Words:** Homicide, Blunt weapon, Sharp weapon, Death.

### Introduction:

Homicide is the most serious crime and is as old as the human civilization and reported as early as in the Bible.<sup>1</sup> Homicide is defined as killing of one human being by another human being.<sup>2</sup>

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DOR: 06/10/2017 DOA: 13/11/2018

DOI: 10.5958/0974-0848.2018.00060.X

Killing of an individual is the highest level of aggression found in all the cultures. Since ages, the very reason or motive for these killings has remained the same viz., lust for money, women or land. To commit a murder, two elements: *Mens rea*, which means preplanning or afore thought, and *Actus reus*, which means the actual execution; should work together to constitute the crime.<sup>3</sup> The present study attempts to study and analyse pattern of homicidal deaths in Hubballi region of Karnataka.

### Materials and Methodology

This was a cross sectional, descriptive study conducted during the period of January 2015 to December 2015. All the cases brought to the department for medicolegal autopsy, either confirmed or later registered as homicide by investigating police officer, were considered for study. Any cases subjected for autopsy with alleged or suspected history of homicide but which were later registered as non homicidal, based on the autopsy findings, circumstantial evidence and investigation by the police, were

excluded. Total data of 45 homicidal death cases was collected for the study purpose from postmortem findings, police, requisition papers, hospital case papers and information furnished by family members and relatives.

**Results**

There were 45 cases of deaths due to homicide during the period January 2015 to December 2015. The results are analysed and tabulated as frequency and percentages in **Tables 1 to 6**.

**Table 1: Sex wise distribution of homicidal cases**

Sex	Frequency	Percent
Male	31	68.9%
Female	14	31.1%
<b>Total</b>	<b>45</b>	<b>100%</b>

In the present study, the victims of homicidal deaths had male preponderance (68.9%) compared to female (31.1%). (**Table 1**)

**Table 2: Age wise distribution of homicidal cases**

Age (years)	Frequency	Percent
0-9	00	0%
10-19	03	6.7%
20-29	16	35.6%
30-39	10	22.2%
40-49	07	15.5%
50-59	05	11.1%
60 and above	04	8.9%
<b>Total</b>	<b>45</b>	<b>100%</b>

Maximum number of cases was seen in the age group of 20-29years (35.6%), followed by 30-39years (22.2%), then 40-49years (15.5%), 50-59years (11.1%), 60years and above (8.9%) and 10-19 years (6.7%).(**Table 2**)

**Table 3: Distribution of homicide cases based on motive**

Motive	Frequency	Percent
Argument	07	15.6%
Revenge	15	33.3%
Financial conflicts	05	11.1%
Property gain	03	6.7%
Infidelity	02	4.4%
Others	07	15.6%
Not known	06	13.3%
<b>Total</b>	<b>45</b>	<b>100%</b>

The most common motive was revenge (33.3%), followed by argument (15.6%), others (15.6%), not known (13.3%), financial conflicts

(11.1%), property gain (6.7%) and infidelity (4.4%).(**Table 3**)

**Table 4: Distribution of cases according to pattern of homicide**

Pattern of Homicide	Frequency	Percent
Sharp weapon injuries	13	28.9%
Blunt weapon injuries	20	44.5%
Sharp + Blunt weapon injuries	08	17.8%
Asphyxial deaths	02	4.4%
Burns	02	4.4%
<b>Total</b>	<b>45</b>	<b>100%</b>

Blunt weapons was the most common weapon used, (44.5%), followed by sharp weapons (28.9%), and combined sharp and blunt weapons (17.8%), asphyxia (4.4%) and burns (4.4%). (**Table 4**)

**Table 5: Period of survival**

Period of survival	Frequency	Percent
Spot (<1/2hr)	23	51.1%
1/2hr – 1 day	11	24.4%
1-7days	08	17.8%
>7days	03	6.7%
<b>Total</b>	<b>45</b>	<b>100%</b>

In this study, death occurred on spot (51.1% of cases) or within first 24 hours (24.4% of cases), followed by 1-7 days (17.8%) and >7days (6.7%).(**Table 5**)

**Table 6: Cause of death**

Cause of death	Frequency	Percent
Haemorrhagic Shock	20	44.5%
Head injury	18	40.0%
Thermal burns	02	4.4%
Complications of injury	03	6.7%
Asphyxia	02	4.4%
<b>Total</b>	<b>45</b>	<b>100%</b>

Cause of death was due to haemorrhagic shock (44.5% of cases), followed by head injury cases (40%), complications of injury (6.7%), asphyxial deaths (4.4%) and thermal burns (4.4%).(**Table 6**)

**Discussion**

In the present study, cases of homicide constituted 3.3% of the total autopsy cases. Majority of the victims were male (68.9%) and

the commonly affected age group of victims was 20. 29 years (35.6%), followed by 30. 39 years (22.2%) which correlates with previous studies such as Jhaveri<sup>4</sup>, Zanzrukiya<sup>5</sup>. The high incidence of cases of males may be because of outside activities, aggressive physical activities and risk taking behaviour and the reason of age group 20-29 years for being victim of homicide may be due to person in this age group are more aggressive, short tempered, and least tolerant.

In most cases of homicide, the motive was revenge (33.3%), followed by argument (15.6%) and others (15.6%), which included marital discord, socio-economic stress, sexual jealousy etc. Similar observations were also made by Hugar<sup>6</sup> wherein the main motive was revenge (26.5%), followed by others.

Use of blunt weapons (44.5%) for homicide was more common, followed by sharp weapons (28.9%), combined sharp and blunt weapons (17.8%), asphyxia (4.4%) and burns (4.4%). These could be due to unpremeditated aggressive/explosive response. Similar findings were seen by Rastogi<sup>7</sup> where blunt weapon injuries were common, but in contrast with study conducted by Parmar DJ<sup>8</sup> wherein sharp weapon injuries were commoner than blunt weapon injuries.

Again, death occurred on spot (51.1%) or within first 24hours (24.4%) and cause of death was haemorrhagic shock (44.5%), followed by head injury cases (40%), complications of injury (6.7%), asphyxial deaths (4.4%) and thermal burns (4.4%). These findings are consistent with studies conducted by Hugar<sup>6</sup> and Parmar DJ<sup>8</sup>. These could be due to lethality of the weapons which were used.

### **Conclusion**

The pattern of homicidal deaths revealed from this study showed a high incidence in male. The maximum numbers of cases were in the 20-29 years group and the common motive was revenge. In majority of cases blunt weapon injuries were commoner compared to sharp weapon injuries and death occurred on spot and cause of death was due to haemorrhagic shock and head injury.

In the present age of urbanization and industrialization, homicides are inevitable part of all offences. Revenge, argument, financial disputes, infidelity, love affairs, poverty, stress, poor education, easy accessibility of addictive substances and weapons of violent offences, poor temperament, unemployment, substance abuse etc, are some of the provocative circumstances for such type of violent offences.

**Conflict of interest:** None

**Financial Assistance:** None

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## Original Research Paper

# Age determination from Radiological Investigation of Epiphyseal Fusion around Wrist Joint: A Cross-Sectional Survey from Haryana Region

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### Abstract:

**Background-** Determination of the age of an individual from the appearance and the fusion of the ossification centers is considered a reasonably well accepted method in the field of medical and legal professions. The challenges encountered while determining the age of a bone vary from place to place, depending on the geographic terrain, climatic, dietetic, hereditary, disease & other factors. **Aim-** The aim of this study was to ascertain status of epiphyseal fusion of long bones at wrist joint for determination of age. **Materials & Methodology-** The study comprised of a total 296 subjects in the age groups from 11 to 21 years from Rohtak and neighboring districts from the state of Haryana region. X-rays of the bilateral wrist joint were taken in the antero-posterior view. The films were studied radiologically by interpreting the ossification into stages. **Results-** Complete fusion of distal end of ulna with its shaft was seen in the age group of 16-17 years in males and 15-16 years in females and complete epiphyseal fusion was noticed at the age of 18-19 years in males and 17-18 years in females. **Conclusion-** Ages of bilateral complete union of epiphysis around wrist joint i.e. for lower end of radius and ulna both, was found to be 17-18 years for girls & 18-19 years for boys in Haryana region.

**Key Words:** Age Estimation, Radiology, Epiphysis, Fusion, Wrist Joint, Region

### Introduction:

Determination of the age of an individual from the appearance and the fusion

of the ossification centers is considered a reasonable scientific method and a well accepted fact in the field of medical and legal professions.<sup>1</sup> It is a common practice that doctors are called upon in the court of law to give expert opinion about age of the person. On the other hand, comment on age of bones in mutilated skeletal remains poses a challenge to a forensic expert. Hence determination of age presents a task of considerable importance from the view-point of the administration of justice.<sup>2,3</sup>

The bones of human skeletons develop from separate ossification centers. From these centers, ossification progresses till the bone is completely formed. It is therefore possible to determine the approximate age of an individual by radiological examination of bones till ossification is complete. The challenges encountered while determining the age of a bone vary from place to place depending on the geographic terrain, climatic, dietetic, hereditary, disease & other factors.<sup>4</sup> In

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DOR: 10/03/2018                      DOA: 14/11/2018

DOI: 10.5958/0974-0848.2018.00061.1

view of the same, a survey committee while reporting on medico-legal practice recommended to the Government of India in the year 1964 that a zone wise study for the problem of determination of age is to be encouraged.<sup>5</sup> Therefore the present study was planned with an objective to analyze and ascertain the status of epiphyseal fusion of long bones at wrist joint for determination of age. An additional objective was to determine differences of epiphyseal fusion of long bones at wrist joint in both the genders and both sides.

**Materials and Methodology:**

The present cross sectional survey was conducted in the Departments of Forensic Medicine and Radio-diagnosis, Pt. B. D. Sharma Post Graduate Institute of Medical Sciences (PGIMS), Rohtak. Approval from the Institutional Ethics Committee was taken for the study. The study population consisted of consenting volunteers from nearby schools, medical and para-medical courses. Only subjects with known date of birth (duly verified from the birth certificates/ school admission records/ matriculation certificate) and those apparently normal and healthy individuals were included in the study. Cases with unknown exact date of birth and those having any chronic illness, apparent skeletal deformity/malformation were excluded from the survey.

The study comprised of a total number of 296 subjects in the age groups from 11 to 21 years from Rohtak and neighboring districts from the state of Haryana region. The volunteers were divided in ten groups according to the age. i.e. 11 -12 years; 12 -13 years; 13 -14 years; 14 -15 years; 15 -16 years; 16 -17 years; 17 -18 Years; 18-19 years; 19-20 years; 20-21 years. Proforma was devised to collect all relevant

information of volunteers. The information regarding particulars of the subject like name, age, sex, height, weights were included. Then subjects were then taken for radiological examination. Subjects were made to wear the lead apron, and then seated on a stool of convenient height. X-rays of the both elbow joints and bilateral wrist joint were taken in antero-posterior view. The films were studied radiologically by interpreting the ossification into three stages<sup>6</sup> as follows: Bones showing no epiphyseal fusion (N), Bones showing partial fusion i.e. in the process of fusion (P), Bones showing complete fusion (C). The age of epiphyseal fusion was taken as the youngest age group in which complete fusion was noticed in all (100%) of the subjects.

The collected data was coded and entered in Statistical Package for Social Sciences (SPSS), version 20. The results were expressed as proportions. Chi-square (  $\chi^2$  ) test was applied to test the difference across the groups and  $p < 0.05$  was considered statistically significant.

**Results:**

The X-ray films of 296 subjects of the wrist joint were studied for fusion of the lower end of radius and ulna with its shaft. Complete fusion of distal end of ulna with its shaft was seen in the age group of 16-17 years in males and 15-16 years in females and 100% complete epiphyseal fusion was noticed at the age of 18-19 years in males and 17-18 years in females. (Table 1, Figure 1)

Complete fusion of lower end of radius was seen in females in the age group 15-16 years, and in males in the age group of 16-17 years. All the cases i.e. 100% complete fusion of lower end of radius was seen in the age group of 18-19 years in males and 17-18 years in females. (Table 2, Figure 2)

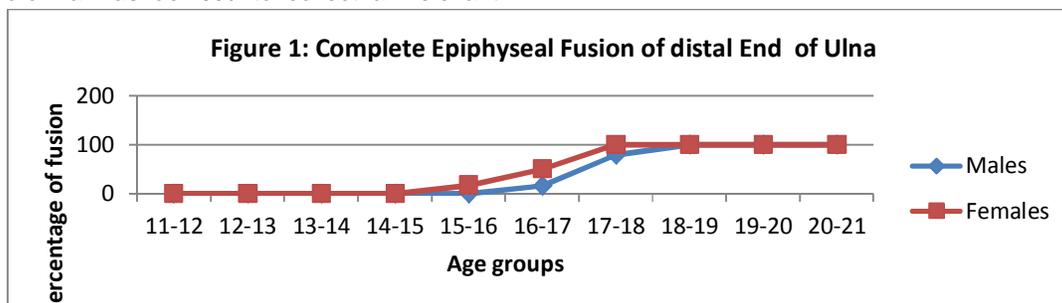


Table 1: Gender and Age Group wise fusion of distal end of ulna with its shaft.

Age group (Years)		Male				Female				p value
		N(%)	P(%)	C(%)	T(%)	N(%)	P(%)	C(%)	T(%)	
11-12	Right	11(100)	0(0)	0(0)	11(100)	12(100)	0(0)	0(0)	12(100)	NA
	Left	11(100)	0(0)	0(0)		12(100)	0(0)	0(0)		
12-13	Right	13(100)	0(0)	0(0)	13(100)	13(100)	0(0)	0(0)	13(100)	NA
	Left	13(100)	0(0)	0(0)		13(100)	0(0)	0(0)		
13-14	Right	11(100)	0(0)	0(0)	11(100)	21(100)	0(0)	0(0)	21(100)	NA
	Left	11(100)	0(0)	0(0)		21(100)	0(0)	0(0)		
14-15	Right	15(100)	0(0)	0(0)	15(100)	14(100)	0(0)	0(0)	14(100)	NA
	Left	15(100)	0(0)	0(0)		14(100)	0(0)	0(0)		
15-16	Right	10(100)	0(0)	0(0)	10(100)	15(65.2)	4(17.4)	4(17.4)	23(100)	0.101
	Left	10(100)	0(0)	0(0)		15(65.2)	4(17.4)	4(17.4)		
16-17	Right	16(64)	5(20)	4(16)	25(100)	3(18.8)	5(31.2)	8(50)	16(100)	0.013
	Left	16(64)	5(20)	4(16)		3(18.8)	5(31.2)	8(50)		
17-18	Right	0(0)	4(21.1)	15(78.9)	19(100)	0(0)	0(0)	18(100)	18(100)	0.004
	Left	0(0)	4(21.1)	15(78.9)		0(0)	0(0)	18(100)		
18-19	Right	0(0)	0(0)	10(100)	10(100)	0(0)	0(0)	14(100)	14(100)	NA
	Left	0(0)	0(0)	10(100)		0(0)	0(0)	14(100)		
19-20	Right	0(0)	0(0)	11(100)	11(100)	0(10)	0(0)	10(100)	10(100)	NA
	Left	0(0)	0(0)	11(100)		0(10)	0(0)	10(100)		
20-21	Right	0(0)	0(0)	14(100)	14(100)	0(0)	0(0)	16(100)	16(100)	NA
	Left	0(0)	0(0)	14(100)		0(0)	0(0)	16(100)		

Table 2: Gender and Age Group wise fusion of distal end of radius with its shaft

Age group (Years)		Male				Female				p value
		N(%)	P(%)	C(%)	T(%)	N(%)	P(%)	C(%)	T(%)	
11-12	Right	11(100)	0(0)	0(0)	11(100)	12(100)	0(0)	0(0)	12(100)	NA
	Left	11(100)	0(0)	0(0)		12(100)	0(0)	0(0)		
12-13	Right	13(100)	0(0)	0(0)	13(100)	13(100)	0(0)	0(0)	13(100)	NA
	Left	13(100)	0(0)	0(0)		13(100)	0(0)	0(0)		
13-14	Right	11(100)	0(0)	0(0)	11(100)	21(100)	0(0)	0(0)	21(100)	NA
	Left	11(100)	0(0)	0(0)		21(100)	0(0)	0(0)		
14-15	Right	15(100)	0(0)	0(0)	15(100)	14(100)	0(0)	0(0)	14(100)	NA
	Left	15(100)	0(0)	0(0)		14(100)	0(0)	0(0)		
15-16	Right	10(100)	0(0)	0(0)	10(100)	16(69.6)	3(13.0)	4(17.4)	23(100)	0.145
	Left	10(100)	0(0)	0(0)		16(69.6)	3(13.0)	4(17.4)		
16-17	Right	16(64.0)	2(8.0)	7(28.0)	25(100)	4(25)	5(31.2)	7(43.8)	16(100)	0.033
	Left	16(64.0)	2(8.0)	7(28.0)		4(25)	5(31.2)	7(43.8)		
17-18	Right	2(10.6)	7(36.8)	10(52.6)	19(100)	0(0)	0(0)	15(100)	18(100)	0.008
	Left	2(10.6)	7(36.8)	10(52.6)		0(0)	0(0)	15(100)		
18-19	Right	0(0)	0(100)	10(100)	10(100)	0(0)	0(0)	14(100)	14(100)	NA
	Left	0(0)	0(100)	10(100)		0(0)	0(0)	14(100)		
19-20	Right	0(0)	0(0)	10(100)	11(100)	0(0)	0(0)	10(100)	10(100)	NA
	Left	0(0)	0(0)	10(100)		0(0)	0(0)	10(100)		
20-21	Right	0(0)	0(0)	14(100)	14(100)	0(0)	0(0)	16(100)	16(100)	NA
	Left	0(0)	0(0)	14(100)		0(0)	0(0)	16(100)		

**Discussion:**

In the present study, epiphyseal fusion of the lower end of radius and ulna in the males and females of Haryana region was evaluated and the results were compared with the previous studies. It was observed in our study that complete fusion of distal end of ulna

with its shaft was seen in the age group of 16-17 years in males and 15-16 years in females and 100% complete epiphyseal fusion was noticed at the age of 18-19 years in males and 17-18 years in females. Similarly, complete fusion of lower end of radius was seen in females in the age group 15-16 years, and in

males in the age group of 16-17 years. All the cases i.e. 100% complete fusion of lower end of radius was seen in the age group of 18-19 years in males and 17-18 years in females. The results of this study are in agreement with previous studies from Marwar<sup>9</sup> and Davangere.<sup>10</sup> On the other hand, authors from England and Manchester observed fusion of distal end of ulna at 20 and 21 years respectively.<sup>11,12</sup> Another study by Flecker from Melbourne is also in concordance with our observations.<sup>13</sup> Fusion of lower end of ulna

was delayed by 1 year in the study in Marwar region among females.<sup>9</sup>

Fusion of lower end of radius was found to be 1 year earlier in the study conducted by Hepworth<sup>7</sup> in Punjab and 1 year later by another author from Egypt.<sup>14</sup> Our findings confirm the results of another study from Mumbai.<sup>15</sup> (Table 3) This study has several strengths. First, we determined the current status of epiphyseal fusion of long bones at wrist joint for determination of age in the Haryana region.

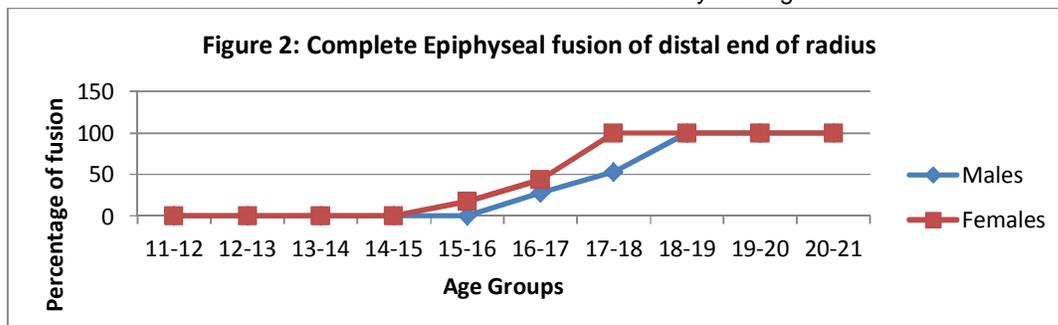


Table 3: Gender wise comparison of epiphyseal fusion of lower end of ulna and radius with its previous studies

Age of fusion of distal end of ulna (in years)		
Study	Gender	
	Male	Female
Indian Studies		
Hepworth (Punjab- 1927) <sup>7</sup>	16-17	16-17
Pillai (1936) <sup>8</sup>	18	18
Kothari (Marwar-1974) <sup>9</sup>	18-19	18-19
Sunil & Viswanathan (2012-Davanagere) <sup>10</sup>	18-19	15-16
Present Study (Haryana-2014)	18-19	17-18
Foreign Studies		
Davies and Pearson (England -1929) <sup>11</sup>	20	20
Paterson (Manchester-1929) <sup>12</sup>	21	20
Flecker (Melbourne-1931) <sup>13</sup>	19	17
Sidhom and Derry (Egypt -1931) <sup>14</sup>	19-20	----
Age of fusion of distal end of radius (in years)		
Indian Studies		
Hepworth(Punjab- 1927) <sup>7</sup>	16-17	16-17
Pillai ( Madrasi-1936) <sup>8</sup>	18	18
Kothari (Marwar-1974) <sup>9</sup>	18-19	18-19
Bhise and Nanandkar (Mumbai-2010) <sup>15</sup>	16-17	15-16
Present Study (Haryana-2014)	18-19	17-18
Foreign Studies		
Davies and Pearson (England -1929) <sup>11</sup>	19-20	19-20
Paterson (Manchester-1929) <sup>12</sup>	21	20
Flecker (Melbourne-1931) <sup>13</sup>	19	18
Sidhom and Derry (Egypt -1931) <sup>14</sup>	19-20	----

Very few similar experiences are available in the literature about the age estimation from ossification of wrist and elbow joint involving this particular region of India. Second, all the x-rays were read by a single person which creates a sense of uniformity. The study has some limitations as well. For example, findings emerging out of the current study may not be extrapolated across India. Studies with bigger sample size are warranted to confirm our observations.

### Conclusion:

To conclude, the empirical evidences of the current study indicate that ages of union of epiphysis around wrist joint i.e. for lower end of radius and ulna both, it is found to be 17-18 years for girls & 18-19 years for boys in the Haryana region. Studies with bigger sample size are warranted to confirm our observations in this part of India.

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## Review Research Paper

# HIV – Medicolegal Issues Update - HIV AIDS (Prevention and Control) Act - 2017 & Related Case Laws in India & Abroad

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### Abstract:

The Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome (Prevention and Control) Act, 2017, often shortened to the HIV/AIDS Prevention Act, or simply the HIV/AIDS Act, is an Act of the Parliament, Government of India, that prohibits discrimination against individuals who are diagnosed with HIV/AIDS. The law prohibits conducting an HIV test, medical treatment or research on a person without their informed consent. It also prohibits a person from being forced to disclose his/ her HIV/AIDS status, unless mandated by a court order. In this review article, we have analysed the HIV Related medicolegal Case Laws & ethical issues in India & Abroad, based on incidents of discrimination in hospitals, schools, and communities, and even though the rate of such incidents has gone down in recent years, due to provision of punishment & penalties for violating the HIV Act.

**Key Words:** HIV-AIDS Act 2017, HIV-affected person, Discrimination of HIV affected, Ombudsman, Protected Person, Capacity to consent, Disclosure of HIV status, Duty of HIV positive person, Children with HIV, Disability.

### Introduction:

In the HIV Act, unless the context otherwise requires, 'AIDS' means Acquired Immune Deficiency Syndrome, a condition characterized by a combination of signs and symptoms, caused by Human Immunodeficiency Virus, which attacks and weakens the body's immune system making the HIV-positive person susceptible to life threatening conditions or other conditions, as may be specified from time to time.<sup>1</sup>

'HIV-affected person' means an individual who is HIV-positive or whose partner (with whom such individual normally resides) is HIV-positive or has lost a partner (with whom such individual resided) due to AIDS.<sup>1</sup>

'Child affected by HIV' means a person below the age of eighteen years, who is HIV positive or whose parent or guardian (with whom such child normally resides) is HIV-positive or has lost a parent or guardian (with whom such child resided) due to AIDS or lives in a household fostering children orphaned by AIDS.<sup>1</sup>

'HIV-related information' means any information relating to the HIV status of a person and includes: (i) information relating to the undertaking performing the HIV test or result of an HIV test; (ii) information relating to the care, support or treatment of that person; (iii) information which may identify that person; and (iv) any other information concerning that person, which is collected, received, accessed or recorded in connection with an HIV test, HIV treatment or HIV-related research or the HIV status of that person.<sup>1</sup>

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DOI: 10.5958/0974-0848.2018.00062.3

### Reporting as HIV Positive:

In case of HIV tests, irrespective of the results of enzyme immune assay (EIA) . both positive and negative . advice should be given to correlate the results clinically by Western Blot Technique (WBT). This advice must be written prominently on the same report. It should be specifically stated if the investigations are preliminary in nature. Further requisite confirmatory tests need to be advised. It is necessary to give separate reports for both preliminary tests as well as final tests. In case HIV is detected in an IPD patient and the hospital is not fully equipped to treat HIV positive patients, the patient is to be immediately referred to another hospital having appropriate facilities to treat such patients.<sup>1</sup>

#### **Screening ELISA Test for HIV in Medico-legal Cases:**

Standard screening test for HIV infection is the ELISA, which is an extremely good screening test with a sensitivity of 99.58%; Commercial use of EIA kit by most of the diagnostic laboratories is not optimal with regard to specificity and, therefore, it must be confirmed with a more specific assay. EIA tests are generally scored as positive (highly reactive), negative (non-reactive), or indeterminate (partially reactive). While the EIA is an extremely sensitive test, it is not optimal with regard to specificity. This is particularly true in studies of low-risk individuals, such as volunteer blood donors. In this latter population, only 10% of EIA positive individuals are subsequently confirmed to have HIV infection. Among the factors associated with false-positive EIA tests are antibodies to class II antigens, auto-antibodies, hepatic disease, recent influenza vaccination, and acute viral infections. For these reasons, anyone suspected of having HIV infection based upon a positive or inconclusive EIA result must have the result confirmed with a more specific assay. The most commonly used confirmatory test is the Western Blot.<sup>2</sup>

#### **Patient sues doctor for wrongly labelling him HIV positive:**

In one case it was alleged that the hospital had given false HIV-positive report due to which the patient suffered mental and

physical agony and harassment. It was alleged that the HIV-positive report should not have been given based on the results of a non-conclusive screening test. Further, it was stated that the HIV-positive report had to be given only after conducting confirmatory tests suggested by the hospital. The court found that the report which showed the patient as HIV positive had clearly mentioned that it was a screening test. A note was also given to this effect to the patient that the result may be correlated clinically and must be confirmed by WBT. Hence, the court held that the hospital was not negligent.<sup>3</sup>

#### **Universal Precautions:**

Universal Precautions+ means the control measures that prevent exposure to or reduce, the risk of transmission of pathogenic agents (including HIV) and includes education, training, personal protective equipment such as gloves, gowns and masks, hand washing, and employing safe work practices.<sup>1</sup> Significant-risk body substances+ which can transmit HIV are blood, blood products, semen, vaginal secretions, breast milk, tissue and the body fluids, namely, cerebrospinal, amniotic, peritoneal, synovial, pericardial and pleural fluid.<sup>1</sup> The body fluids that do not pose significant-risk+ shall not include: (i) exposure to urine, faeces, sputum, nasal secretions, saliva, sweat, tears or vomit that does not contain blood that is visible to the naked eye; (ii) human bites where there is no direct blood to blood, or no blood to mucous membrane contact; (iii) exposure of intact skin to blood or any other blood substance; and (iv) occupational centres where individuals use scientifically accepted Universal Precautions, prohibitive techniques and preventive practices in circumstances which would otherwise pose a significant-risk and such techniques are not breached and remain intact.<sup>1</sup>

The significant-risk circumstances are: the circumstances which constitute significant-risk for transmitting or contracting HIV infection+and include:

(A) Sexual intercourse including vaginal, anal or oral sexual intercourse which exposes an uninfected person to blood, blood products, semen or vaginal secretions of an HIV-positive person;

(B) Sharing of needles and other paraphernalia used for preparing and injecting drugs between HIV-positive persons and uninfected persons;

(C) The gestation, giving birth or breast feeding of an infant when the mother is an HIV-positive person;

(D) Transfusion of blood, blood products, and transplantation of organs or other tissues from an HIV-positive person to an uninfected person, provided such blood, blood products, organs or other tissues have not been tested conclusively for the antibody or antigen of HIV and have not been rendered non-infective by heat or chemical treatment;

(E) Other circumstances during which a significant-risk body substance, other than breast milk, of an HIV-positive person contacts or may contact mucous membranes including eyes, nose or mouth, non-intact skin including open wounds, skin with a dermatitis condition or abraded areas or the vascular system of an uninfected person, and including such circumstances not limited to needlestick or puncture wound injuries and direct saturation or permeation of these body surfaces by the significant-risk body substances.<sup>1</sup>

#### **Patient sues Hospital for wrongly transfusing HIV infected blood:**

The window period of HIV infection still remains a cause of concern. The court very categorically observed that in spite of observing all mandatory safety precautions in accepting blood from a donor and then transfusing it to a patient, it always has a risk, especially the risk that the donor may have donated blood during the window period for which a doctor/ hospital could not be held liable. The court observed that the PGI had acted according to the standard medical practice and blood transfusion services were conducted as per the provisions of The Drug and Cosmetic Act.<sup>28</sup>

The courts are accepting that even after taking all the mandatory safety precautions, there will always be the risk that the donor had donated blood during the window period and hence merely because the patient has contracted HIV a doctor/ hospital will not be held negligent.<sup>4</sup>

#### **Guidelines for Blood Banks to Prevent Transmission:**

For the purpose of regulating its collection, storage and supply, blood is treated as a 'drug' under the Drugs and Cosmetics Act.<sup>28</sup> It is advisable that the blood banks not only keep a record of blood that is found to be fit for transfusion, but must also keep records of the blood that is discarded. It is a mandatory requirement to conduct tests on blood which is to be administered to a patient or to be issued to hospitals for transfusion. The blood so issued has to be free from AIDS, viral hepatitis, malaria, venereal diseases etc. Blood banks are bound to screen each and every unit of blood for Transfusion Transmitted Diseases (TTD) like HIV/ HBsAg/ HCV/ VDRL, and MP and that all the blood banks of India were brought under The Drugs and Cosmetic Act, 1940 and NACO (National AIDS Control Organization). This order has been passed by the Supreme Court.<sup>5</sup>

#### **The Healthcare Provider as per the HIV Act:**

%healthcare provider+ means any individual whose vocation or profession is directly or indirectly related to the maintenance of the health of another individual and includes any physician, nurse, paramedic, psychologist, counsellor or other individual providing medical, nursing, psychological or other healthcare services including HIV prevention and treatment services.<sup>1</sup>

#### **The Role of Ombudsman in Dealing with HIV Related Issues:**

The Ombudsman is a person who will inquire in to any complaints regarding the violations of the provisions of HIV Act-2017, in relation to acts of discrimination mentioned in Section 3 and providing of healthcare services by any person, in such manner as may be prescribed by the State Government.<sup>1</sup>

**Legal powers of Ombudsman in RTI:** The Ombudsman may require any person to furnish information on such points or matters, as he considers necessary, for inquiring into the matter and any person so required shall be deemed to be legally bound to furnish such information and failure to do so shall be punishable under sections 176 and 177 of the Indian Penal Code.<sup>1</sup>

**Ombudsman to Decide on Complaint:** The Ombudsman has to decide on the complaint within a period of thirty days of the receipt of the complaint after giving an opportunity to both the parties. He will pass such an order, as he deems fit, after giving reasons for the same. In cases of medical emergency of HIV positive persons, the Ombudsman shall pass such order as soon as possible, preferably within twenty-four hours of the receipt of the complaint. He shall, after every six months, report to the State Government, the number and nature of complaints received, the action taken and orders passed in relation to such complaints and such report shall be published on the website of the Ombudsman and a copy thereof be forwarded to the Central Government.<sup>1</sup>

**Ombudsman is Protected of any Action Taken in Good Faith:** No suit, prosecution or other legal proceeding can be initiated against the Central Government, the State Government, or any member or officer or other employee or person acting under the direction either of the Central Government or the State Government in respect of anything which is in good faith done or intended to be done in pursuance of the Act or any rules or guidelines made under the Act.<sup>1</sup>

#### **Guidelines for Courts under the HIV Act 2017:**

No court other than the court of a Judicial Magistrate First Class shall take cognizance of an offence under this Act. Offences under this Act shall be cognizable and bailable. No person shall subject any other person or persons to any detriment on the ground that such person or persons have taken any of the following actions, namely: (a) made complaint under this Act; (b) brought proceedings under this Act against any person; (c) furnished any information or produced any document to a person exercising or performing any power or function under this Act; or (d) appeared as a witness in a proceeding under this Act.<sup>1</sup>

#### **Duty of Clinical Establishments (under CEA 2010)<sup>30</sup> in Maintaining Confidentiality:**

As per the HIV Act, every establishment keeping the records of HIV-

related information of protected persons shall adopt data protection measures in accordance with the guidelines to ensure that such information is protected from disclosure. Data protection measures shall include procedures for protecting information from disclosure, procedures for accessing information, provision for security systems to protect the information stored in any form and mechanisms, to ensure accountability and liability of persons in the establishment.<sup>1</sup>

**Duty of Clinical Establishment for safe working environment:** Every establishment, engaged in the healthcare services and every such other establishment where there is a significant risk of occupational exposure to HIV, shall, for the purpose of ensuring safe working environment, - (i) provide, in accordance with the guidelines, - (a) Universal Precautions to all persons working in such establishment who may be occupationally exposed to HIV; and (b) training for the use of such Universal Precautions; (c) Post Exposure Prophylaxis to all persons working in such establishment who may be occupationally exposed to HIV or AIDS; and (ii) inform and educate all persons working in the establishment of the availability of Universal Precautions and Post Exposure Prophylaxis.<sup>1</sup>

#### **Duty of Government in HIV prevention and control:**

The Central Government and every State Government, shall take all such measures as they deem necessary and expedient for the prevention of spread of HIV or AIDS, in accordance with the guidelines.

(1) The measures to be taken by the Central Government or the State Government under Section 13 of the Act shall include the measures for providing, as far as possible, diagnostic facilities relating to HIV or AIDS, Anti retroviral Therapy and Opportunistic Infection Management to people living with HIV or AIDS.

(2) The Central Government shall issue necessary guidelines in respect of protocols for HIV and AIDS relating to diagnostic facilities, Antiretroviral Therapy and Opportunistic Infection Management which

shall be applicable to all persons and shall ensure their wide dissemination.

(3) The Central Government shall notify model HIV and AIDS policy for Clinical establishments, in such manner, as may be prescribed.<sup>1</sup>

#### **Strategies for reduction of HIV risk:**

Any act carried out by persons, establishments or organizations for the reduction of the risk of HIV in the manner specified in the guidelines issued by the Central Government shall not be restricted or prohibited in any manner, and shall not amount to a criminal offence or attract civil liability.<sup>1</sup>

The criminal liability of doctors, de-addiction psychiatrists, nurses, pharmacists, condom suppliers, social workers by conducting public Health program in preventing HIV transmission includes strategies for reducing risk of HIV transmission, like:

(a) A supplies condoms to B who is a sex worker or to C, who is a client of B. Neither A nor B nor C can be held criminally or civilly liable for such actions or be prohibited, impeded, restricted or prevented from implementing or using the strategy.

(b) M carries on an intervention project on HIV or AIDS and sexual health information, education and counselling for men, who have sex with men, provides safer sex information, material and condoms to N, who has sex with other men. Neither M nor N can be held criminally or civilly liable for such actions or be prohibited, impeded, restricted or prevented from implementing or using the intervention.

(c) X, who undertakes an intervention providing registered needle exchange program services to injecting drug users, supplies a clean needle to Y, an injecting drug user who exchanges the same for a used needle. Neither X nor Y can be held criminally or civilly liable for such actions or be prohibited, impeded, restricted or prevented from implementing or using the intervention.

(d) D, who carries on an intervention program providing Opioid Substitution Treatment (OST), administers OST to E, an injecting drug user. Neither D nor E can be held criminally or civilly liable for such actions

or be prohibited, impeded, restricted or prevented from implementing or using the intervention.

The strategies for reducing risk of HIV transmission means promoting actions or practices that minimize a person's risk of exposure to HIV or mitigate the adverse impacts related to HIV or AIDS including- (i) the provisions of information, education and counselling services relating to prevention of HIV and safe practices; (ii) the provisions and use of safer sex tools, including condoms; (iii) drug substitution and drug maintenance; and (iv) provision of comprehensive injection safety requirements.<sup>1</sup>

#### **Duties of Government for Children's welfare:**

The Act lays down the responsibility on the Central and the State Governments to take measures to facilitate better access to welfare schemes to persons infected or affected by HIV or AIDS. Both the Central and the State Governments shall frame schemes to address the needs of all protected persons, take appropriate steps to protect the property of children affected by HIV or AIDS. The parents or guardians of children affected by HIV and AIDS, or any person acting for protecting their interest, or a child affected by HIV and AIDS may approach the Child Welfare Committee for the safe keeping and deposit of documents related to the property rights of such child or to make complaints relating to such child being dispossessed or actual dispossession or trespass into such child's house.

%Child Welfare Committee+, as per the Act means a Committee set-up under section 29 of the Juvenile Justice (Care and Protection of Children) Act, 2000.<sup>29</sup>

#### **Duties of the HIV Positive Person:**

As per the Act, it will be the duty of HIV positive person to prevent transmission of HIV. Every person, who is HIV-positive and has been counselled in accordance with the guidelines issued or is aware of the nature of HIV and its transmission, shall take all reasonable precautions to prevent the transmission of HIV to other persons which may include adopting strategies for the

reduction of risk or informing in advance his HIV status before any sexual contact with any person or with whom needles are shared with. However, the provisions of this section are not applicable to prevent transmission through a sexual contact in the case of a woman, where there is a reasonable apprehension that such information may result in violence, abandonment or actions which may have a severe negative effect on the physical or mental health or safety of such woman, her children, her relatives or someone who is close to her.<sup>1</sup>

If a person suffering from HIV/AIDS knowingly marries a woman & thereby transmits infection to her, he shall be held guilty. The Supreme Court has held that he would be guilty of offences indicated in Section 269 & 270 of the IPC - Malignant act likely to spread infection of disease dangerous to life. These provisions impose duty upon the person knowing that he is suffering from HIV. (Mr X vs Hospital Z; AIR 1999 SC 495).<sup>6</sup>

A doctor/ hospital's maintenance of strict secrecy & failure to disclose to a sexual partner/ potential sexual partner, eg, a fiancé, about a person having HIV infection/ AIDS also amounts to an offence. The Supreme Court has held that in such a situation the silence of the doctor/ hospital would make them *Participes Criminis* (a participant in crime) (Mr X V. Hospital Z AIR 1999 SC 495).<sup>6</sup>

The Supreme Court again observed that so long as the person is not cured of the communicable venereal disease or impotency, the right to marry cannot be enforced through a court of law & shall to be treated as a suspended right. (Mr X V. Hospital Z AIR 1999 SC 495).<sup>6</sup> The issues discussed in this case were:

- Whether the respondents were guilty of violating the appellant's right to privacy guaranteed under Article 21 of the Constitution of India.
- Whether the respondents were guilty of violating the duty to maintain secrecy under Medical Ethics.
- Whether the appellant was entitled to compensation from the respondents

The Supreme Court declared that the case presented was without any merits and was dismissed.

#### **Disclosure of HIV Status in Law:**

No person can be compelled to disclose his HIV status, except by an order of the court that the disclosure of such information is necessary in the interest of justice, for the determination of issues in the matter before it. No person shall disclose or be compelled to disclose the HIV status or any other private information of other person imparted in confidence or in a relationship of a fiduciary nature, except with the written informed consent of that other person or a representative of such another person.

The informed consent for disclosure of HIV related information under clause (ii) of sub-section (1) of the Act is not required where the disclosure is made- (a) by a healthcare provider to another healthcare provider who is involved in the care, treatment or counselling of such person, when such disclosure is necessary to provide care or treatment to that person; (b) by an order of a court that the disclosure of such information is necessary in the interest of justice for the determination of issues and in the matter before it; (c) in suits or legal proceedings between persons, where the disclosure of such information is necessary in filing suits or legal proceedings or for instructing their counsel; (d) as required under the provisions of section 9; (e) if it relates to statistical or other information of a person that could not reasonably be expected to lead to the identification of that person; and (f) to the officers of the Central Government or the State Government or State AIDS Control Society of the concerned State Government, as the case may be, for the purposes of monitoring, evaluation or supervision.<sup>1</sup>

#### **Breaking Doctor-Patient Confidentiality for Disclosure of HIV Status Held as Negligence:**

In the New Zealand case of *Furniss v Fitchett* [1958] NZLR 396<sup>7</sup>, a patient successfully sued his doctor in a medical negligence action as she was harmed physically by the doctor's improper disclosure of medical information.

The duty of confidentiality is a part of the general medical duty of care to the patient. The ethical duty to maintain patient

confidentiality allows patients to disclose information on their health to their doctor freely. Patients are protected from harm that may happen from an unauthorized disclosure of medical information.

The Hippocratic Oath<sup>7</sup> says % Whatever, in connection with my professional service, or not in connection with it, I see or hear, in the life of men, which ought not to be spoken of abroad, I will not divulge, as reckoning that all such should be kept secret.+

The Declaration of Geneva<sup>7</sup> says % I will respect the secrets which are confided in me, even after the patient has died.+

The Singapore Physician's Pledge<sup>7</sup> says % solemnly pledge to ð respect the secrets which are confided in me ð +

However, there are certain exceptions when the doctor can reveal the patient's medical information. These are where the patient consents to the disclosure to comply with the statutory duty to report infectious diseases requiring notification, e.g. under the Infectious Diseases Act and the Misuse of Drug Regulations<sup>7</sup> to comply with a court order when disclosure is in the public interest, e.g. *W v Egell* [1990] 1 All ER 835<sup>7</sup> where disclosure can prevent or avert serious harm to the patient to communicate with other doctors on treatment. Therefore, the patient cannot sue a doctor for breaking the doctor-patient confidentiality because he has to report to the relevant authorities under the exceptions or limits to the doctor-patient confidentiality rule.<sup>7</sup>

#### **Duties of the Doctor in Disclosure of HIV-Positive Status to Partner of HIV-Positive Person:**

No healthcare provider, except a physician or a counsellor, shall disclose the HIV-positive status of a person to his or her partner. A healthcare provider, who is a physician or counsellor, may disclose the HIV-positive status of a person under his direct care to his or her partner, if such healthcare provider: (a) reasonably believes that the partner is at the significant risk of transmission of HIV from such person; and (b) such HIV-positive person has been counselled to inform such partner; and (c) is satisfied that the HIV-positive person will not inform such partner; and (a) has informed the HIV-positive person

of the intention to disclose the HIV-positive status to such partner: Provided that disclosure to the partner shall be made in person after counselling; and that such healthcare provider shall have no obligation to identify or locate the partner of an HIV-positive person; and also that such healthcare provider shall not inform the partner of a woman where there is a reasonable apprehension that such information may result in violence, abandonment or actions which may have a severe negative effect on the physical or mental health or safety of such woman, her children, her relatives or someone who is close to her. The healthcare provider shall not be liable for any criminal or civil action for any disclosure or non-disclosure of confidential HIV related information made to a partner under this section.<sup>1</sup>

#### **Informed consent in HIV Act:**

%Informed consent+ means consent given by any individual or his representative specific to a proposed intervention without any coercion, undue influence, fraud, mistake or misrepresentation and such consent obtained after informing such individual or his representative, such information, as specified in the guidelines, relating to risks and benefits of, and alternatives to, the proposed intervention in such language and in such manner as understood by that individual or his representative, as the case may be.<sup>1</sup> The %capacity to consent+ means ability of an individual, determined on an objective basis, to understand and appreciate the nature and consequences of a proposed action and to make an informed decision concerning such action.<sup>1</sup> Informed consent is necessary for undertaking HIV test or treatment. The informed consent for HIV test shall include pre-test and post-test counselling to the person being tested or such person's representative in the manner as may be specified in the guidelines. If the patient/ his representative does not give permission for HIV testing, the doctor cannot proceed to test him against his wishes. If he does so, he is liable for prosecution both under the civil as well as the criminal law.<sup>7</sup>

The informed consent for conducting an HIV test shall not be required in cases of-

3 D $\phi$  - Duty joining, Donating organs, Decided by court in criminal cases, (a) where a court determines, by an order that the carrying out of the HIV test of any person either as part of a medical examination or otherwise, is necessary for the determination of issues in the matter before it; (b) for procuring, processing, distribution or use of a human body or any part thereof including tissues, blood, semen or other body fluids for use in medical research or therapy: Provided that where the test results are requested by a donor prior to donation, the donor shall be referred to counselling and testing centre and such donor shall not be entitled to the results of the test unless he has received post-test counselling from such centre; (c) for epidemiological or surveillance purposes where the HIV test is anonymous and is not for the purpose of determining the HIV status of a person: Provided that persons who are subjects of such epidemiological or surveillance studies shall be informed of the purposes of such studies; and (d) for screening purposes in any licensed blood bank.<sup>1</sup>

#### **HIV Testing in Children without Parental Consent – Is It Ethical?:**

Test cannot be done on minor without the informed consent of the guardian.<sup>1</sup>

**Discrimination on HIV related grounds:** %Discrimination+ means any act or omission which directly or indirectly, expressly or by effect, immediately or over a period of time, (i) imposes any burden, obligation, liability, disability or disadvantage on any person or category of persons, based on one or more HIV related grounds; or (ii) denies or withholds any benefit, opportunity or advantage from any person or category of persons, based on one or more HIV-related grounds, and the expression %discriminate+ to be construed accordingly.

If the treating consultant advises safeguards & precautions to his staff & attendants while handling HIV patient & his body-fluids, that adoption of medically advised safeguards and precautions to minimize the risk of infection shall not amount to discrimination.<sup>1</sup>

"The alleged victimsq discharge from the Army on the basis of their HIV status constitute violations of the Convention on Human Rights ".<sup>8</sup> "The Order 70(3) of the Andhra Pradesh Revised Police Manual, which prohibited employment of people living with HIV, was not held as constitutionally valid".<sup>9</sup> "The Aeroplane Company $\phi$  policy of refusing to hire people living with HIV, as cabin attendants in violation of their Rights of equality was held as valid".<sup>10</sup> "The Cooking expert $\phi$  discharge from his job as a cook at a nursing home based on his HIV status constitutes unlawful discrimination under the Human Rights Act".<sup>11</sup> The treatment centre's unlawful discrimination against the complainant by denying her enrolment in a treatment program for eating disorders based solely on her HIV status was accepted as unlawful.<sup>12</sup> The Plaintiff, who was sterilized without their informed consent, was also accepted as unlawful.<sup>13</sup> The Insurance company $\phi$  denial to the petitioner's access to health insurance coverage based solely on his HIV status was also considered unlawful.<sup>14</sup> The HIV is a %disability+ under the Rights of Persons with Disabilities Act, 2016, thus providing people living with HIV protections under the Act.<sup>15</sup> The Respondent $\phi$  HIV infection doesnq constitute a %direct threat to the health and safety of others+ under the Disabilities Act.<sup>16</sup> The Defendant insurance company did not act in a %bona fide+ manner when it repudiated the deceased $\phi$  insurance contract because it believed he had failed to disclose, and in fact was aware, that he was living with HIV at the time the contract was completed.<sup>17</sup> The State has a constitutional obligation to provide free medicines to people living with HIV who cannot afford them and the Government has a constitutional obligation to ensure access to second-line antiretroviral treatment for people living with HIV who needed such treatment.<sup>18</sup>

#### **Prohibited Online Indiscrimination Related to HIV:**

As per the Act, no person shall propagate, advocate or communicate the feelings of hatred against any protected persons or group of protected person in general or specifically or disseminate,

broadcast or display any information, advertisement or notice, which may reasonably be construed to demonstrate an intention to propagate hatred or which is likely to expose protected persons to hatred, discrimination or physical violence.<sup>1</sup>

The sex workers in India are entitled the right to life of dignity & protection from HIV.<sup>19</sup> Sex workers also cannot be tested for HIV against their will.<sup>20</sup> Survivors of aggravated sexual assault can claim more rigorous punishment of accused for causing significant risk of serious bodily harm by transmitting HIV, when accused is known - HIV positive. The Court held that in this case "the scientific evidence indicated that either the careful use of a condom or effective antiretroviral therapy which reduced viral loads to an undetectable level could potentially reduce the level of risk to below the legal test of significant risk."<sup>21</sup> A HIV positive person undergoing regular ART can be accused of transmitting HIV by unprotected sex.<sup>22</sup>

A journalist can also be restrained for the publication of the confidential records of HIV positive doctors.<sup>23</sup> A journalist obtained confidential records of two HIV-positive doctors who continued their general practice. The doctors sought a permanent injunction to restrain the publication of the information. The Court granted the injunction. It held: "I keep in the forefront of my mind the very important public interest in freedom of the press. And I accept that there is some public interest in knowing that which the defendants seek to publish. But in my judgment those public interests are substantially outweighed when measured against the public interest in relation to loyalty and confidentiality both generally and with particular reference to AIDS patients' hospital records."<sup>23</sup>

A HIV positive person's photo can be published in his interview without his consent.

In another case, a survivor of aggravated sexual assault claimed more rigorous punishment of accused for causing significant risk of serious bodily harm by transmitting HIV, when accused is known - HIV positive. The Court held that in this case "the scientific evidence indicated that either the careful use of a condom or effective antiretroviral therapy which reduced viral loads

to an undetectable level could potentially reduce the level of risk to below the legal test of significant risk."<sup>24</sup>

Even deliberate spitting by HIV positive accused was not punished for criminal exposure to HIV.<sup>25</sup> HIV positive accused was not punished more rigorously, even when he deliberately tried to spread the HIV infection by biting with teeth on victim's body.<sup>26</sup>

### **Upcoming Issues of HIV Related Forensic Autopsy:**

Forensic Medicine experts dealing with dead bodies of HIV positive patients undergoing medicolegal Post-mortem autopsy should demand Risk Allowance. HIV, HBV, HCV are the infections, that may be contracted in the course of official duty of attending to a venereal or septicaemic patient or conducting a post-mortem examination. Due to continuous efforts of senior forensic experts, irrespective of the HIV status of the patient, whether its HIV positive or negative, few states of India are paying risk allowance for following universal precautions while doing autopsy. Eg., Rajasthan government (Since 6<sup>th</sup> Dec. 2017) has started paying Rs.500 per post-mortem, Rs.400 for doctor and Rs.100 for sweeper.<sup>27</sup> Similarly in Haryana, state government pays Rs.1000 per post-mortem to the doctor conducting it.<sup>31</sup>

### **Conclusion:**

The primary objectives of the HIV AIDS Act are to prevent and control the spread of HIV/AIDS, ban discrimination against people living with HIV/AIDS, and provide for treatment of such persons. All the relevant provisions of this Act & related case laws that have been discussed, empower patients regarding their basic human rights & safety from further psychological harm; though it has created new medicolegal & ethical challenges for the doctors & nurses while performing their duties towards patients diagnosed with HIV / AIDS. Providing Risk allowance to doctors for utilising the money for procuring equipments & protective gloves, masks, gowns, shoes for implementing universal precautions while conducting autopsy on HIV positive patients to prevent iatrogenic transmission of the incurable disease of AIDS, is a welcome step

for promoting not only other patients safety but also doctor's safety, while handling HIV positive patients

**Conflict of Interest:** None

**Financial Assistance:** None

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## Case Report

### When a Playground Turned into a Graveyard

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#### Abstract:

Electrocution is mostly an occupation related injury. Deaths due to electrocution in adults occur at work places, while in children, such incidents occur mostly at home. The present case is of a 15 year male child who was playing football in a playground. A high tension wire fell over him and entangled his anterior neck and ended in death. Burns were so severe that all the anterior neck structures, up to cervical vertebra, were exposed. Such an un-believable incidence would have never happened if our government would have made good plans for the establishment of housing areas that are free from high tension wires which are hanging over our heads, all the time. Poorly planned and improperly maintained high tension lines are responsible of such kind of incidences.

**Key Words:** Electrocution, High tension, Playground.

#### Introduction:

Electricity is one of the greatest inventions of the mankind. It is the flow of electrons from high concentration towards low concentration across a potential (voltage- V) and requires a circuit to create continuous flow. Current (amperes) is the amount of electrons that flow along this gradient. 1000V or more are called as High Voltage. Ohm's law,  $I = V/R$ . (R= resistance/ impedance to flow).<sup>1</sup>

Commercialization of electricity to generate power was started since 1849. Fatal and non fatal injuries due to electrocution, at home as well as work places, are increasing day by day.<sup>2</sup>

Current is directly proportional to voltage and inversely proportional to resistance. There are two types of current, AC (alternating current) and DC (direct current). In the alternating current, direction of flow of electrons reverses at regular intervals; for example, domestic electricity.

Direct current is the flow of electrons in one direction, for example batteries, high-tension power lines and lightning. Alternating current is more dangerous than direct current of same voltage.<sup>3</sup>

Direct current throws away a person after he receives an electrical shock but alternating current gives repetitive and tetanic muscle contractions and that's why it is more dangerous than the direct current. Joule's law - Thermal Energy =  $I^2 R t$  (t= Time of flow of current).<sup>1</sup>

Voltage, type of current, resistance offered, pathway through the body (vertical pathway, horizontal pathway and pathway through lower part of the body) and duration of contact plays a major role in the damage.<sup>4</sup>

More the resistance offered by the body parts, more will be the rise in temperature. For example, skin of foot, palm, fat and bones which coagulates at the end. Dry parts provide high resistance to electricity than moist part. Nerves and blood vessels are the pipelines to maintain the vitality of the body but it gives resistance free pathway to electricity and leads to more damage.<sup>5</sup>

Electrocution can cause various types of injuries and leads to death through ventricular fibrillation, asystole, apnea, muscle contractions, thermal burns and electroporation.<sup>6</sup> (**Table: 1**)

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DOR: 01/01/2018 DOA: 04/11/2018

DOI: 10.5958/0974-0848.2018.00064.7

**Table 1- Electric current and its patho-physiology**

1mA	Tingling sensation
16mA	Maximum amount of current a person can grasp and release.
16-20mA	Tetany of skeletal muscles
20-50mA	Respiratory arrest
50-100mA	Threshold for Ventricular fibrillation
>2 A	Asystole

mA- Milli-ampere, A- ampere.

**Case Report:**

A 15 years old boy was playing football in the playground of a residential area in the evening when a high voltage wire fell on him over the anterior aspect of his neck. Death occurred on the spot. Autopsy was conducted in the Department of Forensic Medicine and Toxicology, SAMC & PGI, the findings of which were as follows-

**External Examination-**

All the clothes were smudged with dried clotted blood, dust and mud particles. Burning effect of clothes was present over genital region and over left thigh and knee region. Margins of clothes had blackish, brittle and burn like effect. Both eyes were open, slit like and cornea was hazy. Mouth was open, lips apart, upper incisors visible, with tongue inside. Rigor mortis was present all over the body. Post mortem hypostasis was present over back and was fixed.

A lacerated wound of size 23cm x 5cm was present over the anterior aspect of neck, starting from right external ear up to anterior aspect of left external ear. All soft tissues and muscles in the vicinity of neck on anterior aspect were charred and blackened. Trachea, esophagus, blood vessels and muscles of anterior aspect of neck were transected, exposing cervical vertebra. Multiple pieces of molten white metallic wires were found deeper inside the lacerated wound at places. Burn injuries were present over right arm, left forearm and over the abdomen. Burn injuries were also present over both hands, fingers and over ventral aspect of base of right toe. Base of these injuries was pale, hard and punched out, with reddish hyperemic margins. Crocodile burns were present over the anterior aspect of left thigh and knee. Flash burns were present over the external genitalia.

**Figure 1- Electrocutation Injuries over neck**



**Figure 2 & 3- Showing multiple molten metallic pieces of electric wire deep seated into neck structures**



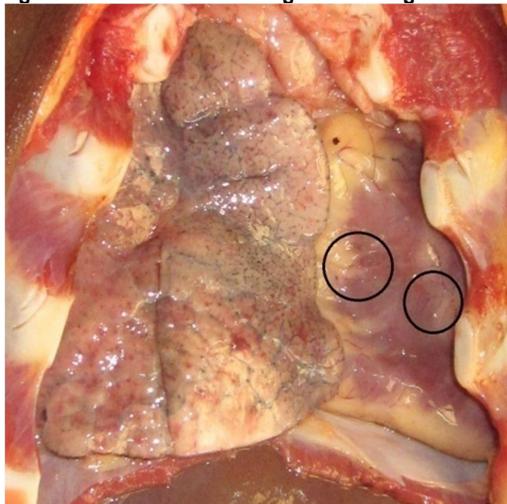
**Internal Examination-**

Brain was pale, diaphragm was at the level of 5<sup>th</sup> inter-costal space, both lungs were light weight, ballooned and patchial hemorrhages were present all over, at places. Very fine patchial hemorrhages were present over apex region and both sides of the heart. Heart was empty. Stomach contained about 50ml of yellowish pasty material and mucosa

was pale. Liver, spleen and both kidneys were pale.

arrest, cardiac arrest and electro-dermal injuries.<sup>2</sup> (Table 2)

Figure 4- Petechial hemorrhages over lung and heart



Opinion given was death was due to cardiac arrest as a result of electrocution, as there were numerous petechial hemorrhages present on the epicardium on both sides of heart, which shows the line of passage of current. However, histopathology was not done in this case as there was no doubt about electrocution. Evidence of flash burn (crocodile skin) due to electrocution was present on body. Duration of death was within 24 hours of post mortem examination.

**Discussion:**

We are so much dependent on electricity and electrical appliances that it will be just an imagination to live without it. So we are more prone to such injuries and that's why rate of fatal as well as not-fatal injuries are increasing day by day.<sup>7</sup>

There will be involvement of brain stem and upper cervical spinal cord if pathway of current is from any extremity towards head and vice versa and this causes paralysis of respiratory centre and sudden death. Death occurs from ventricular fibrillation or cardiac arrest without fibrillation if current makes its way from arm to arm or from left arm to any lower extremity. In high voltage electrocution, the major causes of death are respiratory

Table 2: Pathway of Electric Current v/s Cause of Death

Sr. No.	Entry	Exit	Cause of Death
1	Head	Any extremity	Respiratory Arrest
2	Any extremity	Head	Respiratory Arrest
3	Upper extremity	Upper extremity	Cardiac Arrest
4	Left upper extremity	Lower extremities	Cardiac Arrest

Organs at lower level (heart) are affected in low voltage currents and organs at higher level (respiratory centre) are affected in high voltage currents.<sup>8</sup>

Injury becomes more severe if a person becomes the part of an electrical arc i.e. when the person comes in between two objects of different potentials that are not in contact; for example between high tension line and ground. The temperature may rise up to 2500 degrees and it causes deep thermal burns.<sup>9</sup>

In the present case, the cause of death was opined as cardiac arrest due to electrocution. Although, this can be debated as there can be other individual or combined multiple causes of death. There can be respiratory arrest as the level of electrical injury was at higher neck, so it can involve brain stem/ medullary centre. There can be involvement of upper cervical spinal cord, leading to tetanic spasm of respiratory muscles, causing asphyxia. Also, there was transection of trachea which itself will cause asphyxia. There was transection of all neck vessels so it will cause hemorrhagic shock. But respiratory centre paralysis or ventricular fibrillation will be quicker enough to cause death before establishment of hemorrhagic shock. But death due to cardiac arrest was given due to presence of multiple petechial hemorrhages on both side of heart, which shows the line of passage of current. No any such finding of petechial hemorrhage was observed in brain.

Charring of the body occurs in high voltage burns. Crocodile flash burns are

produced in high voltage burns as a result of arc dancing over body.<sup>10</sup>

Elevation of periostium or even fracture of bones may occur if bone is involved. Sometimes small pieces of molted metal from the electrode may be found inside the tissues at the area of contact as it was found in present case. Even melted calcium phosphate from the bones may be found which appears as bone pearls or wax drippings+ in radiography.<sup>10</sup>

A total of 9606 accidental deaths occurred in India in 2014 with maximum number of cases being reported from Madhya Pradesh, Maharashtra, Rajasthan and Utter Pradesh. 17.3% of the accidental deaths in 2014 were reported in Madhya Pradesh due to electrocution.<sup>11</sup>

This incidence could have been prevented by implementing proper safety guidelines of residential areas and proper maintenance of high voltage guidelines, if the safety measures of residential areas were maintained.

### Conclusion:

To avoid such injuries in children, parents must use preventive measures such as plugs over electricity circuits at home. The workers who are at more risk for such injuries must be trained and dressed on a regular basis. Electricity departments should avoid path of high tension lines from residential areas or to redirect the path. There must be strict rules for electrical equipments to satisfy the safety standards.

**Conflict of Interest:** None

**Financial Assistance:** None

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## Case Report

# Carnal Gratification Goes Fatally Wrong: A Case of Autoerotic Asphyxial Death

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### Abstract:

Autoerotic asphyxia, when seen on the basis of the psychoanalytical scrutiny, is a paraphilia wherein an individual seeks or heightens sexual gratification by inducing cerebral hypoxia.<sup>1</sup> Most of the time, though, it is associated with hardcore sexual masochists, it is sometimes practiced by curious school boys and men, who are unaware of the risks involved. We present a case of accidental death of a college student due to this deviant sexual behavior. Autopsy was backed by methodical examination of the scene of occurrence and psychological workup, which helped in establishing the manner of death. Autoerotic deaths, though not common, aren't uncommon either; and run a risk of being misdiagnosed as suicidal hanging in the absence of ancillary work up.

**Key Words:** Asphyxiophilia, Autoerotic Asphyxia, Crime Scene Examination, Masochistic Hanging, Sexual asphyxia, Psychological Autopsy

### Introduction:

Autoerotic asphyxia, when viewed on the basis of the psychoanalytical scrutiny, is a paraphilia, according to DSM-IV-TR, where an individual seeks sexual gratification by means of manipulations of his body parts.<sup>1</sup> It consists of the practice of self-induced transitory cerebral anoxia by means of a ligature around the neck, or suffocation during masturbation.<sup>2</sup>

Although very little is known about the frequencies within the various ethnic groups, a broad diversity of case illustrations and appraisals are present in the forensic literature over past two decades<sup>3</sup> Though, such bizarre practices date back to several centuries; infrequent documentation has made them rare.<sup>4</sup>

Most of the time, the body of the deceased is found naked or with genitals in hand or exposed, with pornographic material or sex toys around.<sup>3</sup> At times, there might also be evidence of other paraphilic activities like fetishistic cross-dressing and masochism.<sup>4</sup>

### Case Report:

Dead body of a 20 year old college student was brought to mortuary for autopsy. He was found hanging from the window grill in his hostel room early on a Sunday morning, with a nylon rope, with exposed genitals. (Figure 1)

Figure 1



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DOI: 10.5958/0974-0848.2018.00065.9

A thorough examination of the crime scene revealed that the door was locked from inside and a smartphone with pornographic material on display. His friends also revealed that the deceased was glued to his smartphone for the past 3- 4 months. There were no apparent reasons for taking the extreme step of suicide.

On postmortem examination, the body was that of a young adult male, moderately built and nourished, measuring 160 cm in length and weighed about 52kgs. The genitals were exposed (**Figure 2**). The ligature was in situ. A neatly placed cotton cloth padding was present on the neck, over which there was a nylon rope completely encircling his neck, with the knot present on the left mastoid (**Figure 3, 4**).

**Figure 2**



**Figure 3**



**Figure 4**



On removal of the ligature and the padding, there were two distinct ligature marks: one lighter (corresponding to the padding) and a darker groove (corresponding to the nylon rope). Both the ligature marks were brown, parchmented pressure abrasions, present above the level of thyroid cartilage, running backwards and upwards, towards the left mastoid, completely encircling the neck, with the latter one appearing like a groove with the circumference around the neck being 39cm. Dried salivary stains were present on the right angle of the mouth. There were typical external and internal signs of asphyxia. Toxicological analysis of the routine viscera was unremarkable.

Based on the crime scene investigation, psychological autopsy and the postmortem examination, it was concluded that the death was as a result of autoerotic asphyxia due to hanging. Nature of death was opined as Accidental.

#### **Discussion:**

Autoerotic asphyxia embroils deliberate but cautious induction of cerebral hypoxia in order to produce or to augment the sexual excitement.<sup>4</sup> Constriction of the neck with a ligature, covering the external air passages with a plastic bag around the neck, chest compression with the abdominal ligatures, inhaling anesthetic drugs or volatile substances, autoerotic drowning, etc, are few methods of autoerotism which are commonly listed in the literature.<sup>4</sup> The genuine prevalence of the practice is not known because this kind of behavior is exposed only when a death transpires. Seldom, such individuals seek forensic or psychiatric advice when alive.<sup>5</sup>

Data from the USA indicates that there are around 500 cases being reported every year, whereas data from Canada, England, and Australia indicate that there are only 1-2 cases of autoerotic asphyxia for one million population.<sup>6</sup> The reason for the considerable variation could be misdiagnosis of such cases as suicides<sup>6</sup>.

Autoerotic practices usually happen in secluded places, mostly to reduce the risk of being watched by others.<sup>7</sup> Majority of the victims of such practice are young male adults, who learn about this practice by word of mouth, through sex magazines, medical books, pornographic literatures, media, and accidental discovery or through some self-generated experiences.<sup>6</sup> It has been suggested that hanging might be used to produce physiological augmentation of sensation during masturbation; enhancement that is thought to take place through interference with the blood supply to the brain, triggering cerebral anoxia that is intuitively perceived as lightheadedness, and elation, which reinforces the masturbatory sensation.<sup>3</sup> Most of the time, such cases go undetected because of varied reasons, such as, lack of professional awareness, social stigma, improper psychological autopsy or the family's efforts to alter the scene of crime to reduce the subsequent embarrassment.<sup>8</sup>

### Conclusion:

The inexplicable nature of death due to autoerotic asphyxiation can leave a void in the lives of the surviving family and friends. Knowledge of such phenomenon, its various presentations, a thorough crime scene investigation, psychological autopsy and a complete postmortem examination of any case, by the forensic experts, aids the investigating-officers to uncover the more stigmatizing death than a simple case of suicide. Until there is an increased awareness of such dangerous practice of autoerotic

asphyxiation, the untimely and tragic death of adolescents and young adults will continue to occur. Through augmented awareness and better documentation of such practices and its catastrophic penalties on them; society will be better able to comprehend and cope with the intricate environmental and behavioral factors that lead to this dangerous practice.

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## Case Report

# Acquired Cystic Disease Associated Renal Cell Carcinoma

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### Abstract:

Acquired cystic disease predisposes to renal cell carcinoma. We describe a patient who had received kidney transplant 7 years back with normal allograft function who suffered sudden cardiac death at home and was discovered to have acquired cystic disease and renal cell carcinoma in her native kidneys. This case highlights the need to assess native kidneys periodically after kidney transplant.

**Key Words:** Cystic Disease; Renal Cell Carcinoma; Native Kidney; Transplant

### Introduction:

Renal cystic disease represents a wide spectrum of diseases that may be hereditary, developmental, or acquired, in which the renal cysts are seen in the cortex, the corticomedullary junction, and/or the medulla depending on the underlying disease process.<sup>1</sup> Acquired Cystic Kidney Disease (ACKD) develops in long standing kidney disease or on long term dialysis.<sup>2</sup> In ACKD, numerous fluid-filled sacs are present, arising from any part of nephron or collecting duct in the kidneys of individuals with no congenital cystic disease. Though the dialysis itself does not cause the cysts, researchers have attributed the incomplete removal of unidentified waste products for their formation.<sup>3</sup> About 90% of patients on dialysis for a period of 8 years develop ACKD.<sup>4</sup>

ACKD has been associated with Renal Cell Carcinoma (RCC) with incidence of 0.18% as compared to 0.005% in general population.<sup>1</sup> RCC, here, is multicentric in at least 50% of cases and bilateral in about 10% of cases. In October 2013, The International Society of Urological Pathology Vancouver Classification of Renal Neoplasia recognized Acquired Cystic Disease-Associated Renal Cell Carcinoma as a distinct entity.<sup>5</sup> Status quo, the focus of follow-ups in renal-transplanted patients lies on the transplanted kidney itself. Many of the times, the native kidneys are overlooked.

We present a case of unilateral RCC with acquired cystic Kidney disease, which was incidentally diagnosed on autopsy in a post-renal transplantation patient.

### Case Presentation

A 49-year-old lady was brought to the Emergency and Trauma Department after sudden cardiac death at home. She had been on follow up after receiving kidney transplant and had been on maintenance haemodialysis for 10 years prior to renal transplantation. An autopsy confirmed cause of death to be sub endocardial infarction. The cross-section of her native left kidney (weighing 45 grams and measuring 8 x 5 x 3.5 cm) showed thinned out cortex measuring 0.8 cm at its thickest diameter and multiple cortical cysts measuring 0.2cm across. Pelvicalyceal system appeared dilated and flat (**Figure 1**); histopathology of the native kidneys showed features of chronicity, acquired cystic disease and

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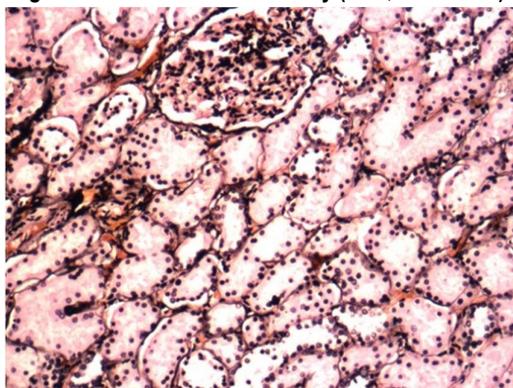
DOI: 10.5958/0974-0848.2018.00066.0

microscopic RCC (**Figure 2**). The transplanted kidney showed features of chronic pyelonephritis.

**Figure 1** Cross section of the left native kidney; pelvicalyceal system appear dilated



**Figure 2** shows section of kidney (10 X, H&E Stain)



Haematoxylin and eosin stain was used. Section from left kidney showed cystic spaces with papillary projections lined by stratified cells with clear cytoplasm and round to oval hyperchromatic nuclei. There was no distinction between proximal and distal tubules which appeared atrophic with cysts suggesting acquired Cystic Kidney Disease Associated Renal Cell Carcinoma.

#### Medical records and Lab Investigations

Her medical records showed that she was suffering from End Stage Renal Disease (Stage V) due to lupus nephritis. Hence, she had renal transplantation (7 years ago). She maintained normal allograft function on triple immunosuppression with steroids, tacrolimus and mycophenolate mofetil. Last year, she had multiple episodes of urinary infection leading to

chronic pyelonephritis in the transplanted kidney.

#### Discussion

Many clinical and morphological studies including autopsy based study done by Dunnill, et al. (1977) have been published supporting the fact of ACKD in patients with end-stage renal disease on long-term dialysis.<sup>2,6-10</sup> ACKD can lead to two sequels; haemorrhage and tumour formation.<sup>1,2,11</sup> The former usually presents as pain due to enlargement of kidney, haematuria or retroperitoneal haemorrhage due to rupture of hematoma. RCC may be missed in early stages due to lack of symptoms and signs and may be detected incidentally via imaging done for other reasons. Its multicentric and bilateral nature increases the burden of the disease. Literature has shown that renal transplanted patients succumbing to metastasis from an unnoticed primary renal tumour.<sup>12</sup> Renal transplantation may alleviate uraemia; however increased risk of malignancy remains.<sup>13</sup> We suggest emphasis on both native and transplant kidneys during follow up especially in patients who have received allografts after being on haemodialysis for long periods and in those with ACKD.

#### Acknowledgement:

We wish to acknowledge and thank Dr. Anuradha CK Rao, Former Professor of Pathology, Kasturba Medical College, and other staff members for their timely help in histopathological examination of the tissues. We are also grateful to the staff in the department of Forensic Medicine for their advice.

**Conflict of Interest:** None

**Financial Assistance:** None

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## Case Report

### Haemopericardium...traumatic or spontaneous?

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#### Abstract:

Haemopericardium, as an autopsy finding, obviously indicates rupture of heart or bleeding from root of aorta . either due to trauma or pathological condition, like ruptured aneurysm. The task of deciding the manner of production of haemopericardium and rupture of heart, whether traumatic or spontaneous, becomes more difficult when the external or internal evidence of mechanical injury is also found at autopsy.

An autopsy case of male aged about 60 years, brought dead to this institute, with history of sudden chest pain followed by postural imbalance and fall from table+ is presented in the light of evaluating the manner of haemopericardium by meticulous interpretation of autopsy findings and histopathological analysis report.

**Key Words:** Haemopericardium, Heart rupture, Myocardial infarction, Spontaneous, Sudden death, Traumatic.

#### Background:

The World Health Organization (WHO) defines sudden death according to the International Classification of diseases, version 10 (ICD-10) as, %Death, non-violent and not otherwise explained, occurring less than 24 hours from the onset of symptoms.<sup>1</sup> Cardiovascular disease and hypertension are the rifest causes of sudden death.<sup>2,3</sup> Diseases of the cardio-vascular system are responsible for almost 45-50% of sudden deaths, which includes ruptured myocardial infarct as one cause.<sup>4</sup> Diagnosis of heart wall rupture is very difficult task when required to be performed ante-mortem.<sup>5</sup> Labeling ruptured myocardial infarct as the cause of sudden death entails autopsy examination. Senility and hypertension are the risk factors for ruptured myocardial infarct.<sup>5-7</sup> Rupture of heart is common in cases of road traffic accidents and fall from height as a result of trauma<sup>8</sup> but, non-traumatic rupture of heart raises queries towards its cause.

Meticulous autopsy is imperative in differentiating between traumatic and non-traumatic (spontaneous) heart rupture, as there may not be evident external signs of injury even in traumatic cases.

Here, we are presenting a case of non-traumatic heart rupture post myocardial infarction.

#### Case Report:

A 60 year old male, chronic smoker, known case of hypertension since 15 years, on irregular medications, was brought to the casualty of this hospital, in an unconscious state with history of %sudden chest pain followed by postural imbalance and fall from table subsequently+- witnessed by a sweeper. Past history of an episode of myocardial infarction 5 years back was present. The case was made medico-legal since it was brought-dead at casualty and police requested the medico legal autopsy.

#### Autopsy Findings:

It was the dead body of a 60 years old male, well built & nourished, weighing 69 kg with length 169 cm [BMI: 24.16 kg/m<sup>2</sup>], wearing grey pants & brown underwear.

**External Examination:** Rigor mortis was found to be in developing phase, postmortem lividity was unfixated. These postmortem changes were consistent with time

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DOR: 12/08/2017 DOA: 30/10/2018

DOI: 10.5958/0974-0848.2018.00067.2

since death of about 3-4 hours. No evidence of any trauma to the chest or any other body area was present, except, three small reddish abrasions on left side of face, of size  $2 \times 2 \text{ cm}^2$ ,  $1 \times 1 \text{ cm}^2$  and  $1 \times 1 \text{ cm}^2$ , located 1 cm below & 1 cm left to lateral angle of left eye, mid of root of nose and 1.5 cm below & 1 cm lateral to left angle of mouth, respectively.

**Internal examination:** There was no evidence of injury to soft tissues or bony cage of the chest wall. Purplish hue was visible through the tense pericardium. On opening the pericardium, 220 gm of clotted blood was found in pericardial sac (**Figure.1**).

**Figure. 1** Transversely opened pericardial sac found filled with blood clots



Heart weighed 366 gm. Antero-lateral surface of the left ventricle showed vertical, reddish defect with irregular margins (rupture) of  $1.6 \times 0.1 \text{ cm}^2$  size, lower end of which was located 8.5 cm above the apex of heart. The rupture was surrounded by  $4 \times 3 \text{ cm}^2$  sized pale area (**Figure.2**) and was ventricular cavity deep (**Figure.3**).

**Figure. 2** Rupture of left ventricular wall at antero-lateral surface,  $1.6 \times 0.1 \text{ cm}^2$  size, lower end located 8.5 cm above the apex of heart with surrounding pale area



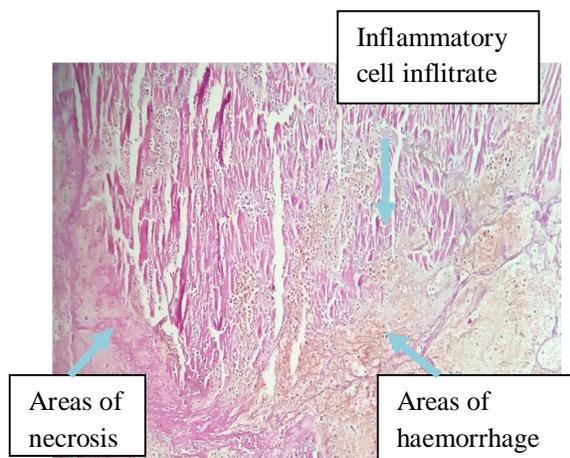
**Figure. 3** Whole thicknesses (cavity deep) rupture of left ventricular wall at antero-lateral surface as shown by passing the probe through the wall



Atheromatous plaques were present in aorta near coronary ostia, in initial 2 cm of left coronary & left anterior descending artery and also in initial 1.5 cm of posterior circumflex artery, with narrowing of lumen. Right and left ventricular wall thickness varied from 0.9-1.1 cm and 1.9-2.1 cm, respectively. The rest of the viscera showed congestion and oedema. Cardiac tamponade, as a result of rupture of heart, was considered to be the immediate cause of death but to further investigate about the manner of heart rupture, whether traumatic or spontaneous; all routine viscera along with blood clot recovered from pericardial cavity were subjected to histopathological examination.

Histopathology of heart showed marked congestion, neutrophilic infiltration, oedema and areas of necrosis at the rupture site (**Figure.4**), along with fibrosis, chronic inflammatory cell infiltrate and hypereosinophilic myocytes (myocytolysis) in the adjacent area of the rupture. Changes of atherosclerosis with calcification were noted in left anterior descending, right coronary artery and aorta. Lungs showed congestion and heart failure cells. Kidneys showed focal glomerulonephritis with chronic inflammatory infiltrate. Microscopy of rest of the viscera was insignificant.

**Fig. 4 H & E stained section (10X) of ruptured myocardial site showing congestion, inflammatory cell infiltrate, areas of haemorrhage and necrosis**



This concluded that death occurred due to haemopericardium, as a result of spontaneous rupture of left ventricular wall secondary to acute myocardial infarction, which was superimposed on the already weakened wall of myocardium that resulted from old myocardial infarct and that it was a natural death. The area of the rupture had suffered infarction in past which resulted in thinning and weakening of the wall of the ventricle and subsequent episode of infarction led to the rupture. It was safely concluded that history of fall and facial injuries in present case were not the cause of haemopericardium but occurred subsequent to it.

### Discussion:

Rupture of left ventricular wall stands to be the second leading cause of in-patient death with acute myocardial infarction.<sup>9</sup> Rupture of heart may be traumatic or spontaneous. According to Symbas PN, as quoted by Sheikh, et al, there may be presence of injuries like contusions, conduction defects and rupture of any structure or detachment of heart according to the severity of the injuries in traumatic cases.<sup>8</sup> In cases of spontaneous rupture and some cases of trauma, there may not be any evidence of injury to the heart or any overlying structures.

In our case, police provided the history of fall from the table and very trivial trauma which resulted in the abrasions on the face but no history or evidence of trauma to

chest was found. In spontaneous cases, myocardial rupture is most common between first and fourth day of acute infarction.<sup>10</sup> Opining ruptured myocardial infarct as cause of sudden death only by clinical examination, of a person, who is already dead in almost in all cases when brought to the hospital, seems to be an impossible task, without thorough autopsy examination. A study done by Schmidt P, et al<sup>11</sup> on %Sudden natural death at the wheel+ demonstrated coronary artery disease as the major cause of sudden death even in cases of road traffic accidents (RTA) which concludes that incapacitation done by the cardiac component could have resulted in RTA, the absence of which could not have led to the accident. He also quoted that M.J. Davies and A. Thomas, along with M.J. Davies, respectively demonstrated the detection of recent coronary thrombosis in about only one third of the cases on routine autopsy examination, while meticulous investigation techniques yielded coronary thrombi in 74% of sudden cardiac ischemic deaths.<sup>11</sup>

A careful history taking, meticulous autopsy, along with articulation of histopathological findings can indicate not only the cause of death but also to the manner of death, whether traumatic or spontaneous.

### Conclusion:

Meticulous autopsy, histopathology of heart etc., if interpreted in a scientific way can not only establish the cause and manner of haemopericardim but can also explain the history of fall and external injuries sustained subsequent to it.

**Conflict of Interest:** None

**Financial Assistance:** None

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## Case Report

# Accidental Hanging among Toddler Associated with Homemade Rocking Cradle: A Case Report

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### Abstract:

Accidental hanging is a rare entity. Many times, the circumstantial evidence alone can sufficiently indicate the accidental nature of its occurrence. Infants and toddlers may get exposed to a variety of dangerous situations when left sleeping in unsafe environment. Death due to accidental hanging among infants or toddlers always leads to difficulty in differentiating it from homicidal hanging. In such cases, the circumstances of the incident are sometimes so unusual that, it arouses interest among the autopsy surgeons. Here, we report the death of an 18 months toddler boy due to accidental hanging in unsafe sleeping environment associated with homemade temporary rocking cradle.

**Key Words:** Sleeping environment, Accidental hanging, Toddler, Homemade rocking cradle.

### Background:

Death by hanging is a very common entity encountered in autopsy practice and occurs in all parts of the world. Hanging is a form of ligature strangulation in which the force applied to the neck is derived from the gravitational forces of the body or a part of the body. Apart from the now rare lynching hanging is almost always suicidal or accidental, the former being by far the most common.<sup>1</sup> Although infrequent, accidental hanging represents one of the most interesting areas in forensic context to analyze the cause and manner of death. Many a times, it leads to the difficulty in distinguishing it from suicidal/homicidal hanging. Infants and toddlers represent an age range which is at high-risk of injuries and accidental deaths, since their lack of skill makes them unable to avoid potentially dangerous situations present in their environment.<sup>2-5</sup>

In fact, many times the environment where infants are left sleeping exposes them to potentially dangerous situations that may result in accidental death by hanging or strangulation.<sup>2-4</sup>

The present case of accidental death of a toddler boy associated with homemade rocking cradle illustrates one of the most unsafe sleeping environment created for infants and toddlers. Although, use of the homemade rocking cradle is a routine practice among rural population and low socio-economic class of India; the published literature regarding hazardous outcome of this indigenous practice among Indians is scarce.<sup>6</sup>

### Case History:

This incident occurred in a family of low socio-economic class residing in Juhu area of Mumbai, Maharashtra (India). On a day of May 2017 in afternoon, an 18 months boy was found hanging from the homemade rocking cradle, by his father. He was suspended by the Odhani (an integral part of Indian female clothing) tied around the cradle, was not breathing and not moving any body parts. His father removed him and immediately and shifted him to the nearby private hospital, where the attending physician declared him brought dead and referred the case to Cooper Government Hospital. However, the father took the dead body to his residence where chaos arose after knowing the incidental death

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DOR: 24/08/2017 DOA: 03/11/2018

DOI: 10.5958/0974-0848.2018.00068.4

by the other family members and neighbors. Meanwhile, someone informed the death incident to police authority. Afterwards, Investigating officer carried out the inquest and subjected the dead body for medico-legal autopsy to determine cause and manner of death.

On detailed inquiry about incident, the father gave information about routine practice of using homemade rocking cradle to enable the child to sleep by creating a pouch of bed sheet/ Sari/ odhani/ towel in between two ropes tied at two distant points at the ceiling **(Figure. 01)** On the day of incident, while the boy was sleeping in such homemade temporary rocking cradle; wife was gone outside for housekeeping work; one elder daughter was playing outside and other playing in bathroom. The father had an important phone call and had to go outside for some urgent work. However, before leaving the sleeping child unattended, as a routine he had tied a sling of Odhani around the pouch at level of abdomen to safeguard him from fall on awakening. When he came back after about two hours, he noticed the boy in state of complete suspension with the Odhani entangled around neck.

**Figure No. 01: Homemade rocking cradle – An indigenous practice among Indians**



- Vertical arrow - Sling of the Odhani.
- Small left side directed arrow – Rope used.
- Right side directed arrow – Pouch.

**Autopsy Findings:**

The autopsy was conducted in the mortuary of Cooper Post-mortem Center, Juhu, Mumbai, on the next day. The deceased was a well-nourished 18 months old boy and

the body was naked. Mouth & eyes were closed and tongue was inside the oral cavity with total 16 teeth in the jaws. Rigor mortis was well marked in whole of the body and postmortem lividity was observed over posterior aspect of the body, except contact areas, and was fixed. Dried salivary stain was present at right angle of mouth running vertically downward. Face was congested. The ligature mark was present as a faintly developed pressure mark over upper anterior part of neck, above the thyroid prominence, running slightly upward and backward of 18 cm length with 4 cm maximum breadth on front of neck and was absent for 6 cm at back of neck **(Figure. 02)**. The ligature impression was shallow with faint brownish furrow at upper margin on anterior part of neck.

**Figure No. 02: Ligature impression over the Neck**



Apart from the ligature mark over neck, there was no other external or internal injury evident. Brain and lungs were congested and edematous. Sub-pleural and sub-pericardial petechial hemorrhages were present. All organs were congested and dark fluid blood was present in heart & large vessels. The subcutaneous tissues revealed a white glistening area, corresponding to the ligature impression. There was no extravasation of blood in the neck muscles and glands. The jugular vein and carotid arteries did not reveal any abnormality or intimal injury. The hyoid bone and laryngeal cartilages didn't show any fracture. There were no injuries to the cervical vertebrae. Stomach was congested and empty without any peculiar smell. On completion of the autopsy, the opinion as to cause of death was given as **'Death due to Hanging'**.

## Discussion:

Death due to accidental hanging is a rare entity; however, it concerns children as well as adults. It is seen in children while playing or in athletes who are in the habit of exhibiting hanging. Workmen falling from scaffolding may be hanged by ropes.<sup>7</sup> Also, accidental deaths have been observed due to asphyxial games among children and adolescents and as a result of autoerotic asphyxiation among adolescents and adults.<sup>8,9</sup> Death by accidental hanging is uncommon among toddlers and infants, as compared to the older children and adults. Accidental hanging and strangulation among infants and toddlers is usually related to their sleeping environments.<sup>2-4</sup>

In the present case, an 18 months toddler boy sleeping unattended in homemade rocking cradle got asphyxiated due to hanging. The deceased boy, on awakening, might have struggled in the cradle which resulted in slippage of the Odhani tied at abdomen to his neck. Afterwards, he might have fallen down with entangled sling of the Odhani around neck causing complete hanging. A case of infant girl's survival from accidental partial hanging in similar circumstances had been reported from India.<sup>6</sup>

The use of such homemade rocking cradle, an indigenous practice in India, represents the very unsafe sleeping environment for infants and toddlers. Among infants, due to the rocking motion of the cradle, there may be change of position and/or the slippage of the infant to the dependent area, leading to compression of head and obstruction of nose and mouth resulting into suffocation of the baby. Among the toddlers, their struggling on awakening may result in fall from the cradle or the neck may be entrapped in the sling tied around the cradle to safeguard them from fall. The unintentional asphyxia is most commonly encountered in toddlers and infants first because of their lack of understanding of potentially hazardous situations, and second, because of their small size, lack of aptitude and muscular strength that do not allow them to get out of dangerous situations.<sup>2,3</sup>

Unsafe sleeping environments are particularly dangerous for infants and toddlers.

Cases of children trapped between a mattress and side rails or between the slats of a crib have been reported. Causes of strangulation and hanging deaths include harnesses, loose restrainers, clothing, necklace, curtain cord and a toy strap.<sup>2-5</sup> Cases were reported from Turkey with scarf wrapped around swing-like cradles.<sup>10</sup> However, the hazardous outcome due to use of such homemade rocking cradle might be underreported from India. The present case might also have gone unreported; if, the third person had not reported the incident to the Police authority.

In this case of hanging, faint ligature impression was observed during autopsy which showed characteristic findings of hanging. Also, signs of asphyxia were observed during autopsy. The autopsy, in this case, did not bring any elements in favor of the accident but confirmed the absence of defensive wounds and other traumatic lesions. However, the accidental manner of death can be easily concluded from the circumstantial evidence and pathological findings observed at autopsy.

## Conclusion:

Indigenous practice of using homemade rocking cradles for sleeping infants/ toddlers among Indians is one of the most unsafe sleeping environments. Also, if the sleeping infant/ toddler is left unattended with sling tied around such cradle, to avoid their fall on awakening, can prove fatal by causing accidental death due to hanging. Such accidental deaths can be reduced by generating public awareness about this unsafe practice, by educating people about safe sleeping practices and importance of supervision and by replacing homemade rocking cradles with cribs that are designed for infant/ toddler.

**Conflict of Interest:** None.

**Financial Assistance:** None.

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## Case Report

# Chin-Sternum-Heart Syndrome in Road Traffic Fatalities: A Case Report on the Biomechanics and Reconstruction of Events from Autopsy

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### Abstract:

**Background:** Chin-sternum-heart syndrome refers to a pattern of injury where there is a triad of chin injury, sternum fracture and heart rupture/contusion. **Case Report:** We report a fatal case of pedestrian victim of road traffic accident on the highway with the chin-sternum-heart syndrome type of injury. The autopsy findings were as follows: large scalp bruise, abrasions in the chin and the sternal region, a transverse fracture of the sternum, contusion of the heart and cervical injury. **Conclusion:** We postulate that above the critical impact velocity of 100 km per hour, the body is tossed up, thrown backwards, rotates along its axis, and falls with hyper flexion at the neck. This causes compression fracture of sternum and blunt force trauma to the heart and great vessels. This leads to almost instantaneous death. The primary impact injury may or may not be discernible. This chin- sternum-heart-syndrome type of injury is useful finding for reconstructing the impact biomechanics in road traffic fatalities.

**Key Words:** Chin-Sternum-Heart Syndrome, Forensic Pathology, Biomechanics, Blunt Cardiac Trauma, Hyperflexion of Neck, High Velocity Pedestrian Injury

### Background:

Chin-sternum-heart syndrome refers to a pattern of injury where there is a triad of chin injury, sternum fracture and heart rupture/contusion.<sup>1</sup> This syndrome has been reported primarily in aviation fatalities. The principal mechanism of wounding in the chin- sternum - heart type of injury is hyperflexion of the torso with compression of the chin against the sternum.

This results in blunt compressive trauma to the heart and leading to almost instantaneous death. The obvious finding is laceration of chin, sternum fracture and rupture of heart and great vessels. It may also be associated with fall where there is hyperflexion and striking of the body on the ground. However, to our knowledge, a similar syndrome has been described only once in a traffic accident.<sup>2</sup>

We report one case of a pedestrian victim of road traffic fatality with similar type of blunt cardiac injury, chin laceration and sterna fracture. From the autopsy findings, in this case report, we have tried to explain the plausible biomechanics that are responsible for the development of chin-sternum-heart syndrome type of injury in high velocity hit and run type of pedestrian fatalities.

### Case report

A middle-aged male was brought to the mortuary of a tertiary level Medical College for autopsy. The body was recovered from the roadside of a four lane national highway .Police records and short history stated that he was found lying dead with injuries on his body.

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DOR: 22/09/2017 DOA: 08/11/2018

DOI: 10.5958/0974-0848.2018.00069.6

It was an average built, moderately nourished body clad with apparel soiled by dirt, grit and bloodstains. Rigor mortis was well developed and present all over the body. Hypostasis was seen over back except in the area of contact flattening.

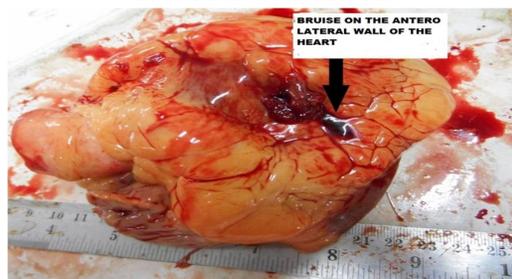
The following injuries were seen at autopsy; Abrasion over chin 2x2 inches. Bruise over vertex 2x2 inches placed almost centrally. Abrasion 7x3 inches over lateral aspect of left shoulder and grazed abrasion 5x3 inches lateral aspect of left thigh. Transverse fracture of body of sternum at level of fourth rib with retrosternal bruises 2x2 inches and haematoma 1x1x1/2 inches in anterior mediastinum [Figure 1].

**Figure 1 transverse fracture of sternum**  
Transverse fracture of body of sternum at level of fourth rib with retrosternal bruises



Bruise was noted, measuring 3x2 inches, in the anterior aspect of the body of cervical spine at level of C1 and C2 with fracture dislocation of the body of C2 vertebra and bruise of the spinal cord at corresponding level. Sub pericardial hemorrhage and bruise, 2x1 inches, were present over the antero-lateral wall of the left ventricle [Figure 2]. Liver laceration of 1/2x1/2x1/2 inches was present in the right lobe with local hemorrhage.

**Figure 2 Bruise on anterior surface of heart**  
Sub pericardial hemorrhage and bruise over antero-lateral wall of left ventricle



## Discussion

The triad of chin injury, sternum fracture and heart bruise, commonly referred to as chin sternum syndrome, was observed at

autopsy in the reported case. In the inquest report, the police documented the case as a hit and run road traffic fatality. Biomechanics of wounding and reconstruction of the event in fatal cases is one of the objectives of forensic autopsy. The pattern, distribution and type of injuries on the body are often analyzed to derive the possible mechanism of wounding.

From the available data and review of the previously reported cases, we attempted to reconstruct the events involved in this fatal case. Previously, this type of injury was reported only in aviation accidents involving parachute failure.<sup>3</sup> The other case, reported from Japan, showed a run over injury of an alcoholic pedestrian where the postulated mechanism was hyper-flexion at neck.<sup>3</sup>

With advent of high velocity automobiles and expressways, the average speed of cars is usually more than 100 KM per hour. When the velocity of the hitting vehicle is more than 23km/hr the body of the pedestrian can be tossed up and thrown backwards over the roof of the vehicles.<sup>4</sup> The pedestrian in hit and run case is usually tossed up and often slides over the roof and falls behind the vehicle. This leads to striking of the chin against the sternum with the neck in a hyperflexed position.<sup>5,6</sup> This can cause injury of the mandible, cervical vertebrae, sternum and contusion of the heart.

In our instant case, we found all the typical injuries of chin-sternum-heart syndrome. It is reiterated that the chin hit and compressed the sternal region of the chest because of the hyper-flexion. The sternal fracture and cervical lesion indicate the mechanism of the blunt cardiac trauma. This pattern of pedestrian injuries is analogous to the chin-sternum-heart syndrome type of injury reported in aviation mishaps.<sup>1,3,4</sup>

Velocity of the offending vehicle is an important variable that influences the biomechanics and pattern of injury in road traffic fatalities.<sup>5</sup> Vehicle collision speed is significantly associated with the pedestrian of Abbreviated Injury Scale (AIS) severity score of 3 or above.<sup>7,8</sup> An earlier study<sup>9</sup> of simulation model reported that the kinematics of pedestrian is greatly influenced by vehicle front shape. In the collision of pedestrian with a sedan, the impact is only restricted to the

lower limbs at the beginning of the collision. The pelvis of the pedestrian meets the vehicle earlier followed by the chest. The pedestrian will thus slide over the vehicle. The head impact velocity is much lower than the vehicle speed in the direction of moving vehicle. The head thereafter acquires greater velocity in the vertical axis owing to the rotation of the body and then strikes the vehicle usually the windshield. It may slide and be thrown off backwards.

Contrary to the proposed mechanism of injury in the case report from Japan, wherein it was a run over pedestrian fatality,<sup>3</sup> we propose a viable alternative mechanism in reconstruction of the event. From the autopsy findings (type and distribution of injuries in the body), we hypothesize that above the critical impact velocity of 100 km per hour, the body is tossed up, thrown back, rotates along its axis, and falls with hyper flexion at the neck, resulting in compression fracture of sternum and blunt force trauma to the heart and great vessels. This causes almost immediate/instantaneous death. The primary impact injury may or may not be discernible.

In our present case, there was no external injury consistent with direct compressive force over chest. This rules out the possibility of run over type of lesion. This fact helps us conclude that the blunt cardiac trauma was contributed by the hyper-flexion associated with the fall. This is in consonance with earlier reports.<sup>1,2</sup> These observations help us emphasize that in highway fatalities, findings of chin-sternum-heart type of injury indicate a high velocity impact causing scooping up of the pedestrian.

### Conclusion

The purpose of reporting this case was to emphasize its rarity and relevance in road traffic deaths. It is seen that the accident occurred on a four-lane expressway in which the average velocity of Light motor vehicle is more than 100kms/hr. In case of some vehicles, the speed sometimes exceeds 130kms per hour. The aim of this paper was to highlight that in high velocity motor-pedestrian collision, the triad of injuries (abrasion of chin, fracture of sternum with laceration of heart) known as chin-sternum-heart syndrome type of injuries may be encountered by forensic

pathologists in their day to day work. Though rare, one should keep an open mind while performing postmortem examination of fatal the road traffic injuries. This is important and especially noteworthy, when those are reported to be hit and run cases.

Going by the autopsy findings of the case, we have cogent reasons to conclude that this chin-sternum-heart-syndrome type of injury is useful finding for reconstructing the mechanism of injury in road traffic fatalities. Also further interdisciplinary research is needed in elucidating the biomechanics of collision using autopsy data and simulation studies.

**Conflict of Interest:** None.

**Financial Assistance:** None.

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## Case Report

# Hidden Facts About Death: A Homicide due to Combination of Asphyxia and Head Injury

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### Abstract:

Police, few times, refers the medicolegal cases for autopsy, with inadequate inquest and with facts being concealed by the relatives to hide the crime. Multi-factorial homicide in an elderly woman by combination of asphyxia and head injury is an uncommon incident. We report an unusual case of a sixty-five-year-old woman who was brought dead to the hospital as a case of unknown bite. On autopsy, we observed the features of death by asphyxia due to combination of smothering and throttling, with head injury as a contributory cause. Initially we informed the Police about possible cause and manner of death. We reconstructed the proper sequence of events of the crime after meticulous autopsy, crime scene visit and inquiry of the suspect by the Police.

Investigating officers should be regularly trained to identify such cases for preparing a proper inquest.

**Key Words:** Homicide, Asphyxia, Throttling, Smothering, Head Injury

### Background:

Deaths due to asphyxia are commonly seen at autopsy, either in the form of hanging or drowning, depending on the region.<sup>1</sup> Throttling and smothering are rarely encountered forms of asphyxial deaths, and when encountered, they usually point towards homicidal death.<sup>2-5</sup> Asphyxial deaths always test the skills of forensic pathologists, especially when more than one method has been used simultaneously. In such cases, if the police inquest is conducted inadequately and history given by relatives is misleading, the case becomes even more complicated. Smothering and throttling, associated with head injury, are usually a rare combination, and moreover, very less external findings that are present in such cases can make the forensic pathologist easily miss these findings.

Asphyxial deaths usually involve the respiratory orifices and neck structures, which are complex structures, both anatomically, and from dissection point of view. Therefore, it demands a meticulous examination and proper skill from the forensic pathologist to identify such cases and provide the proper cause of death.<sup>6,7</sup> Forensic specialist's visit to the scene of crime and inquiry of the suspects by police always act as a corroborative evidence to prove the crime.

We report a case of homicide of a sixty-five-year-old woman by a rare combination of head injury and two different mechanisms of asphyxia: throttling and smothering.

### Case Report:

A sixty-five-year-old female was brought to casualty with alleged history of an unknown bite during the morning hours when she was returning home from temple. Around 5 to 6 hours after the unknown bite, she was found lying on the ground, fallen off her bed; she was in an unresponsive state with her face swollen. At the casualty, she was declared as brought dead. This history was narrated by her daughter-in-law to the police and the doctors as she was the only person present with the deceased on a fateful day. Police prepared

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DOA: 04/11/2018

DOI: 10.5958/0974-0848.2018.00070.2

inquest and requested for medico-legal autopsy, registering it as a case of an unknown bite. Police did not even report injuries on the body in their inquest form.

**Autopsy Findings:**

At autopsy, the deceased was found to be moderately built. Blood stained discharge was seen oozing from both nostrils and mouth. Cyanosis was present in the nail beds. A bruise was present in left periorbital and zygomatic region along with sub-conjunctival hemorrhage. A circular bruise was present on left cheek. Multiple abrasions and bruises were present around the margins of right and left nostril and around the nose. Laceration of size 5 cm X 0.2 cm X 0.2 cm was present on the middle and left side of inner aspect of the upper lip with a contusion of frenulum. Two lacerations of size 0.5 cm X 0.1 cm X 0.1 cm each, were present on middle part of the inner aspect of lower lip. A laceration was seen in the lower gum with a fracture of lower left central incisor tooth. All these injuries were suggestive of smothering. (Figure. 1A, 1B)

**Figure 1: (A) Multiple abrasions and contusions around the margins of both nostril and around the nose**

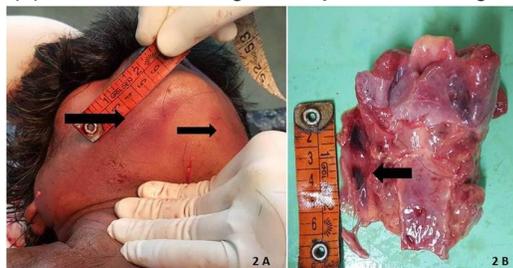
**(B) Multiple lacerations involving the inner surface of upper and lower lip and lower gum, fracture of lower left incisor tooth**



Multiple bruises were seen on the inferior aspect of mandible along with multiple contusions involving the soft tissue of left paratracheal region and clavicular end of right sternocleidomastoid muscle. (Figure. 2A, 2B)

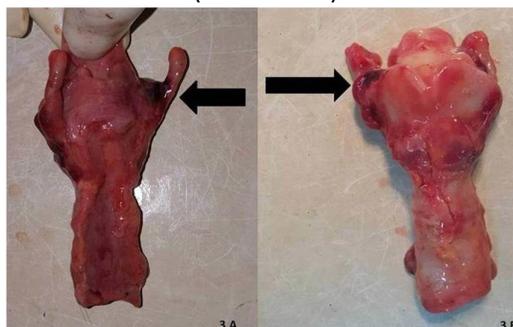
A Contusion was seen on right upper border of the thyroid cartilage, with underlying fracture of right superior cornua. (Figure. 3A, 3B)

**Figure 2: (A) Multiple contusions on the inferior surface of mandibular margin. (B) Contusion involving the left para-tracheal region**



**Figure 3: (A) Contusion over right superior border of thyroid cartilage with fracture of right superior cornua. (Posterior view)**

**(B) Contusion over right superior border of thyroid cartilage with fracture of right superior cornua. (Anterior view)**



All these injuries were suggestive of throttling. Multiple bruises were seen involving the scalp over the external occipital protuberance and left temporalis muscle. Patchy sub-arachnoid hemorrhage was seen involving the right side of the brain. Two fissure fractures were seen extending from internal occipital protuberance towards the right and left posterior cranial fossa. All these injuries were suggestive of head injury.

On chemical examination, no poisonous substance was found. Histopathological examination of lung and kidney revealed features of congestion, liver showed normal architecture with occasional hepatocytes showing feathery degeneration and lipofuscin pigment deposition; aorta showed early atheromatous changes.

Opinion was drawn and informed to the police at the end of autopsy:

- i. It was a case of murder and not an unknown bite, with the cause of death being asphyxia due to smothering and

- throttling, with head injury as a contributory cause.
- ii. Probable sequence of events from injury analysis: Victim could have been struck on the head from behind or pushed over a hard surface by surprise. This resulted in multiple bruises in scalp, fissure fractures and patchy sub-arachnoid haemorrhages.
  - iii. At this state, victim could have been unconscious or in a state of shock when she was probably smothered and throttled to death. This resulted in multiple bruises around the nostrils, mouth and neck; lip lacerations and fracture of right superior cornua of thyroid cartilage. There were no evidences of defense wounds or signs of struggle.

Crime scene visit and inquiry of the suspect by police helped in co-relating the autopsy findings and also in solving the crime. After police investigation, daughter-in-law confessed to the crime and narrated the sequence of events on the fateful day which almost matched the conclusions drawn at the end of autopsy, except for the fact that she was the only person involved.

### Discussion:

Asphyxia is a condition caused by interference with respiration, or due to the lack of oxygen in respired air, as a result of which the organs and tissues are deprived of oxygen (together with a failure to eliminate carbon dioxide), causing unconsciousness or death.<sup>8</sup> Smothering is a form of asphyxia which is caused by closing the external respiratory orifices either by hand or by other means or blocking up the cavities of nose and mouth by an introduction of a foreign substance such as mud, paper, cloth etc.<sup>6</sup> Throttling or manual strangulation is asphyxia produced by compression of the neck by human hands.

On external examination of throttling cases, bruises can be seen on the neck. Situation and extent of these bruises depend on the relative position of the assailant and victim, manner of grasping the neck and degree of pressure exerted upon the throat. These bruises are produced by tips or pads of the fingers. If fingers are run across the skin surface longer, irregular marks may occur along the jaw margins and chin.<sup>9,10</sup> Superior

horn of the thyroid cartilage is more fragile and more vulnerable than the greater horn of hyoid. Fracture of the superior horn of the thyroid cartilage at its base is due to local pressure.<sup>11</sup> Abrasions or bruises seen on various parts of the body of the victim or assailant are due to struggle by the victim to free oneself. In few cases, these signs of struggle can be absent due to a state of unconsciousness, altered sensorium of the victim, attack by surprise or when overpowered by the assailant.<sup>12</sup>

Different studies on elderly homicide have reported two main contrasting categories. First is the intra familial homicides and the other are those committed by strangers, mostly secondary to robbery or burglary.<sup>13,14</sup> In different parricide studies, homicide by asphyxia is reported to be a relatively less common method in comparison to the sharp force or blunt force injuries.<sup>15,16</sup>

### Conclusion:

Though asphyxia is a common mode of death, smothering and throttling constitute a minor proportion. Here we presented a case of homicide where the cause of death was asphyxia due combination of smothering and throttling, with head injury as a contributory cause, which is rarely reported. Such cases require careful external and internal examination at the time of autopsy and it puts the expertise of the forensic pathologist to a real test. Meticulous autopsy and crime scene visit are essential for collection of evidence to find the truth, cause of death and manner of death. Investigating officers should be regularly trained to identify such injuries and if needed should take the help of forensic pathologist before preparing the inquest.

**Conflict of Interest:** None.

**Financial Assistance:** None.

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## Case Report

# Meticulous Autopsy Revealed Ruptured Fallopian Tube: A Case Report

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### Abstract:

An **ectopic pregnancy** is where the fertilised ovum gets implanted & develops in a site other than normal uterine cavity. It can occur in any sexually active woman of reproductive age. Here, we present a case of a sudden & suspicious death of a young married female aged about 20 years who was brought to the casualty of our hospital and declared brought dead. The case was investigated under magisterial inquest as there were allegations of dowry death.

**Key Words:** Ectopic Pregnancy, Fallopian Tube, Hemorrhage

### Background:

Ectopic pregnancy (EP) is defined as a pregnancy in which the implantation of the embryo occurs outside the uterine cavity, most frequently in one of the two fallopian tubes or, more rarely, in the abdominal cavity. During the first three months of pregnancy, ectopic pregnancy is the leading cause of maternal death in industrialized countries, and possibly the second most frequent cause in developing countries.<sup>1</sup>

Extra-uterine implantation occurs in approximately 1-2% of all pregnancies, and of these, 97% occur in the fallopian tube, which is

associated with severe maternal morbidity and mortality.<sup>2</sup> The incidence of rupture ectopic pregnancy has been increasing for years, even now. There are a number of risk factors that lead to tubal damage and dysfunction. The risk factors include: tubal corrective surgery, tubal sterilization, previous ectopic pregnancy, documented tubal pathology, infertility, previous genital or pelvic infection, multiple partners, previous pelvic/abdominal surgery, smoking, overuse of progestin oral contraceptive pills, young age abortions etc.<sup>3</sup>

The most frequently experienced symptoms of ectopic pregnancy are pelvic and abdominal pain - 100%, amenorrhea - 75%, vaginal spotting or bleeding - 70%, dizziness - 10%.<sup>[4]</sup> Diagnosis can be made by taking detailed history, examination, advising various diagnostic tests such as urine pregnancy test, quantitative measurement of serum human chorionic gonadotropin (-hcg), trans-abdominal as well as trans-vaginal scan, and in uncertain cases laparoscopy can be performed. Early diagnosis reduces the risk of tubal rupture and allows more conservative medical treatment to be employed.<sup>5</sup>

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DOI: 10.5958/0974-0848.2018.0007

### Case Report:

A young, newly married female was brought to the casualty of our hospital where she was declared brought dead. History could not be obtained from her husband as he was arrested by police officials & sent to custody. History from the near relatives revealed that, she had pain abdomen since last three days

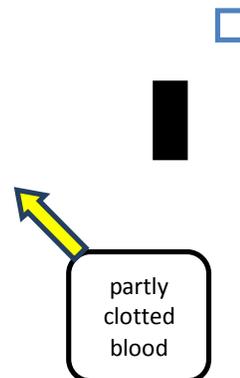
and vomiting, around 4-5 times, prior being shifted to our hospital. She was under treatment by a private practitioner for pain abdomen & nausea. The practitioner advised some pain killers & antiemetic. Neither any investigation, nor any referral was made, but later acute symptoms forced her to be rushed to our hospital. The body was shifted to the mortuary and the postmortem examination was conducted the next day.

**Autopsy Findings:**

The body was of a young adult female, rigor mortis was present all over and faint post mortem staining was present and fixed over back. Eyes were closed, corneas were hazy, conjunctiva pale and generalized pallor was present over the body. No injuries were present on the body. Internal examination showed presence of about 2 liters of blood in the abdominal and pelvic cavity. All the internal organs were pale. Pelvic peritoneum was apparently normal. The uterus was measuring 4x4x2 cm & both the ovaries were normal. Products of conception was not found due to severe & extensive retroperitoneal hemorrhage. **(Photo 1)** On careful examination, evidence of rupture of right

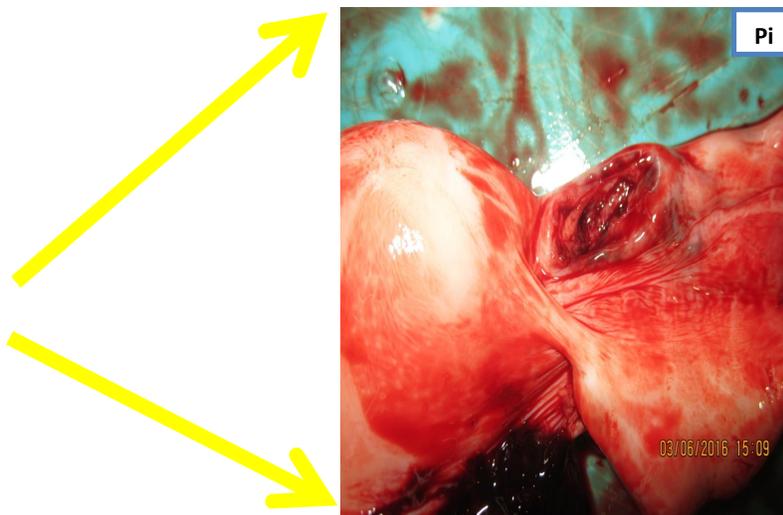
fallopian tube was present. A rent of size 2 x 1.5cm was present on the posterior surface of isthmus region of right fallopian tube. **(Photo 2 & 3)** Left fallopian tube was patent. The uterine cavity was empty, with slightly thickened walls, and corpus luteum was present in the ovary. All the other internal organs were pale. Hence, viscera & uterus with adnexa were preserved for histo-pathological examination. Histopathology of the fallopian tube confirmed the tubal pregnancy. **(Photo 4 & 5)**

Photo 1



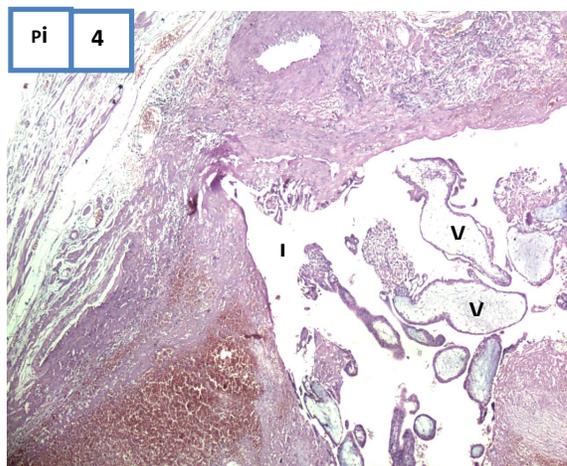
Product of conception not found due to severe & extensive retroperitoneal hemorrhage. Hence, viscera

Pi

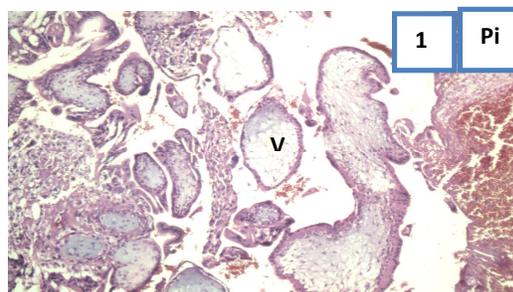


Pic showing uterus, FT & ovaries A rent of size 2cm x 1.5cm on posterior surface of isthmus region of right fallopian tube

Photo 2 & 3  
Photo 4 & 5



Lumen (L) of FT showing chorionic villi (V) along with surrounding hemorrhages



4 Pi

S  
C M

Villi showing central mesenchyme (MC) surrounded by cytotrophoblast (C) and syncytiotrophoblast (S) cells

**Discussion:**

Ectopic pregnancy is the most common cause of maternal death in the first trimester of pregnancy, the usual time period in which tubal pregnancy ruptures.<sup>6</sup> The tube may burst intra-peritoneally or rarely within the lumen of the tube or extra-peritoneal rupture. Ruptured ectopic pregnancy is usually spontaneous and death results in sudden natural death. Common presentations are like that of appendicitis, obstructed inguinal hernia and acute abdomen.<sup>7</sup>

The incidence of ectopic pregnancy among all pregnancies is about 0.25-2.0%, worldwide, and can occur in any sexually active woman of reproductive age.<sup>8</sup> Ectopic pregnancy was reported in 0.91% of pregnant women (with no maternal deaths) in a study done at tertiary care centre in South India.<sup>9</sup>

Globally, the incidence of ectopic pregnancy has been on the rise over the past few decades because of increased incidence of salpingitis (infection of fallopian tubes mostly due to sexually transmitted infections), induction of ovulation, and tubal surgeries; and improved ability to detect ectopic pregnancy. The incidence of ectopic pregnancy has risen from 4.5 cases per 1,000 pregnancies in 1970 to 19.7 cases per 1,000 pregnancies in 1992 in North America. Though the cases of ectopic pregnancy are on rise; the incidence of rupture of ectopic pregnancy and maternal deaths has declined because of early

diagnosis and management. It still accounts for 4% to 10% of pregnancy-related deaths and leads to a high incidence of ectopic site gestations in subsequent pregnancies. Ectopic pregnancy accounts for 3.5-7.1% of maternal deaths in India.<sup>10</sup>

Study on ectopic pregnancy<sup>11</sup> found that 82% of women were in the age group of 20-30 years because of sexual activity and fertility of women is highest during this period. Studies also reported cases of ruptured tubal pregnancy/ ruptured ectopic pregnancy where the women were of age group 20-30 years<sup>6,12</sup> with similar findings as in the present study. These cases also reported similar history by police and their husbands, of pain abdomen for the last 5 days for which they were taking treatment from local private practitioners. They were prescribed pain killers along with antacids, apparently without any investigations. Their condition worsened and when they reported to the same doctor, they were given another pain killer. They were, however neither investigated nor advised admission. On the very next day the condition deteriorated and they died.

Cross sectional prospective study<sup>13</sup> on 199 cases in Eastern Sudan to find the factor associated with delayed presentation of ruptured ectopic pregnancies cases. The mean age of patients was 27.9 (±6.3). The causes of delay reported by the patients were: 64.5% were not aware of the pregnancy, 28%

were seen by health providers but reassured and 7.5% regarded the symptoms not serious enough to ask for care.

Early diagnosis of ectopic pregnancy helps to reduce the rate of female morbidity and mortality. In the reproductive years of female, screening of patient who presents with history of amenorrhea, abdominal pain and vaginal bleeding should be done without any delay.

The present case is important as it presented as sudden, suspicious and unnatural death of young married woman, who was reported dead by the husband. The police suspected some foul play, later her husband was detained by police officials for interrogation. The meticulous autopsy ascertained the cause of death as ruptured tubal pregnancy, not precipitated by trauma. Pregnancy was confirmed by histopathology of uterus and tubes. For clinicians, there needs to be a high index of suspicion for ectopic pregnancy in women of reproductive age, presenting with complaints of abdominal pain and vomiting. Autopsy findings cleared the suspicious circumstance around the case by alleviating the potential allegation of relatives and relieving husband from the guilt. On the basis of postmortem report, her husband was released.

Our case also highlights the importance of psychological autopsy and history taking before autopsy. Anticipation of findings helps in seeking them during autopsy.

### Conclusion:

The incidence of ectopic pregnancy is advancing. The incidence of ruptured ectopic pregnancy is high in developing countries due to late diagnosis and delayed referral. Strong clinical suspicion in female of reproductive age group with amenorrhea, with the assistance of investigation such as sonography can diagnose ectopic pregnancy at the earliest. Early diagnosis and treatment of ectopic pregnancy prevents the damage incurred from ruptured fallopian tube. The case highlights the vigorous training & meticulous autopsy in all such cases to find out the exact cause of death and help in disbursement of justice to the concerned.

**Conflict of Interest:** None.

**Financial Assistance:** None.

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**Letter to Editor**

Dear Sir,

**Through, your esteemed Journal, I wish to Highlight the demoralising scene of Forensic science in India and the need to revamp it.**

**Need of Revamping Forensic Science in India**

Forensic science is defined as application of different branches of science for purpose of medico-legal investigations.<sup>1</sup> This subject sounds to be a glamorous and exciting scientific discipline, providing numerous interesting awarding carriers. But in the real world, the picture is totally different. Almost all the universities which are providing Forensic Science course are A or A+, as accredited by NAAC.<sup>2</sup> Every year more than 400 students are getting Bachelor's, Master's and Doctorate degrees in the subject from various government/ private universities and institutes.<sup>2</sup>

Forensic Science is not an elementary subject. It takes lot of rigorous scientific efforts/training. However, it's scope in India is Shady as finding jobs in forensics in India is like a finding a fish in the pond where already many fishermen are there. It sounds to be a fascinating profession, but in reality, forensic science is a dying profession in India. It's growth is static and stunted in India.

**Strengthening Forensic Science in India – A Path Forward**

- Scope for Forensics is limited in our country, but it can be increased. The subject is always considered as an additional subject, with other subjects (botany, zoology, biotechnology, chemistry etc.) in the recruitment for the scientific posts in Forensic Science laboratories.<sup>3</sup> The recruitment rules of the Forensic Science Laboratories should be reformed so that either the subject is made the only option or people applying with basic sciences must have diploma in forensics.
- Establishment of Regional Laboratories and mobile laboratories throughout India.

Because of the exponential increase in crime, the state and central laboratories are bursting to the seams with huge number of cases. The establishment of regional laboratories will lower the burden and will help in solving majority of cases in a short span of time.

- The interlinking of various forensic laboratories with academic institutions and research bodies, which are so essential for any field to grow, is totally lacking. Establishment of Forensic Council at central level to link all these together at the same platform with the responsibility of establishing and maintaining high standards of forensic education and recognition of forensic qualifications in India is a necessity. It should register forensic scientist practicing in courts in India so as to protect and promote the legal and safety of the public by ensuring proper standards in the practice of forensic.
- A National Academy of Forensic Sciences (NAFS) needs to be established to identify the needs of the forensic science community.
- Forensic science is vast field of study that has many sub-disciplines in its scope and application. Special Forensic University should be established in each state, as the fully furnished Gujarat Forensic University.
- Banks often deal with forged cheques and counterfeit currencies. The questioned document examination is one of the integral parts of Forensic Science. Recruitment of Questioned Document Examiner in the Banks and Insurance companies may be made. There should be a regional office for collective banks where the forged documents are examined. The bank employees must be given regular short term training about the procedure of the analysis of forged documents.
- Recently Rajasthan Public Service Commission and West Bengal Service Commission did not include Forensic Science subject in their eligibility criteria.<sup>4,5</sup>

The subject of Forensic Science must be made compulsory in the recruitment rules of every state and Central Public Service Commission for the recruitment to the various laboratories.

- In India, the police appearing at the scene of crime is usually not even aware of the need to maintain crime scene integrity for the forensic purposes nor are they well equipped to collect the crime scene evidence. That's why there should be special reservations for forensic students in investigative agencies (Police department and other investigative agencies).
- Forensic Science subject must be added as an additional subject in the core syllabus of professional (BDS, LLB, LLM etc.) Courses so that dental and legal graduates enough knowledge about forensics. At least Forensic diploma should be there in the core syllabus of professional courses in academic institutions.

### Conclusion

It's a high time that the Ministry of Home Affairs, the Government of India and the Universities take steps to fortify the discipline of Forensic Science. The government should try to bring forensic science in the main stream of science and technology. Forensic science has never been given the freedom to innovate, resulting in stagnation. It is not that India does not have talent. If given freedom, encouragement and infrastructure, forensic science can develop equally well like other

branches of science - space, computer, atomic energy, medicine and pharmaceuticals.

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Thank You,

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The Editor,  
Dr. Dasari Harish delivering a talk



Panel Discussion in session. Dr. RC Dere, Dr. R S Bangal,  
Dr Yogender Bansal, Dr. C B Jani, Dr Cyriac in Picture



E C Meet in Session. On the Dias are the President, The G Sec & the Editor



Seated from Left to Right: Dr. Ganesh Govekar, Dr. Madhu Godkirekar, Dr. Kalpesh Shah,  
Dr. Dasari Harish, Dr. Cyriac Job & Dr P C Vyas (Org Sec Forensic Medicon 2019)  
Standing from left to Right: Dr. Yogender Bansal, Dr. C B Jani, Dr. Tanuj Kanchan (Member,  
Org. Committee, Forensic Medicon 2019), Dr. Sudhir Ninanve & Dr. M. Illiyas Shiekh

