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## From the Editor's Desk

It is a matter of honour and privilege for me as editor to present last issue of JIAFM during my tenure. I have tried to touch few significant facets with reference to future of the journal in " Editorial". I wish our collective efforts in future will make the journal more renowned.

With few odds, i have tried my level best to continue the march of academic pursuit initiated by the pillars of our academy. I don't know, to what extent i have succeeded in contributing to academy. But, I heartily accept all discredit for any short coming or flaw with reference to my assignment as editor.

If, any improvement in terms of quantity and quality has been perceived by members, sole credit shall go to learned contributors- who were generous enough for their valued submissions, members of advisory board for their worthy inputs and of course, the respected peer review group members who obliged me for their critical suggestions as referee.

**C B Jani**  
Editor

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Editor



## **Editorial**

### **Journey of JIAFM- Where, When & How ?**

Annual conference and journal of any association are considered principal and crucial tasks and hence indicates its health. Since its inception, JIAFM has witnessed many editors. No one would deny some positive change then and now. Earlier the composing of journal was a manual one (using letter blocks for printing plate) and even with many constraints then, it had a standard, to the extent that many PGs would love to update themselves with them. At present, we are in era of computerisation, having facilities of spell check and many other soft wares which would definitely reduce the mechanical burden of editor as compared to past. I personally feel that far better resources and logistics available at present has not been utilised for the betterment of JIAFM to its greater extent. Some of the existing shortcomings or areas with scope of improvement has been expressed in the present article.

#### **Format**

Title and colour scheme of a journal is its identity, even one can pick up desired journal in library self without difficulty. Unfortunately, with frequent change in editor-JIAFM, the format changes and the look loses its consistency. I tried to remain close to the earlier formats. I don't find much rational in accommodating "photographs" of editor and joint editor and I tried so. In the contents the manuscripts were categorised. The head notes of every article has alternate appearance of international abbreviation of JIAFM and authors short name with key words of the article. If members feel that it is close to international standards that shall be fixed and made constant and shall not be altered at the whims and wishes of every editor. If required a resolution can be passed at GBM with reference to streamlining of various traits of format and a new editor need not start "de novo".

#### **Fiscal backup**

On an average Rs.30000/- are required for each quarterly publication of a volume having 100-120 pages. Keeping in mind postage and printing cost an editor must spend Rs. 1 lac per annum for about 1000 copies of each quarter, out of which 20000/- are to be disbursed by academy and about 40000/- as redirected subscription by Diwan enterprise, New Delhi (an MOU has been entered into for subscription in 2006). The sum is not enough to sustain the printing and publishing in absence of commercial advertisements (we, the forensic fraternity usually do not have larger scope as compared to clinical branches). The first solution of present constraint is increasing fiscal assistance to editor by academy. There are certain journals who charge "printing expenses" from non-members. One more suggestion is to send self addressed envelopes (with postage) to editor, which can check postage expenses and even latest contact details of members are available with editor. It is up to all of us to adopt any or all of above or one can suggest some other means as well.

#### **Online submission and access**

In the web era, online submission and access are good methods for computer friendly members. Unfortunately Diwan enterprise is not able to entertain access facility for want of membership number, e-mail and postal addresses as end user to ensure that non-members do not enjoy "free" electronic version. Dr Sanjoy Das (General Secretary) is trying hard to compile a new directory, because the earlier one has mention of only 503 members that is also with old contact details. With submitting our contact details some modified and latest version of directory can solve many such issues.



For online submission also, the same is required in addition to charge of Rs. 6-10000/- per annum. If that can be done, author need not ring up editor and can submit and learn the status of his submission by logging frequently. Even, reviewers have a provision for login and ultimately the communication between editor, reviewers, and contributors can be automatised with saving time as well. Even members who are not constant appearance at conference and unaware of new editor need not trace the editor for submissions with introduction of online submission and review system.

### **Type of contributions**

The ratio of submissions is also a concern as, "Review Articles" are major chunk. Many a times they are nothing more than "copy/ cut- paste ". Ideally, original papers and case reports (that is also rare and interesting) shall form a major portion, which is not the case always. Even the category of original paper has frequent themes on RTA, poisoning, epidemiological aspects of burns etc. There are instances that a manuscript appears in more than one journal /issue. The "undertaking" of non submission elsewhere is not taken as seriously as it should be. Papers presented at conference are redirected for journal (of course the aim may be to circulate it at larger audience) and so on. All these convey wrong signals that there is no scope of innovative research in the field other than such "chewed" themes. I don't think that Indian fraternity does not endeavour beyond those, because there are many wonderful and indigenous submissions in international journals by Indian workers. Then, why not to JIAFM?. If there are some constraints in the mind of members for not contributing quality submissions to JIAFM (and instead to other journals), it must be addressed.

### **Regularity**

Despite of categorical illustrations and inputs in "Guidelines to authors", the submissions are either not in desired format or with some deficiency, reference pattern etc. One may say that it is the job of editor. I would humbly differ to that opinion. If it is so, then, why we submit to international journal in a prescribed format?. Again, recomposing in desired format eats away the time of editor who is under pressure for timely publication. The subscribers (a major revenue to JIAFM is subscription share) who do not receive the issues within stipulated time limit will be discouraged for extending the subscription next year for mere non receipt of JIAFM timely. i.e. Jan-March issue , if published in May would impose a wrong impression on subscriber.

### **Distribution**

Usually, JIAFM is distributed to members at annual conference. Those who are unable to turn up at conference, manage their journal by known delegates. The existing members' directory shows 503 members and that is also with old contact details. Postal dispatch by editor necessarily does not ensure that it would reach the member if the address is changed. The process of latest directory is in pipeline and its availability to the editor can help in improving effective distribution. But to minimise the postages and in turn financial burden, the suggestion of sending self addressed envelop with postage shall be thought of.

### **Indexing**

Since Medical Council of India has made publications in Indexed / National journal mandatory for promotion to higher post, many of our colleagues have generated query about indexing status of JIAFM. At present JIAFM is indexed with IndMED [a bibliographic database of Indian biomedical journal from India, managed by ICMR-NIC under Department of Information and Technology. As a part



of consortium, JIAFM is forwarded to NISCIR (National Institute of Science Communication And Information Resources, New Delhi) as well. But, internationally most acceptable agency is PubMed, where the JIAFM is not indexed. One will be surprised to learn that journals from almost all specialties and association from India including basic sciences and para clinical ones as Biochemistry, Physiology, Anatomy & Pharmacology are indexed with PubMed, but not a single Indian journal from the field of Forensic Medicine. Last year, after accepting responsibilities as editor, i explored the possibilities but in vein for mainly two among other reasons. Firstly, "acid-free" paper as desired there, would cost us 3-4 times higher than presently used paper. Secondly, quality of few of our manuscripts may not meet with international standards for convincing "Committee" at PubMed. My experience as editor permits me to conclude that , indexing with PubMed is not a short term assignment and we must insist for only "good quality submissions" before applying for such indexing or else "we propose and they dispose" sort of technical stand can't help us in achieving the goal of indexing with PubMed.

### **Attraction to subscribers**

There are national level associations in the field of Forensic Medicine and Toxicology other than IAFM who are coming out with journals. In other words, a subscriber has choice to select a better one amongst all available. We must ensure subscribers' satisfaction in terms of regularity and quality of contents to withstand the competition of sustaining or increasing the subscribers.

It is open to all, what i could not achieve during my tenure for some of known or unknown constraints. I shall be frank enough to admit that even with firm desire i could not index JIAFM with PubMed, arrange online access and submission to members of IAFM and send the journal issue to ALL IAFM members. I endeavored to share my experience and feeling as a member of IAFM and editor of JIAFM in the present editorial, only with the intention that the future editors must have some inputs from me and can contribute to JIAFM in a better way and greater extent than what i could do. It is not a question of "I and you" or "CB Jani or XYZ". Every member owes to academy and its journal. We must sincerely introspect -how, when and where the JIAFM shall sail its journey.

Summing up with stanza of a song from of movie "*Kabhi-Kabhi*":

*' Main pal do pal ka shayar hoon.....*

*Kal aur ayenge nagmo ki khilti kalia chunane wale,*

*Mujse bahetar kahene wale, tumse bahetar sunane wale.....'*

Long live IAFM !

**C. B. Jani**

**Editor**



## Originals and Papers

### Adultery as viewed by future generation- A study and discussion

*P.N.Murkey\**, *B.H.Tirpude\*\**, *Aloke Mazumder\*\*\**, *V.G.Pawar\*\*\**, *S.Bhowate\*\*\** & *Sumit Shende\*\*\**

#### Abstract

Adultery, the age old complaint of society, probably is one of the few issues which are dealt frequently in connection with controversies that arise due to rapid changes of mentality of people especially in Indian scenario where conservative perspective is no longer considered as valuable as used to be accepted in the past. Adultery or in other words-“Violation of marriage bed” is an invasion on the right of a husband over his wife, as people think, perhaps reflects the same motive behind the great war of the “Ramayana” that started after abduction of Sita by Ravana and Sita had to go for ‘Agnipariksha’ to prove her chastity.

But when we see today's society, we find an absolute change that either has come or just awaiting to influence the moral values of present generation. To get a pulse on this issue, present study was organized at four institutes with both rural and urban background. Interesting outcomes have been observed where we find clear concept, rational ideas, deserving comments and strong wishes regarding change of present law and punishment. Though may be a tip of iceberg, but the study definitely reflects a need of re-thought on *adultery* and its punishment.

**Key words:** *Adultery, controversies, society, moral values, law, punishment.*

#### Introduction

“It seems most unfair for a man to require from a wife the chastity he doesn't himself practice.”<sup>1</sup>

Adultery, an often used word, is often not very clear to us- in several aspects-its definition and meaning, the law against it or the actual implication of the law in view of tremendously changed society in recent scenario.

As per the legal definition – (Sec 497) who ever has sexual intercourse with a person who is and whom he knows or has reason to believe to be the wife of another man, without the consent or connivance of that man such sexual intercourse not amounting to the offence of rape, is the offence of adultery, and the guilty shall be punished with imprisonment of either description of a term which may extend to five years, or with

fine, or with both. In such a case, the wife shall not be punishable as an abettor.

Connivance is the willing consent to a conjugal offence and it is an act of mind- a willing mind.

Though such types of acts are often found in the society, the legal aspect and aspect of its punishment is very much unknown to common people.

A study has been performed on adultery which shows some interesting outcomes.

#### Adultery in different societies/ religions<sup>2</sup>

Of course adultery is not a new act of society. Since the age of Old Testament or ancient Indian era of Great laws of Manu, adultery is a matter of consideration. Historically it was rigorously condemned and punished, usually only as a violation of the husbands rights.<sup>2</sup> In Jewish land, the penalty for adultery was stoning for both partners- if they act in spite of warnings by two independent witnesses.<sup>2</sup>

During the time of Old Testament this act was to be punished by death. In Judaism, a married women engaging in sexual intercourse

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with another man was concluded as adultery, and both the woman and the man was considered guilty.

According to Islam, adultery is a violation of a marital contract and it includes both premarital and extra marital sex. As per Sharia law- to seek sex outside the limits set by GOD is a sin, as pre- and extramarital sex would certainly threaten the sacred institution of family. If an adult male had sexual intercourse with a consenting female who was under the age( usually 16 year), he would be charged with rape, while if she was above that age, then both would be charged with adultery or fornication depending upon their marital status. But it should be proved "beyond a shadow of doubt".<sup>3</sup>

In the United States- Pennsylvania, it is punishable by 2 years of imprisonment or 18 months of treatments for insanity. In Michigan, adultery is punishable by a fine of ten dollars. In Canadian law, it is defined under the Divorce act.

In Pakistan it has been criminalized by a law called the Hudood Ordinance which may give death penalty.

In India, under Sec 497 IPC, adultery is criminalized while in civil law both husband and wife can seek divorce on ground of adultery.

### **An analysis of the act of adultery and the law in India:**

If we think on it, few aspects come out as-

1. The offence is only directed to the 'outsider' who violated the sanctity of the matrimonial home when the outsider was a man.
2. The matrimonial home sanctity may be violated by 'outsider, woman but she is not punishable.
3. Wife should have equal right to sue the female paramour, who seduces the husband.
4. The offence of adultery in IPC permits the husband to prosecute the paramour of his wife without giving any corresponding right to the wife to prosecute the husband when he has extramarital relations.
5. In fact adultery is nothing but a civil wrong and should be viewed as a breach of trust.
6. The law is discriminatory for some specific sex which is not acceptable.

7. The Sec 497 IPC requires the following essentials-

8. Sexual intercourse by a man with a woman who is and whom he knows or has reason to believe to be the wife of another man.
9. Such sexual intercourse must be without the consent or connivance of the husband.
10. Such sexual intercourse must not amount to rape.
11. Complaint by person aggrieved is necessary. (Sec 198 Cr.PC)<sup>3</sup>

### **Aims and Objectives**

This study was conducted only with 3 objectives-

1. To get an idea on knowledge of this act of adultery among a group of conscious, literate youngsters who are supposed to be the social representatives of future generation.
2. What is their decision on punishment of this act?
3. Study group and their associated persons are to be made aware of the social and legal pros and cons of adultery.

### **Study group and methods**

A questionnaire was framed where only the definition of adultery was discussed initially because many may not be knowing this terminology but aware of the act proper. The study group comprises of

- a) Students of II<sup>nd</sup> year MBBS course,
- b) Students of I<sup>st</sup> year Engineering course,
- c) Students of II<sup>nd</sup> year Law course &
- d) Students of II<sup>nd</sup> year General course( Arts).

All comprises of both female and male and are of age group 17 year- 25 year. The results with the questions are as follows.

### **Observations**

The present study was conducted in four colleges of Wardha district from 1<sup>st</sup> December 2008 to 28<sup>th</sup> February 2009. The study done in four colleges includes the medical, engineering, arts, and law college. Knowledge of adultery is known to medical and law students but the engineering and art students are unaware of the fact, but as they were from urban area, having some basic knowledge of the adultery is taken



into consideration. The colleges selected are from rural as well as in urban areas to get the concept of adultery of both societies. The data collected from them have been displayed at Tables and observations were made. The study was conducted on behalf of department of Forensic Medicine of Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha. The questionnaire given to them was "Yes" or "No" type and comments were asked at last on their personal views.

**Table- 1: Sex ratio of the students**

Colleges	Male students	Female students	Total students
Medical college	30(60%)	20(40%)	50(100%)
Engineering college	31(62%)	19(38%)	50(100%)
Arts college	28(56%)	22(44%)	50(100%)
Law college	27(54%)	23(46%)	50(100%)
<b>Total</b>	<b>116(58%)</b>	<b>84(42%)</b>	<b>50(100%)</b>

In this study, we have observed that from each college 50 students have participated and out of them male students participated are 116(58%) and female students participated are 84(42%) in total.

**Table 2: College area**

Place of college	College	Total students
Rural area	Medical college	50
	Engineering college	50
	<b>Total 1</b>	<b>100</b>
Urban area	Arts college	50
	Law college	50
	<b>Total 2</b>	<b>100</b>
<b>Total</b>	<b>1+2</b>	<b>200 (100%)</b>

In this study, two colleges each has been chosen from rural as well as urban area and 50 students from each college have participated i.e. from rural 100 and urban 100.

**Table- 3: Marital status of the students**

Status	Male students	Female students	Total
Married	06(5.17%)	06(7.14%)	12 (6%)
Unmarried	100(94.83)	78(92.86%)	188 (94%)
<b>Total</b>	<b>116(58%)</b>	<b>84(42%)</b>	<b>200 (100%)</b>

**Table- 4: Answers of the questionnaire framed for the students**

**Question 1 : Do you know which section of IPC deals with the punishment of adultery?**

Colleges	Yes	No	No comment
Medical college	34(68%)	16(32%)	00
Engineering college	2(4%)	48(96%)	00
Arts college	1(2%)	49(98%)	00
Law college	39(78%)	11(22%)	00
<b>Total</b>	<b>76</b>	<b>124</b>	<b>200</b>

Law college shows highest positive answer, arts college-lowest.

**Question 2: Do you know the punishment?**

Colleges	Yes	No	No comment
Medical college	15(30%)	30(60%)	05(10%)
Engineering college	6(12%)	42(84%)	02(04%)
Arts college	2(4%)	42(84%)	06(12%)
Law college	38(76%)	12(24%)	00
<b>Total</b>	<b>61 (30.50%)</b>	<b>126 (63%)</b>	<b>13 (6.50%)</b>



Both Engineering and Arts College show highest negative answer (84%) .

**Question 3 : Do you think that only female partner should be punished?**

Colleges	Yes	No	No comment
Medical college	2(4%)	48(96%)	00
Engineering college	4(8%)	46(92%)	00
Arts college	3(6%)	47(94%)	00
Law college	2(4%)	48(96%)	00
<b>Total</b>	<b>11(5.5%)</b>	<b>189 (94.5%)</b>	<b>00</b>

Majority of the students disagree with the punishment of only female partner.

**Question 4 : Do you think that only male partner should be punished?**

Colleges	Yes	No	No comment
Medical college	2(4%)	48(96%)	00
Engineering college	1(2%)	49(98%)	00
Arts college	2(4%)	48(96%)	00
Law college	3(6%)	47(94%)	00
<b>Total</b>	<b>8(4%)</b>	<b>192(96%)</b>	<b>00</b>

Again most of the students disagree with the punishment of only male partner.

**Question 5 : Do you think that both partners should be punished ?**

Colleges	Yes	No	No comment
Medical college	46(92%)	04(8%)	00
Engineering college	45(90%)	05(10%)	00
Arts college	45(90%)	05(10%)	00
Law college	45(90%)	05(10%)	00
<b>Total</b>	<b>181(90.5%)</b>	<b>19(9.5%)</b>	<b>00</b>

Most of the students want the punishment for both the partners.

**Question 6 : Do you think that law on it is to be modified?**

Colleges	Yes	No	No comment
Medical college	48(96%)	02 (04%)	00
Engineering college	44(88%)	6(12%)	00
Arts college	42(84%)	8(16%)	00
Law college	47(94%)	02(4%)	01 (As per circumstances)
<b>Total</b>	<b>181 (90.50%)</b>	<b>18(9%)</b>	<b>0.50</b>

Almost all participants wanted the law should be modified.

**Question 7 : Do you think that cases of adultery are becoming more due to changing society with less moral values?**

Colleges	Yes	No	No comment
Medical college	49(98%)	01(2%)	00
Engg. college	45(90%)	04(8%)	01(2%)
Arts college	50(100 %)	00	00
Law college	48(96%)	01(02%)	01(2%)
<b>Total</b>	<b>192(96%)</b>	<b>06(3%)</b>	<b>2(1%)</b>

Majority of the participants agree with the positive answer.

**Question 8 : Do you think that often persons are victimized due to their lack of knowledge of adultery?**

Colleges	Yes	No	No comment
Medical college	37(74%)	13(26%)	00
Engineering college	39(78%)	10(20%)	01(2%)
Arts college	45(90%)	05(10%)	00
Law college	32(64%)	17(34%)	01(2%)
<b>Total</b>	<b>53(76.50%)</b>	<b>45(22.50%)</b>	<b>2(1%)</b>



In this question more or less half of the participants are at both the sides .

**Question 9 : Do you think that there is a fare chance of misuse of the law if the punishment is directed to any specific sex-male/female?**

Colleges	Yes	No	No comment
Medical college	48(96%)	01(02%)	01(2%)
Engineering college	45(90%)	04(8%)	01(2%)
Arts college	15(30%)	03(6%)	32(64%)
Law college	38(76%)	12(24%)	00
<b>Total</b>	<b>147(73.5%)</b>	<b>20(10%)</b>	<b>34(17%)</b>

Majority agreed with the question of the misuse of the law if directed to any specific sex.

**Question 10 : Do you feel that in today's scenario, adultery should not be considered a crime at all ?**

Colleges	Yes	No	No comment
Medical college	02(04%)	48(96%)	00
Engineering college	02(04%)	48(96%)	00
Arts college	00	50(100%)	00
Law college	00	50(100%)	00
<b>Total</b>	<b>04(02%)</b>	<b>196(98%)</b>	<b>00</b>

## Discussion

This study shows very important outcomes. The questions are self explanatory. Tables show a clear trend of the coming generation to consider adultery as a completely unacceptable crime to social structure and punishment to be awarded to both the partners.

Another aspect of very interesting fact came out where few persons under study feels

that adultery should not be considered as a crime at all, because of involvement of partners who are adults and commit the heinous act in full consciousness of mind with awareness of present social trend.

Section 497 IPC directs no punishment to a wife who enjoys physical intercourse without husband's permission. But, adultery is one of the grounds for refusal of maintenance in sec 125 (5), CrPC, 1973.<sup>4</sup> As there is no punishment awarded to a wife, indirectly can we say court allows such act of betrayal from wife? If that wife procures children by an outsider that will be regarded as legitimate children if no access is established under sec 112 of the Indian Evidence Act.

So, considering all these sides, sincere thought must be given on adultery.

## Some comments of participants

- Adultery is an offence in the eye of society as well as in law. So far this offence is concerned both partners should be punished.
- Both the parties should be punished. The cases of adultery are becoming more only because of immorality and their degrading culture. It can be stopped with the help of true education.
- I personally feel that adultery cases are increasing and in view of it law should be modified and punishment should be increased so that any male or female shouldn't commit such offence.
- I think that if a person is having sexual intercourse with another's wife by giving external pressure or torture on her due to demand of sex from her by giving her greed is false on the man's side. And if the women having sex after marriage with another person which broke our ethical values and culture is crime on her side.
- The law is same for all. If any person misuses this law, he only should be punished.
- If both men and women do not have any problem regarding their sexual intercourse there must not be any compulsory punishment for them, hence it (law) should be changed.



- Adultery is because of lack of knowledge about it .so; first give them knowledge about it. It is not because of male or female, it is because of overall environment
- Sex is done with permission of both male and female. There will no punishment but if someone is hurt, by them they should be punished for the sake of society.
- Adultery is not unwanted fact. Both are responsible for this act.
- Punishment is not the remedy of adultery. There should be proper knowledge and moral values are necessary.

## **Conclusion**

The sec 497 IPC, deals with the punishment for an offence of adultery. Adultery is an invasion on the right of a husband over his wife. The scope of the section is limited to adultery committed with a married woman. It is an offence committed by a man against a husband in respect to his wife. Having sexual intercourse with an unmarried girl or a prostitute or a widow or even with a married woman whose husband consents to it or with his connivance are not covered by this section.

The wife is not punishable for being adultery or even as an abettor of the offence. The Indian Penal Code (Amendment) bill 1972 suggested that the special privileges granted to women under sec 497 of the code should be done away with. However the amendment of the section could not be carried out. It is important to note that the Jammu and Kashmir state Ranbir Penal Code 1932, sec 497 is more progressive in this regard.

It makes the errant wife punishable along with her paramour as an abettor. The question of constitutionality of sec 497, i.e. whether it is ultra vires of the constitution is as much as it exempted the wife from being punishable as an abettor and thus infringed the provisions of articles 14 and 15 of the constitution, has crept up sometimes before the courts but it has been upheld even by Supreme court (AIR 1985, SC, 1618).<sup>5</sup>

According to Indian Law, a woman can not commit the offence of rape on a man. Like rape and adultery, cohabitation by deceitfully

inducing to a belief of lawful marriage (Sec: 493 IPC) and charges described under Sec: 376A,376B,376C,376D Can not be brought against a woman for commission of same of same offence on a man in reverse but otherwise identical circumstances.<sup>6</sup>

In fact, when we think of human being, their several types of attitudes / character the crimes originated, we feel there is very less difference between an animal and a human and naturally the basic instinct of enjoying or considering a female sex as the property of a male, often becomes visible even in this so called civilized society and herein lies the origin of act of adultery.

The law / punishment on it is basically a trial to kill this basic instinct for formation of a strong social culture. Here the conflict lies because of with the advent of women right and equality of both sexes. From this study we feel that there is a definite requirement of amendment of the law which probably will make a stronger bond inside social marriage culture.

This study also reflects same type of thought because this unbiased intelligent conscious future generation is perhaps more immunized with so called unaccepted human behavior. Still when these people at a time agree with same thinking of amendment of the law as made long back in past Indian social scenario, it seems to be a real need to think twice to continue with the same act.

Now let us see what do the lawmakers think:<sup>7</sup>

Second Law Commission gave a mind to this offence. Under this code, Adultery is an offence committed by a third person against a husband in respect to his wife. So it is not committed by married man with 1. an unmarried lady, 2. widow, 3. married woman whose husband consents to it.

It is important that such intercourse will be without the consent of husband and must not amount to rape.

The condition of the women in this country is, unhappily, very different from that of the women of England and France; Indian women are often so neglected, tortured unnecessarily, so oppressed and under violence, that we are not



inclined to throw into a scale already too much depressed, the additional weight of the Penal law.

Supreme Court Observation:

".....the wife who is seduced is really the victim and not the author of the crime."

".....law makers may enlarge the definition of adultery to keep pace with the moving times. But until then, law must remain as it is. The law, as it is, does not offend either Article 14 or Article 15 of the constitution".

In this background perhaps time is not yet ripe to punish women for adultery.

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## Originals and Papers

### Time passed since death from degenerative changes in liver

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#### Abstract

Time passed since death is made out from gross postmortem changes like cooling of the body, PM staining, rigor mortis, decomposition etc. In the present study histological changes in the liver tissue were studied at various postmortem intervals in the human body died due to road traffic accidents. In this study control can not be taken because the histological changes of tissue after death is influenced a great deal by atmospheric temperature and humidity besides other external and internal factors. Therefore these must be taken into account in all studies of postmortem interval whether histological, biochemical or physical.

**Key words:** Time since death, liver, cloudy swelling, fatty changes, vacuolation.

#### Introduction

Estimation of time since death is one of the most important object of post-mortem examination. Time passed since death continues to be a major problem for the forensic pathologist and its determination plays an important and vital issue in medicolegal cases because of the fact that forensic experts are very often required to answer questions relating to time of death in the courts of law.

The traditional methods of ascertaining the time since death based on naked eye observations of the gross changes in a dead body occurring after death to provide a rough approximation of post mortem interval, at best only and would appear to be still the closest approximation of the time passed since death in a given case.

These various gross changes in the body after death are loss of corneal reflex and changes in eye, cooling of the body, post mortem hypostasis, rigor mortis, decomposition and other

putrefactive changes. Some clue of time of death is also gathered from the condition of food in stomach, intestine and urine in bladder.<sup>1,2,3,4</sup>

Attempts have also been made to determine time passed since death by studying biochemical changes in blood, CSF and intraocular fluids.<sup>5,6,7</sup> The biochemical methods have been found to be of not much use once the decomposition changes start.

The problem worsens when body is mutilated skeletonised or invaded by animals. Time bound histological and histochemical study of degenerative changes in various organs and tissues may be a good solution.<sup>8,9,10,11</sup>

Forensic pathologist throughout the world are trying to establish time passed since death by studying degenerative changes in organs and tissues at different intervals but definitive conclusion is still awaiting.<sup>12,13</sup>

The histological studies on various tissues after death have been mostly confined to single organ or tissue by individual workers at different atmospheric conditions. Moreover very few workers works based on histological studies of post mortem tissue changes appears to have been undertaken by Indian and more so in Uttar Pradesh. Since only a single organ was studied by most workers, any comparative evaluation of the varying rate of decomposition of the different organs and tissues can not be made out.

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## Material & method

Material for the present study is liver, taken directly from the dead bodies during postmortem examination. Only the cases where the time of death is known and verified either by the doctors or by relatives & friends present at the time of death and also supported by postmortem changes, have been taken for the study.

Histological studies by fixation, dehydration followed by embedding in paraffin wax.

The paraffin sections of tissues were labeled during the process of block making in the following manners from case – 1 to case – 45 liver from the blocks of tissues, sections were cut at 4 – 5  $\mu$  thickness with a rotating microtome. The sections were then placed in warm water at 50 °C in a tissue floatation bath for spreading out and were then mounted on glass slide smeared with albumin glycerin solutions. The slides were stained by reactive haematoxylin and eosin stain.

The stained slides were examined under light microscope for studying the various histological changes that take place in liver tissue at different time intervals after death.

## Plan of study

In this study total 45 cases of road traffic accident are taken. These cases are of different age and sex. The cases in which time passed is known has taken. The environmental temperature and humidity is recorded from newspaper from which average temperature is drawn.

Thus bodies found unnoticed will not be studied, precautions will also be taken to exclude the cases having pathology affecting the cellular architecture or biochemical constituent of the material. Such tissues thus collected, sliced and fixed in 10% formalin for histological study.

Total 45 cases, in which 36 male & 9 female were studied. These are of different age and sex. All road traffic accidents are taken into account.

## Collection of organs

These organs were then kept in 10% formalin for 24-48 hrs for fixation. Small pieces or blocks of tissues each 1-2 mm thick were taken

for histological examination and were processed by the routine methods of processing for The average temperature ranges b/w 20 °C – 35 °C, humidity b/w 45 – 92% and duration range was 7 – 34 hrs.

Now this temperature range is divided in 4 groups as shown in table no – 1.

**Table -1**

Group	Temperature	No. of Cases
I	20 °C	9
II	21-25 °C	6
III	26-30 °C	11
IV	31-35 °C	19
Total		45

Duration is also divided into 5 groups as shown in table no – 2.

**Table -2**

Group	Duration	No. of Cases
I	Up to 12 hrs	5
II	13 – 18 hrs	13
III	19 – 24 hrs	14
IV	25 – 30 hrs	9
V	31 – 34 hrs	4
	Total	45

Now these 45 cases are studied with the effect of temperature and duration. First gross changes in liver studied. Then they were preserved in 10% formalin for microscopic study.

As described earlier, these changes are graded from 0 – 4., these are as follows:

**Grade 0:** No change.

**Grade 1:** Mild (Architecture maintained, mild cloudy swelling)

**Grade 2:** Moderate (Architecture maintained, cloudy swelling more, cords pattern maintained, sinus dilatation).

**Grade 3:** Severe (Architecture disturbed, degenerative sign are more, disturb hepatic lobule).

**Grade 4:** very severe (complete disturbance of lobular architecture).



**Table -3: Degenerative changes (Microscopic changes- according to duration) in liver**

Duration	G - 0		G - 1		G - 2		G - 3		G - 4	
	No.	%	No.	%	No.	%	No.	%	No.	%
Up to 12 hrs (5 cases)	-	-	3	60	-	-	2	40	-	-
13-18 hrs (13 cases)	-	-	-	-	10	77	3	23	-	-
19-24 hrs (14 cases)	-	-	-	-	11	78.6	3	21.4	-	-
25-30 hrs (9 cases)	-	-	-	-	8	88.9	1	11.1	-	-
31-34 hrs (4 cases)	-	-	2	50	1	25	1	25	-	-

(-) No case available

**Table-4: Degenerative changes (microscopic changes -according to temperature) in liver**

Duration	G - 0		G - 1		G - 2		G - 3		G - 4	
	No.	%	No.	%	No.	%	No.	%	No.	%
20°C (9 cases)	-	-	2	22.2	6	66.7	1	11.1	-	-
21-25°C (6 cases)	-	-	-	-	6	100	-	-	-	-
26-30°C (11 cases)	-	-	3	27.3	3	27.3	5	45.4	-	-
31-35°C (19 cases)	-	-	-	-	15	78.95	4	21.06	-	-

(-) No case available

**Table-5: Liver (Relation between temperature and duration)**

	12 hrs (5 cases)	13-18 hrs (13 cases)	19-24 hrs (14 cases)	25-30 hrs (9 cases)	31-34 hrs (4 cases)
20°C (9 cases)	-	2 cases	2 cases	2 cases	3 cases
21-25°C (6 cases)	-	-	3 cases	3 cases	-
26-30°C (11 cases)	5 cases	3 cases	3 cases	-	-
31-35°C (19 cases)	-	8 cases	6 cases	4 cases	1 case

**Table - 6: Distribution of cases according to temperature and time since death**

	12 hrs (5 cases)		13-18 hrs (13 cases)		19-24 hrs (14 cases)		25-30 hrs (9 cases)		31-34 hrs (4 cases)	
	Grade	%	Grade	%	Grade	%	Grade	%	Grade	%
20°C (9 cases)	-		G - 2	100	G - 2	100	G - 2	100	G - 1 G - 3	66.7 33.3
21-25°C (6 cases)	-		-		G - 2	100	G - 2	100	-	-
26-30°C (11 cases)	G - 1 G - 3	60 40	G - 2 G - 3	66.7 33.3	G - 2 G - 3	33.3 66.7	-		-	-
31-35°C (19 cases)	-		G - 2 G - 3	75 25	G - 2 G - 3	83.3 16.7	G - 2 G - 3	75 25	G - 2	100



## Observations

All cases are divided in groups according to temperature and duration which is discussed earlier.

### Degenerative changes in Liver:

In Liver degenerative changes are mainly seen in portal triad, hepatocytes, and cytoplasm, nucleus and kupffer cells.

**In portal triad:** condition of hepatic artery, vein and Bile duct epithelium.

**Cytoplasm:** outline, granularity, hydropic changes, vacuolation, fatty changes, glycogen deposition, pigment deposition are seen.

**Nucleus:** Karyolysis, degeneration, fragmentation, vacuolation are seen.

**Hepatic lobule:** degenerative sign in central vein, hepatocytes, cords, sinus are seen.

## Discussion

In the present study 45 cases of different age and sex are taken in which 36 male and 9 female. Average environmental temperature ranges b/w 20 – 35 °C, humidity b/w 45 – 92% and duration range was 7 – 34 hrs.

On histological study revealed the various changes in a definite sequence.

- In first 12 hrs – at temperature range 26 – 30 °C, 3 out of 5 cases show mild cloudy swelling in cytoplasm (G -1) only 2 cases show severe changes (G-3), both of these person were suffering form some liver disease, because other organs of these two cases show mild degenerative changes.
- In 13 – 18 hrs - with increasing temperature of up to 31-35 °C, moderate & severe changes are seen i e Architecture is maintained, – cloudy swelling more, cord pattern maintained, sinus dilatation, only 3 cases out of 13 cases show severe changes (G-3).
- In 19 – 24 hrs – With increasing temperature of 26 – 30 °C, severity increases. But at 31 – 35 °C, the severe changes are less as in this category, the no of cases are less.
- In 31 – 34 hrs – With further increase in temperature of 31- 35 °C no definite sequence of changes are seen. In these category no. of cases is less, so we can not comment on these changes. All grades G-1 to G-3 are seen.

In a study done on liver tissues of goat and observed – granularity of liver cell cytoplasm was the first change seen 12 hrs after death in open air and pond water conditions and after 12 days in tissues kept at 3.5 °C in refrigerator pyknosis of nuclei was seen after 36 hrs. in open air and pond water, whereas in refrigerated state it was seen after 5 days. Loss of alignment of the liver cells was seen after 48 hrs in open air and pond water and on 21<sup>st</sup> day in tissue kept in a refrigerated temperature<sup>14</sup>.

In another study of time and temperature controlled histopathological changes in tissue and organs of rabbit shows that in liver at 20 °C after 12 hrs – mild autolytic changes like focal lysis and swelling of the cells were seen<sup>14</sup>.

1. In 24 hrs – the cell outlines became hazy, cytoplasm granular and the nuclei looked pyknotic.
2. In 36 – 48 hrs – Moderate degree of autolysis, though the general lobular architecture was preserved. Cytoplasmic granularity, disappearance of cell nuclei, rupture of the cell walls with syncytium formation and heavy bacterial & fungal growth were seen.
3. By 72 hrs – the lobular architecture lost.
4. At 30 °C – mild autolytic changes were seen beginning form 24 hrs & b/w 36 – 48 hrs, the changes were moderately advanced, while after 72 hrs severe autolytic changes could be seen with loss of lobular architecture and all cellular details.

At 40 °C – In 12 hrs Postmortem lysis of liver cells, pyknosis, karyorhexis and blurring of cell outline was observed.

There was moderate to severe autolysis from 24 – 36 hrs. Complete loss of liver architecture and the cellular details at 48 hrs and the liver tissues were completely liquefied by 72 hrs.

In 1988 'a study done on histopathological changes in liver at temperature of 25.9 °C & 39.6 °C with humidity of 83% & 45%. It is observed that degenerative changes in liver tissue of both rat and man has been observed to start at 14 hrs after death. In 17 hrs – lobular pattern disturbed<sup>14</sup>.

- 20 hrs – Hepatocyte began degenerating.
- 23 hrs – Chromatolysis of nuclei and



vacuolation in the cytoplasm of hepatocytes. Portal triad showing sign of degeneration.

- 26 hrs – Lamellar pattern of hepatocytes disturbed. Portal triad is disturbed.
- 29 hrs – Hepatocytes arranged in small irregular masses. Central vein degenerated.
- 36 hrs – Liquefied.

### Summary and Conclusion

In this study it is observed that the rate of microscopic changes increases as the temperature and duration increases up to 24 hrs & 31 - 35 °C. But with further increase of Temp. & duration mild to moderate changes are observed.

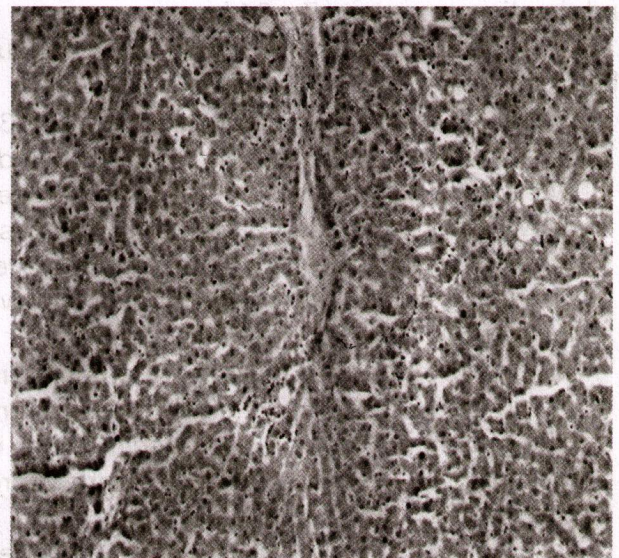
Further studies using large number of cases & environmental conditions such as age, sex, humidity, body built, clothings & surrounding of the body etc. in different seasons should be done. Findings derived from such studies are likely to go a long way to promote the course of scientific crime investigation and fair administration of criminal justice, by way of furnishing more accurate answers, to the age old questions of the time passed since death in a given case of unnatural death under investigation.

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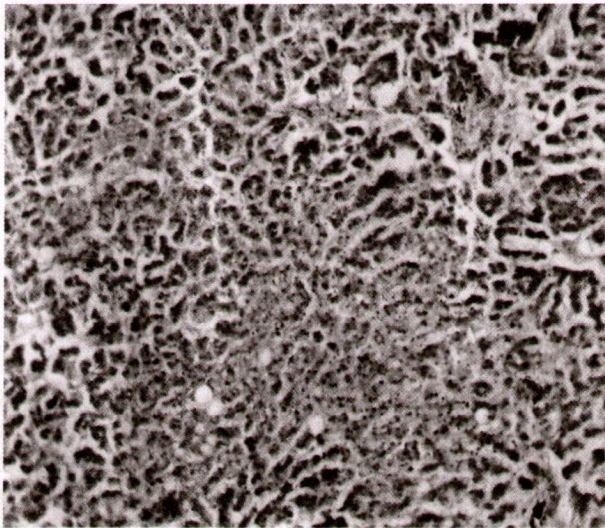
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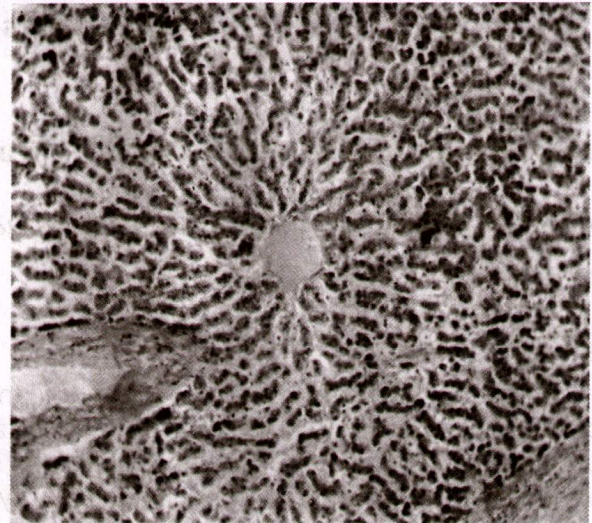


**Figure- 1 :** At temperature 30 0C & duration 8 hours showing architecture is maintained, sinusoids slightly dilated, cord pattern is maintained. In cytoplasm mild degree of hydropic changes are seen. (H/E X HP)





**Figure- 2 : At temperature 33 0C and duration 16 hours showing – sinus dilated. Vessels also dilated. Cytoplasm show vacuolation and fatty changes. There is marked glycogen depletion. (H/E X HP)**



**Figure- 3 : At temperature 32 0C and duration of 33 hours showing architecture maintained. Foci of liver cell necrosis & mononuclear infiltration. Central vein thickened, sinus dilated & filled with fluids, cords separated. Nuclei showing degeneration & fragmentation. Cytoplasm showing fine vacuolation, hydropic changes. (H/E X HP)**



## Originals and Papers

### Trends of road traffic accidents in Seurat city

*Ganesh Govekar\**, *Gaurang Patel\*\**, *Bhaumesh Rajdev\*\**, *Chandresh Tailor\*\*\**, & *Dharmesh Shilajiya\*\*\*\**

#### Abstract

Present study was carried out from 1<sup>st</sup> January 2006 to 31<sup>st</sup> December 2006 at Dept. of Forensic Medicine and Toxicology, Govt. Medical College and New Civil Hospital, Surat; to study the distribution, nature and types of injuries received during fatal Road Traffic Accidents (RTA) and to suggest possible preventive measures. Surat is an industrial city with hub to diamond and textile industries, so the people from all over the country come here to earn bread. According to the National Crime Records Bureau (Ministry of home affair), the incidence of accidental deaths has shown a mixed trend during the decade 1996-2006 with an increase of 43 per cent in the year 2006 as compared to 1996. The population growth during the corresponding period was 20.2 per cent whereas the increase in the rate of accidental deaths during the same period was 19 per cent.

During present study period 1731 total postmortems have been conducted, out of which, 243 cases were of road traffic accidents.

**Key words:** *Road traffic injuries, head injury, vehicular accident & pedestrians.*

#### Introduction

The term **accident** has been defined as an occurrence in the sequence of events which "Usually produces unintended injury or death or property damage" <sup>1</sup>. Accident is an event, occurring suddenly, unexpectedly and inadvertently under unforeseen circumstances. In developed countries, RTA is the most common cause of death below the age of 50 years. Amongst all traffic accidents, RTA claims largest toll of human life and tend to be the most serious problem world over. Worldwide, the number of people killed in RTA is almost 1.2 million each year, while the number of injured could be as high as 50 million <sup>2</sup>. In India, over 80,000 persons die in

the traffic crashes annually & over 1.2 million get injured seriously and about 300,000 get disabled permanently. In India, for individuals more than 4 years of age, more life years are lost due to RTA than due to cardiovascular diseases or neoplasm <sup>3,4</sup>. The problem appears to be increasing rapidly in developing countries <sup>5</sup>. Currently motor vehicle accidents rank 9th in order of disease burden and are projected to be ranked third in the year 2020. Injuries due to RTA depends upon a number of factors, whether the victim is a pedestrian, a motorcyclist, a pedal-cyclist or 3/4 wheelers. Vehicle and environmental factors play vital roles before, during and after a serious RTA. The important factors are human errors, driver fatigue, poor traffic sense, mechanical fault of vehicle, speeding and overtaking, violation of traffic rules, poor road conditions, traffic congestion, road encroachment etc out of which most of them are preventable. Studies done by WHO shows that road accidents accounts for 2.5% of total deaths in India & in age group of 5-44 years, it is as high as 10% and is among six leading causes of death <sup>2</sup>.

The present study has been carried out regarding the various epidemiological, medico-legal aspects of vehicular accidents in Surat city

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population, making an attempt to establish various causative factors, pattern and distribution of injuries and thereby to plan successful measures against it.

## Materials and methods

The present prospective study was conducted in the Department of Forensic Medicine and Toxicology, Govt. Medical College and New Civil Hospital, Surat, during the period from 1st January 2006 to 31st December 2006. All the cases of road traffic accidents brought to the department for medico legal post mortem examination were the subjects of the study. Information regarding the date, time and place of the incident, age & related information was gathered from the detailed history taken from the relatives of deceased and from the police papers.

## Observations

It is observed that out of 1731 cases received for postmortem examination at our department, 243(14.03%) cases were road traffic accidental deaths.

**Table-1: Sex wise distribution**

Sex	No. of cases	Percentage
Male	220	90.5
Female	23	9.5
Total	243	100.0

It is observed that 220 (90.5%) subjects under this study were Males and 23 (9.5%) were Females i.e. Approximately 10:1 ratio for male : female. ( Table-1)

**Table-2: Age and sex wise distribution of the persons**

Age Groups	Female	Male	TOTAL
0-14 years	3	14	17(7%)
15-29 years	5	68	73(30%)
30-44 years	9	84	93(38.3%)
45-59 years	5	40	45(18.5%)
60-80 years	1	14	15(6.2%)
TOTAL	23	220	243

Age wise distribution of the cases is divided in to five groups as per WHO guidelines. It is observed that maximum no. of cases are found in the age group of 30-44 years, and

minimum no. of cases is found in the age group of 60-80 years, having more male victims in all age groups. ( Table-2)

We had observed that the persons died due to RTA were of four types. Out of 243 persons 99 (40.74%) were pedestrian, 17 (6.99%) persons were Cyclist, 96 (39.50%) were motor cyclist, 31(12.75%) were 3 or 4 wheeler users. (Table-3) Maximum number of deaths was seen in pedestrians & minimum no of deaths were seen in cyclists.

**Table-3: Distribution as per road users**

Type of Road users	No. of Persons	Percentage
Pedestrian	99	40.74
Cyclist	17	6.99
Motorcyclist	96	39.50
3 or 4 wheeler	31	12.75
Total	243	100

We have distributed the presence of external injuries according to type of victims. We had seen Abrasions, Contusions, Lacerations, Incised wound, Palpable fractures in persons died due to RTA. Among the presence of injuries, abrasions were present in maximum no of victims 202(83.12%). Palpable fractures were present in 165 (67.90%) victims.( Table-4)

We have distributed the injuries according to the presence on various body regions in relation to type of victim. Many persons have injuries over single, double or more body regions. Maximum no. of victims had injuries over Head region 190(78.1%) out of 243 victims. only small no. of victims had injury over neck region 10(4.11%). Among the victims motorcyclist had maximum no. of persons injuries over head region 78(81.25%) out of 96 persons.( Table-5)

We have also observed and divided persons with injuries present involving visceral organs. Many have injuries involving more than one visceral organ. Comparing the visceral injuries, maximum no. of persons had injuries involving Brain i.e. 52.61% out of total visceral injuries and in relation to no. of victims it is 74.48%.( Table-6)



**Table-4: Distribution of cases according to type of victim and injury**

Type of Victim	Type of injury					
	Abrasion	Contusion	Laceration	Incised wound	Stab wound	Fracture
Pedestrian (99)	84	38	46	1	0	67
Cyclist(17)	13	10	12	0	0	11
Motor cyclist(96)	80	58	52	0	0	70
3 or 4 wheelers(31)	25	16	13	1	0	17
<b>Total(243)</b>	<b>202 (83.12%)</b>	<b>122 (50.20%)</b>	<b>123 (50.61%)</b>	<b>2 (0.82%)</b>	<b>0</b>	<b>165 (67.90%)</b>

**Table-5: Type of victim and body region injured**

Type of Victim	Injuries present over body region						
	Head	Face	Neck	Chest	Abdomen	Upper limb	Lower limb
Pedestrian (99)	77 (77.7%)	18	3	27	13	17	31
Cyclist(17)	12 (70.58%)	8	2	6	4	7	8
Motor cyclist(96)	78 (81.25%)	20	4	36	18	36	32
3 or 4 wheelers (31)	23 (74.19%)	6	1	11	4	7	4
<b>Total(243)</b>	<b>190 (78.18%)</b>	<b>52 (21.39%)</b>	<b>10 (4.11%)</b>	<b>80 (32.92%)</b>	<b>39 (16.04%)</b>	<b>67 (27.57%)</b>	<b>75 (30.86%)</b>

**Table-6: Distribution according to visceral injuries**

Visceral injuries	No.	Percentage
Brain	181	52.61
Heart	10	2.90
Lungs	87	25.29
Liver	20	5.81
Spleen	21	6.10
Kidney	7	2.03
Mesentery	5	1.45
Intestine	11	3.19
Others	2	0.58
<b>Total</b>	<b>344</b>	<b>100</b>

It is observed that in winter season (From November to February months) there were 97 (39.9%) deaths, in Monsoon season (From July to October) 85(35%) deaths and in summer season (From March to June months) 61(25.1%) deaths occurred. That is the maximum no. of deaths occurred are in winter season.( Table-7)

**Table-7: Seasonal distribution of cases**

Season	No. of death	Percentage
Winter	97	39.9
Monsoon	85	35
Summer	61	25.1
<b>Total</b>	<b>243</b>	<b>100</b>



## Discussion

Road traffic accidents (RTAs) are increasing with rapid pace and presently these are one of the leading causes of death in developing countries. Vander sluis et. al.<sup>6</sup> has reported that traffic is the most important cause of severe injuries and the three quarters of the severely injured cases, who died during hospitalization are victims of traffic accidents. The incidence of accidental deaths in India has shown a mixed trend during the decade 1996-2006 with an increase of 43 per cent in the year 2006 as compared to 1996. A total of 3,14,704 accidental deaths were reported in the country during 2006 (20,529 more than such deaths reported in 2005) showing an increase of 7.0 per cent as compared to previous year.

In the present study, a total of 243 cases of fatal road traffic accidents (RTA) have been studied in respect to distribution, nature and type of injuries. A majority of fatal RTA have sustained multiple injuries. E.Ke N et. al.<sup>7</sup> have also reported occurrence of multiple injuries in 93.5% of the victims. Singh & Dhatarwal have also recorded involvement of multiple body parts in all cases. Abrasion, laceration, fractures, dislocation, head and visceral injuries were more commonly observed in fatal RTAs. In the present study, males to female ratio is 10:1. This is near to ratio of 9:1 as has been observed by Singh and Dhatarwal<sup>8</sup> and by B.R.Sharma et al. in northern India who has observed majority of male victims (84%). Highest incidence of fatalities have occurred in the age group of 30-44 years (38.3%) followed by the age group 15-29 years (30%). Kochar et. al.<sup>9</sup> have reported that maximal fatal accidents have occurred in the age group of 31-40 years and a preponderance of males (85%) is seen. Whereas Singh & Dhatarwal<sup>8</sup> has observed that the commonest age group involved is 21-30 years (27.3%) followed by 31-40 years (20.6%). Pedestrians have been mostly involved followed by motorized 2 wheelers. Pedestrians being the common victims can be explained by the fact that there is a lack of proper footpath and presence of vendors and other commercial installations by the side of the roads. Moreover majority of road users are pedestrians, thus they are comparatively more exposed to the risk of

accidents, and are of lower middle socioeconomic status, illiterate and lacks traffic sense. Our findings are in general agreement with these observers<sup>7, 8, & 9</sup>. Multiple visceral injuries (internal injuries) are quite common following fatal RTA. Table-6 has depicted various visceral organs involved in the RTA. In majority of cases, brain has been chiefly injured followed by lungs, liver and spleen respectively. A higher incidence of brain injury has also been reported by other workers<sup>7, 8, & 9</sup>. Singh & Dhatarwal<sup>8</sup> who had reported the incidence of head injuries as 50.4%. Severe brain injury is the most important cause of death, is held by vander sluisas<sup>8</sup>.

## Conclusion

We have done total 1731 Postmortems, out of them 243 were due to Road Traffic Accident (14.03%). We have observed in our study that deaths due to RTA are more in Males than in Females (10:1 ratio), & is more in younger age groups in Surat city. From the data it is observed that maximum no of victims were pedestrians, maximum no of persons had injuries on head region. Maximum no of motorcyclist had injuries over head from total motorcyclist. Maximum no. of deaths occurred in winter season.

In most of cases, fatal RTAs are due to human errors and are therefore preventable. Strict licensing policy especially for four wheelers, a greater awareness about traffic rules, cultivation of road traffic sense, curbing drug abuse, and a proper road network conforming to the volume of traffic will go a long way in curbing the incidence of fatal RTAs. Providing safe crossings and sidewalks or separate paths and lanes for pedestrians and cyclists, providing convenient and affordable, & frequent public transportation, operating in safe conditions will reduce the occurrence of road traffic accidents. Helmets on all riders of bicycles, motorcycles and mopeds are to be made compulsory to prevent head injuries which are the one of the most likely to result in death or disability of riders<sup>10</sup>. Seat belts are to be made compulsory for all drivers and passengers of cars and other four wheelers. Providing appropriate & immediate first aid at the scene of accidents, appropriate medical care in emergency rooms and appropriate post-



emergency medical care and rehabilitation shall also reduce the death and disabilities.

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## Originals and Papers

### Effects of dietary habits on epiphyseal fusion

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#### Abstract

The feature of appearance of secondary ossification centers which is commonly used for assessment of age is the timing of the union of epiphyses. The process of ossification may also be influenced by food habit, nutritional status, infectious disease, hormonal and metabolic disorders and physical activity.

The present study was conducted on western Rajasthani population to study the effects of dietary habits on the time of fusion of ossification center at the knee joint.

**Key words:** *Epiphyseal union, vegetarians, non vegetarians & radiography.*

#### Introduction

Extent of ossification and union of epiphyses in bones can be determined in living subjects by the use of 'skiagraphy'. The feature of appearance of secondary ossification centers which is commonly used for assessment of age is the timing of the union of epiphyses. Until the teenage years, the diaphyses of the long bones are separated from their epiphyses on both the ends.

While most researchers determine union visually, some scholars advocate the use of radiographs to determine the degree of union.<sup>1,2</sup> Various studies have been conducted time to time pertaining to effects of various factors governing epiphyseal fusion.

The study on 185 subjects, (104 males and 81 females) was conducted in Jammu and Kashmir. The effect of climate on time of fusion of

distal epiphyses of radius and ulna was noticed.

The observations showed that process of fusion is delayed in the subject living in cold climate.<sup>3</sup>

The effect of varying types of nutrition on ossification was conducted and concluded variation in ossification and epiphyseal union occur as a result of social position either in peasants, in artisans and in well to do people.<sup>4</sup>

In 1958 survey was conducted on four hundred healthy subjects (two hundred boys and two hundred girls of Dehradun and Lucknow whose ages range from 15 to 22 years. The study concluded that a predominantly non vegetarian diet, and the staple diet comprising of wheat slightly enhanced the process of fusion.

One more study reported that dietetic variations seemingly had no effect on the progress of epiphyseal union. The major drawback of their study is the fact that they did not include the girls below the age of 17 year and boys below the age of 16 years.<sup>5</sup>

#### Aims and Objectives

As the studies conducted on lower extremity related with dietary habits in Rajasthan are either inadequate or not published and so it is thought pertinent to conduct this study the effect of dietary habits on epiphyseal fusion if any.

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## Materials and methods

The present study was carried out in Department of Radiodiagnosis, Dr. Sampurnanand Medical College and Associated group of Hospitals, Jodhpur.

A total of 60 boys (30 vegetarians and 30 non-vegetarians) in the age group of 14-16 years from all strata of society were examined radiologically for determining average age and frequency of non-fusion of distal femur, proximal tibia and proximal fibular ends. An informed consent was taken.

Criteria for selecting subjects

1. The subject is born to parents living in western Rajasthan and has lived there since birth.
2. The persons consuming eggs were excluded.
3. Individuals who had fracture(s) were not selected.
4. Care was taken not to include any male with lower limb abnormality.
5. They have authentic documentation of their date of birth (i.e., horoscope, hospital records, school certificate)

X-Ray films were taken and developed with the help of experienced radiographers.

The knee region was skiagraphed for A-P view with joints fully extended.

The criteria which were followed for the fusion were that of employed by<sup>6</sup> i.e. the union was regarded as complete when –

1. Diaphyseo-epiphyseal space was completely obliterated and was bony in architecture and density
2. There was continuity of the periosteum between the epiphyses and diaphyses with no notching at the periphery of the epiphyseal line.

It was taken as incomplete union even when some amount of diaphyseo-epiphyseal space was still left.

For the study X ray films were divided into two groups for each epiphysis –

1. Those showing complete union (Figure-1)
2. Those showing non- union (Figure- 2)

## Precautions

Utmost care was taken regarding very carefully centering of the X ray tube over the epiphyses as it is quite easy to give an nonunited

epiphysis, the appearance of union by directing the cone of X ray obliquely.

## Results

The joints around the knee were studied and part of bones includes distal end of femur, proximal end of tibia and fibula. The percentage of bones showing non fusion is shown in table 1 for distal end of femur, Table II for proximal end of tibia and Table III for proximal end of fibula. The average age for which non fusion had been seen in both categories is shown and maximum age in which non fusion was seen is also shown.

## Discussion

The distal end of femur and proximal end of tibia showed no significant difference between the two categories i.e, Vegetarian and non vegetarian. These findings are in accordance with previous study who reported that dietetic variations seemingly had no effect on the progress of epiphyseal union.<sup>6</sup>

The proximal end of fibula showed significant difference between the two categories. This does not corroborates with study which was in favor of early fusion in non vegetarian.<sup>5</sup>

## Conclusion

Individuals taking non vegetarian meals show delayed fusion as compared to the vegetarians. Although data for femur & tibia were non significant but data for fibula showed significant difference between the two categories.

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**Table -1: Non fusion of epiphyses for distal end of femur.**

S.No.		Vegetarian (n=30)	Non-Vegetarian (n=30)
i)	Cases showing Non fusion	13(43.33%)	14(46.66%)
ii)	Average age of Non fusion	15yrs 08mths 27days	15yrs 04mths 04days
iii)	Maximum age in which Non fusion is present	15yrs 09mths 10days	15yrs 08mths 25days
Non significant			

**Table -2: Non fusion of epiphyses for proximal end of tibia.**

S.No.		Vegetarian (n=30)	Non-Vegetarian (n=30)
i)	Cases showing Non fusion	11(36.66%)	14(46.66%)
ii)	Average age of Non fusion	15yrs 04mths 04days	15yrs 03mths 15days
iii)	Maximum age in which Non fusion is present	15yrs 09mths 10days	15yrs 11mths 25days
Non significant			

**Table -3: Non fusion of epiphyses for Proximal End of Fibula**

S.No.		Vegetarian (n=30)	Non-Vegetarian (n=30)
i)	Cases showing Non fusion	11(36.66%)	19(63.3%)
ii)	Average age of Non fusion	15yrs 04mths 04days	15yrs 08mths 27days
iii)	Maximum age in which Non fusion is present	15yrs 09mths 10days	15yrs 11mths 25days
Significant			



## Originals and Papers

### Correlation of foot length with height amongst Maharashtra population of India

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#### Abstract

Estimating stature of an individual from the skeletal remains or from mutilated or amputated limbs or parts of limbs has obvious significance in personal identification in the event of murders, accidents or natural disasters. Stature estimation equations are most accurate when derived from one population and then applied to the same population. This is because the proportions from one population are not necessarily the same as those from another. This study was carried out in 500 males and 500 females between the age group of 25-35 years amongst residents of Ahmednagar district. The lengths of both right and left foot were measured as direct distance from the most prominent point on the back of the heel to the tip of the hallux or to the tip of second toe, when the second toe was longer than the hallux by spreading calipers. The height was measured in standing erect, anatomical position with standard height measuring instrument. To avoid diurnal variation, all measurements were taken at a fixed time. On computing the data, it was found that a strong positive correlation exists between the height and foot length. The correlation coefficients amongst males for height and foot lengths were 0.63 and 0.61 for right and left foot respectively and amongst females were 0.75 and 0.71 for right and left foot respectively.

**Key words:** Height, foot length, correlation & Maharashtra.

#### Introduction

Stature prediction occupies relatively significant position in the identification of an individual. Estimation of stature of an individual from the skeletal remains or from the mutilated or amputated limbs or parts of the body has obvious significance in personal identification. This has become useful in recent times due to mass disasters like tsunamis, forest fires, earth quakes and man made mass disasters like bomb blasts, plane crash, mass suicide etc. Height of the person is one of the cardinal parameters for identification that is often used. Many different parts of the body can also be used to estimate height.

Growth – a vital process is assessed by measuring the height of a person, which itself is a sum of the length of certain bones and appendages of the body. Aptly there exists established relationship of these appendages with the total height<sup>1</sup>. This relationship is very useful medico-legally, when only parts of the deceased body are available.

Many studies have proved beyond doubt that there is a positive correlation between stature and body dimensions<sup>1, 2</sup>. In a similar approach many workers have demonstrated positive correlation between stature and length of the long bones<sup>3-7</sup>.

Stature estimation is most accurate when derived from one population and then applied to the same population. This is because the proportions from one population are not necessarily the same as that from another<sup>8</sup>. It means that the different population groups exhibit variations in their body proportions as a result of which correlation of anthropometric body measurements to stature varies from population to population. The need of the present study arose due to the paucity of data in the region of

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Maharashtra relating to estimation of height by measurements of foot length.

## Materials and methods

This was a cross-sectional study conducted on 1000, healthy Maharashtrian individuals (500 males and 500 females). The age group of the individuals ranged from 25 to 35 years who were born and brought up in Maharashtra (Individuals who had attained skeletal maturity). Individuals with chronic and debilitating disease and having congenital and acquired deformities were excluded from the study. The right and left foot lengths were measured as a direct distance from the most prominent point of the back of the heel to the tip of the hallux or to the tip of the second toe; when the second toe was longer than hallux by spreading calipers. The height was measured in standing erect, anatomical position with standard height measuring instrument. To avoid diurnal variation, all measurements were taken at a fixed time of the day. Obtained data was statistically analyzed.

### Statistical analysis

Range, mean and standard deviation for each parameter were calculated. Correlation coefficient (-1 to +1) was calculated and regression analysis was applied. Correlation coefficient value near +1 indicated strong positive association and value near -1 indicated strong negative association.

## Results

Obtained data was statistically analyzed and the results of the study were tabulated in Table 1 and Table 2.

Table No. 1 shows that mean height of males was 167.90 cm. The mean foot length of right and left foot was 24.97 cm and 25.02 cm respectively. The correlation coefficients for height and foot lengths were 0.63 and 0.61 for right and left foot respectively. There was a strong positive correlation between height and length of both feet in males.

Table No. 2 shows that mean height of females was 154.98 cm. The mean foot length of right and left foot was 23.28 cm and 23.29 cm respectively. The correlation coefficients for height and foot lengths were 0.75 and 0.71 for

right and left foot respectively. There was a strong positive correlation between height and length of both feet in females too.

### Regression equations

The regression equations derived from data of the present study are as follows.

#### For male

From right foot length

$$\text{Height (cm)} = 167.9 + 1.145$$

(Right foot length in cm - 24.97)

From left foot length

$$\text{Height (cm)} = 167.9 + 1.063$$

(Left foot length in cm - 25.02)

#### For female

From right foot length

$$\text{Height (cm)} = 154.98 + 3.616$$

(Right foot length in cm - 23.28)

From left foot length

$$\text{Height (cm)} = 154.98 + 3.481$$

(Left foot length in cm - 23.29)

Thus estimated height in cm can be useful for medico-legal experts.

## Discussion

Assessment of height from different parts of the body by anthropometric study of the skeleton is an area of interest to forensic experts, anatomists and anthropologists. Height is one of the factors in determination of identity of an individual and it varies with race, sex, heredity, climate and nutritional status. These factors differ regionally hence different population groups exhibit variations in their body proportions as a result of which correlation of one bone length to stature varies from population to population.

Various workers have shown positive correlation between height and measurements of different parts of the body. Singh and Sohal (1951)<sup>9</sup>, Jit and Singh (1956)<sup>10</sup> have shown positive correlation between height and length of the clavicle. Athwale (1963)<sup>11</sup> derived a regression equation between height and the length of the forearm bones. Patel, Joshi and Dongre (1964)<sup>12</sup> have derived a regression equation between the length of tibia and height amongst Gujarati population. Shroff and Vare (1979)<sup>13</sup> have derived height from the length of superior extremity and its segments.

Qamra et al (1979)<sup>14</sup> did a study on height and foot length and derived a correlation



coefficient of 0.69 for males and 0.70 for females. They concluded that there is a strong positive correlation between height and foot length of an individual.

Mohanty et al (2001)<sup>4</sup> have studied arm span as a predictor of height. Jasuja and Singh (2004)<sup>2</sup> have derived a regression equation between height and hand length, and also, height and phalange length.

Patel S.M. et al (2007)<sup>1</sup> worked on 502 (278 males and 224 females) asymptomatic, healthy medical students belonging to various regions of Gujarat, of age range 17 to 22 years for the estimation of height by left foot length. They found that correlation coefficients for these variables were 0.65 and 0.8 in males and females respectively.

As it is evident from the present study the mean height and foot length in females was less as compared to males. The mean height of females is 12.92 cm less than the height of males. The mean foot length for right and left foot in females is less by 1.69 cm and 1.73 cm respectively than that in males. This can be explained on the basis that the ossification of long bones occurs earlier in females than in males.

The present study revealed that the correlation coefficients in males for height and foot lengths were 0.63 and 0.61 for right and left foot respectively and that in females were 0.75 and 0.71 for right and left foot respectively. Correlation coefficient for all these parameters was near +1, which proves that there is a strong positive correlation between height and foot length. Similar findings were reported in the previous studies too<sup>1, 14</sup>.

Patel S. M. conducted study only on left foot and found positive correlation between left foot length and height<sup>1</sup>. However our study revealed a new observation that there is a strong positive correlation of right foot length as compared to left foot length with height, as we took in to account lengths of both feet.

There is a difference between the correlation coefficient of males and females in the present study as well as in other studies<sup>1, 14</sup>, which indicates that there is a need to have a separate regression equation for both the sexes for determination of height from foot length. The

positive correlation was found to be stronger in females as compared to males; the same was also noted in earlier studies<sup>1, 14</sup>.

The correlation coefficient of the present study for both sexes is not in accordance with the correlation coefficient of similar studies conducted in the other regions<sup>1, 14</sup>; which highlights the existence of regional variations, and hence the regression equations generated from one region cannot be generalized. So there is a need to generate separate regression equations for each region.

Our study concludes that there are variations in correlation coefficients on the basis of the side of foot, gender and region, so there is a need to generate separate regression equations for these parameters, for estimation of height from foot length. The regression equations obtained from the present study are useful to estimate the height from foot length amongst Maharashtrian population. Though we took care in doing a random sampling in the available population, still we are not able to comment about the external validity of our findings. So there is a need for further study on the lines of ethnicity and religion.

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**Table-1: Range, mean, standard deviation (SD), correlation coefficient (r) and regression coefficient (b) values of anthropometric measurements in adult males.**

Parameters	Range cm	Mean $\pm$ SD	Correlation Coefficient (r)	Regression Coefficient (b)
Height (cm)	150 – 182	167.90 $\pm$ 6.392		
Right foot length (cm)	21.1 – 29.1	24.97 $\pm$ 1.387	0.63	1.145
Left foot length (cm)	21.1 – 29.2	25.02 $\pm$ 1.186	0.61	1.063

**Table-2: Range, mean, standard deviation (SD), correlation coefficient (r) and regression coefficient (b) values of anthropometric measurements in adult females.**

Parameters	Range	Mean $\pm$ SD	Correlation Coefficient (r)	Regression Coefficient (b)
Height	143 – 168	154.98 $\pm$ 6.053		
Right foot length	20.8 – 26.4	23.28 $\pm$ 1.091	0.75	3.616
Left foot length	20.0 – 26.4	23.29 $\pm$ 1.108	0.71	3.481



## Originals and Papers

### Walking bare foot : Print shows stature of a male individual

G. M. Raju\*, V. Vijaynath\*\* & M. R. Anitha\*\*\*

#### Abstract

Estimation of stature is a major concern in Forensic Medicine & Forensic Anthropology. This present study is helpful in scene of crime, where only bare foot marks are available. Estimation of stature plays vital role, where only walking on bare foot prints are available.

The present study is an attempt to examine the relationship of stature by walking on bare foot print of 500 males of South India, in the age range from 18 to 21 years. The result shows statistically highly significant ( $p < 0.001$ ) for walking on bare foot print, selected for the study were found strongly & positively co-related with stature. The highest co-relation, co-efficient is + 0.66 for males. The regression of formulae was checked for their accuracy & reliability.

**Key words:** *Forensic Anthropology; stature, walking barefoot length & South Indian population.*

#### Introduction

Louise Robbins reported the possibilities of establishing the height of a person from foot print.<sup>1</sup> Walking is a cyclic process of human locomotion that requires at least one foot to be on the ground at all times. During the stance phase, the foot passes through processes of heel strike, base of foot, heel off, and toe off, during which time it leaves a footprint<sup>2</sup>. This bare foot print represents the sum of the contact with ground and acceleration phases through which the foot passes. The ground contact information can change significantly during the type of locomotion like running and walking, but the imprint that the bare foot makes during walking has reproducible characteristics<sup>2</sup>.

Bare Foot prints also register the plantar surface of the sole<sup>3</sup>. The bare foot prints reflect the internal structure of the feet.<sup>4</sup> The osseous ligaments, and thus the footprint made during locomotion, is dynamic and difficult to model because it is not a static one.<sup>2</sup> As the foot

skeleton attains its adult proportions, a sexual differentiation also occurs in the bone structure of the feet<sup>3</sup>. Evan<sup>5</sup>, from his work concluded that, male bones bear stronger tensile and compression strength than female bones. The male bones thus have a roughness brought about by the stress of larger muscles and ligament masses. This roughness presents as an increase in the size of the bones in the male.<sup>6</sup> The bones in the feet of the female do not show these rough traits.<sup>3</sup> They can yield the information about the size and shape of bones in the feet. Barefoot impressions are usually found in soil in which there is a considerable diversity of that medium's ability to capture and retain an accurate representation of the foot<sup>7</sup>. Similarly, it is found that step length, which is a product of movement of lower limbs and pelvic girdle when a person is walking, can be helpful in estimating the stature of an individual.<sup>8</sup>

Human feet and their impressions have yielded a tremendous amount of information regarding the physical characteristics of human feet<sup>7,10,11,12,13</sup>. This information has provided the probabilities of particular morphological characteristics and their occurrence in the human population. Jasuja and Manjula<sup>8</sup> established that stature can be measured from foot step length and gave a number of statistical formulae based on individuals in a 'normal' pattern of walking. It was observed, however, that the step length

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varies with speed: the greater the walking speeds, the longer will be the step length. Therefore the formulae deduced for 'normal' walking may not be appropriate when applied to faster pace walking in stature estimation.<sup>8</sup>

People in India often walk with bare feet, which necessitates an imperative and intensive study on, bare foot and bare foot prints.<sup>11</sup> Excellent monograph by Gwyer<sup>14</sup> is published in 1904, constitute some of the pioneering efforts, giving information on the science of foot prints, published in India.

Methods of calculating stature from bare foot print measurements have been suggested by some authors.<sup>10,11</sup> Martin<sup>12</sup> was probably the first to have developed a ratio index of foot length to stature, concluded that, foot length relative to stature shows no great variation within the human races, on an average amounting to 15%. Charnalia<sup>13</sup> too, developed ratio indices for various subgroups.

Robbins<sup>11</sup> measured the foot length of 550 subjects as the maximum distance from the heel to the tip of whichever toe gave the longest measurement. This study showed a method, that how these ratio indices could be used for estimation of stature. Gordon and Buikstra<sup>15</sup> analyzed the statures and foot length and widths of 867 soldiers in a combat boot-fitting study. Barker and Scheuer<sup>16</sup> investigated the

Topinard<sup>17</sup> estimate by collecting data from 105 seated and walking subjects. Topinard<sup>17</sup> estimated that on average a person's footprint length was equal to 15% of a person's height.

However, the study of human foot and foot prints have received scant attention from the forensic experts.<sup>18</sup> Footprints are found at almost every crime scene. Careful scientific examination of these prints may yield information which can help in linking a suspect with the scene of crime. Footprints can also help in personal identification by exhibiting characteristic morphological features.<sup>8</sup> More often in an aircraft accident, it is the feet which are recovered more intact than any other parts of the body.<sup>19</sup>

It is now accepted that feet can be an excellent clue regarding personal identity.<sup>10,18</sup> In the case of a crime, a suspect can either be eliminated, statistically included as a possible source of a track, or identified to a track. Foot

track impression in soil can be used to identify a particular person. These features, when visible, can be photographed or cast and compared directly to controls. A "perfect fit" would identify the individual.<sup>7</sup> Estimation of an individual's height from various foot measurements is possible because the foot, like other major parts of human body (e.g. trunk, limbs), exhibit an algometric relation with total body height.<sup>20</sup>

Hence, the present study has been undertaken to examine walking bare foot length to estimate stature of a male individual in Southern region of India.

## **Materials and Methods**

The study was conducted in Davangere, Karnataka, India among randomly selected subjects of different college who fulfill the inclusion criteris. (500 males), between the age group of 18-21 years of South Indian population.

\*Materials: Printer black ink, Glass plate, Manual Roller, Pencil, Measuring scale, Vertical wooden scale, Proforma, Calculator.

## **Procedure**

1. Male subjects in the age group of 18 to 21 years were chosen randomly from Southern part of India.
2. The aim and objectives of the intended study were properly explained to the subjects and consent was taken on the proforma sheet. They were asked to wash and dry their foot to remove dirt. A plain glass plate of about 24 X 24 inches was cleaned and uniformly smeared with a thin layer of black printer ink by using the roller. The subjects were then asked to walk casually on the smear glass plate. So that print of left foot will be transferred to the duly prepared foot print proforma, keeping in the mind the need to minimized possible technical source of dimensional artifact. In this way each and every individual's left walking bare foot print recorded.

## **Recording of the height:**

The height of the each subject was recorded by asking them to stand erect with bare foot on the ground, plate attached to the vertical Wooden scale of two meters. Then the subjects were asked to stand without support. The arms on the side, head in steady position in that way



the height was measured on the vertex of the head with the help of horizontal thin plate. The height of individual was measured in centimeters to the nearest millimeter.

### Measurements of foot length

- The length of footprint was measured from the heel to the tip of the extension of longest toe in the footprint, which was recorded in centimeters. This length was taken as the walking foot length of that particular individual.
- All unclear footprints and deformed footprints were discarded. With this foot length the individual height was measured with the help of regression formula.
- The calculated height was determined. This calculated height was compared with the actual height and the results are encouraging.

### Observations

Table – 1: Bare foot length & actual height of the male subjects

Foot length [ Cms ]	No. of subjects.	Height in Cms	
		Mean	SD
22-23	18	159.7	0.5
23-24	66	168.7	4.6
24-25	100	172.3	5.4
25-26	150	176.2	5.6
26-27	98	176.3	5.7
27-28	48	181.0	4.5
28-29	20	186.8	1.5

In our study the maximum number of subjects was in barefoot length of 25-26 cms.in

which there were 150 males subjects and average height is 176.2cms. With standard deviation of :  $\pm 5.6$  cms. Average height of male subject with corresponding various levels of barefoot length is represented.

Bare foot length while walking varied among this subject from 22-29cms. It can be seen that height increases as the barefoot length increase showing positive correlation between the two parameters'. The average height was 159.7 cms. For walking barefoot length of 22-23 cms., which increases to 186.8 cms., with maximum walking barefoot length of 28-29cms.

Table – 2: Prediction of height for given bare foot length<sup>3</sup>

Foot length In Cms.	Predicted Ht ( cms )	* Range	
		Min	Max
21	159.8	154	165
22	163.3	158	169
23	166.7	161	172
24	170.1	165	176
25	173.6	168	179
26	177.0	172	182
27	180.4	175	186
28	183.8	178	189
29	187.8	182	193

\* Means  $\pm$  SD SD Reg:  $\pm 5.4$ ,

This table shows the prediction of height for given barefoot length. In males for different levels of walking barefoot length predicted stature and probable range of height of an individual are tabulated. Regression Equation for Male:  $Ht = 87.8 + 3.43 (FPL)$

Table – 3: Correlation between bare foot length, and height among male subjects

Variable (cm)	N	Mean $\pm$ SD	Range	Corr* Coeff. 'r-value'	Reg. Coeff. 'b-value'	Reg. equation (Predictor of Ht).
Barefoot length	500	25.36 $\pm$ 1.37	22.4 - 28.2	+ 0.66	3.43	Ht=87.8+3.43(FPL*)
Actual height	500	174.75 $\pm$ 7.15.	158-194			

\* Diff in Corr. Coeff. Statistically significant.\* FPL – Foot print length.



- Present study aims to assess the relationship between bare foot lengths, stature among male healthy subjects. The data was analyzed from, 500 subjects measuring the length of bare foot.
- Correlation and regression analysis, were applied to measure the relationship and prediction of stature there-on with the knowledge of foot length.
- Barefoot length increases while walking due to weight bearing and there will be elasticity of skin at toe and heel.
- Stature of an individual can be co-related with the barefoot length on walking.
- One of the more satisfying ways to evaluate predictive statistical results is to apply the formula to an independent sample in which the predicted values can be compared to known values.
- Our study is highly significant ( $P < 0.001$ ) and favours height determination by the regressions equation. Therefore, the average accuracy for predicting height by our correlation and regression equation on this test sample is statistically significant.

## Discussion

Very seldom studies have examined the barefoot length while walking to estimate the stature. In this study the creation of a walking print involves a complex interaction of foot upon surface. The heel strikes first and subsequently the axis through which weight is transferred. Traces a pathway along the lateral border of the foot, crossing medially through the ball of the foot to toe-off where the big toe leaves the surface.<sup>21</sup> in this way it can be seen, that a walking barefoot print, is elongated beyond the actual length of the foot.<sup>22</sup>

Once a barefoot print length has been obtained while walking then by applying the regression equations the stature can be determined.<sup>23</sup> the minimum, maximum and mean values of the barefoot length obtained from this study and compared to those obtained in previous studies. The previous studies have not measured the walking barefoot length.

Eugene Giles and Paul H., et al<sup>24</sup> studied the estimation of height from foot. Here the number of subjects studied was not mentioned.

Even the method of measuring the length was not clear and not mentioned correlation, co-efficients. But in this study the barefoot length while walking on the single proforma sheet and the method for recording and measuring the length was the simplest available.

According to Abraham Philip<sup>23</sup>, estimating stature from foot size by using regression method was the study. These equations were used to predict stature of a known foot size. In our study regression equations were created to predict stature of walking left barefoot length for males.

V.M. Charnalia<sup>11</sup> has established in his study that there is high correlation between foot length and foot breadth is statistically significant 0.63. Correlation between foot length and stature is smaller 0.46.

J. Abraham Philip<sup>21</sup> estimated stature from foot prints and foot outlines standing. Our study is estimating the stature by walking barefoot length.

In this methodology, training required for use of calipers is not required. This methodology has an added advantage in its use for large field surveys, as the barefoot print can be recorded during the survey and the same can be measured. The stature as calculated from the minimum, maximum and mean values of bare foot length. This confirms the validity of the linear regression equations developed.

This present study has been taken to fix the actual height of a person by measuring walking barefoot, which shows significant values. This present study shows that males of Indian origin in the southern part of India do have significant correlation with actual height from walking barefoot. The statistical analysis of barefoot length shows that a walking barefoot length in male population more correlates with actual height. The results of this study are quite encouraging and this ultimately would help as a useful tool for foot print experts either in the field of forensic science or in law enforcement field.

## Conclusion

The Bare foot prints of 500 males of the South Indian population were studied by taking walking bare foot length to estimate the stature.

The need to develop methods to reconstruct height from skeletal remains has been



stressed by many workers.<sup>25</sup> Due to its application, in Medico-legal investigation in identifying victims in mass disasters has become easy. Many variables like racial, ethnic and nutritional factors play an important role in human development and growth. Hence, different normograms have become necessary for different populations. Its need is greatly felt when one is confronted with the problem of reconstruction of stature from meagre information available, since norms of other population are bound to give incorrect results. The estimation of stature from various long bones has been the traditional method. Several workers have attempted it with variable degrees of success.<sup>25</sup> However foot dimensions have not frequently been used for this purpose.

In this study significant correlation of height with walking barefoot length has been observed. These findings are consistent with other studies published previously. The confirmation of validity of linear regression equations to reconstruct stature from walking barefoot length on a fresh sample provides excellent normograms for the population of this area. Although these normograms would seem to be applicable in younger adults only, the application of correlation factors derived with similar characteristics could, however, enable us to use for older subjects, provided the rate of structural loss is known.

The measurement of height may also be of use in estimation of stature in deformed subjects as previously suggested by Zorab,<sup>26</sup> 1963 for the estimation of uncoiled height of the subject.

Moreover the estimation of stature from walking barefoot is easy, economical and convenient. No specialized equipment or training is required to use this method. Besides, as it is brought out in this study, the results obtained in laboratory studies can be duplicated under field survey conditions. Anthropologists, forensic experts and investigating officers should be able to use this method to their added advantage. Thus this study has been able to add another method to estimate stature from barefoot length while walking.

Barefoot length displays a biological correlation with height that suggests the stature which might be estimated from walking bare foot length. Such evidence provides the investigator the best or only opportunity to gauge suspect's physical description. Newly determined percentages and linear regressions for determining height from barefoot length while walking for young adult males are presented and evaluated.

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## Originals and Papers

### Variability in Intracranial hemorrhages in relation to nature of trauma to the head – A two year study

Shreemanta Kumar Dash\* & Asis Kumar Ray\*\*

#### Abstract

With growing population, rapid urbanization and industrialization associated with high materialistic mind of human beings, incidence of unnatural deaths increasing in geometrical progression. Out of all unnatural deaths trauma plays the major role and head is the most vulnerable part to receive injuries in different manners. Intracranial hemorrhage being one of the major entities amongst all types of intracranial lesions is not only responsible for death but also impart numerous complications in life. Though many authors highlighted deaths and complications of Intracranial hemorrhages in details still no appropriate attempt had been made to evaluate such lesions in relation to different causative agents. Very little information regarding the epidemiology of ICH in head injuries with reference to causative agents is available. In this present study it is seen that most of the victims belong to male population (78.26%) and of within 21 to 40 years (49.27%) age group, RTA was found to be the most common cause of head injuries revealing ICH (51.68%) whereas hard and blunt instrument was used to cause ICH in the most of the assault related head injuries, injury to the scalp was detected in 95% cases of EDH, fracture of the skull bone was found in 90% cases of EDH whereas SDH occurs in 56.88% of cases without any fracture to skull bone, mixed type of ICH was detected in 35.74% followed by solitary SDH in 28.01%, the commonest site of EDH is found to be at temporal region (45%) followed by Frontal (30%), whereas SDH is more common over Parietal area (48.29%) followed by Frontal (25.86%).

**Key words:** Trauma, Intracranial hemorrhage, EDH & SDH.

#### Introduction

With growing population, rapid urbanization and industrialization associated with high materialistic mind of human beings, incidence of unnatural deaths increasing in geometrical progression. Out of all unnatural deaths trauma plays the major role and head is the most vulnerable part to receive injuries in different manners. ICH being one of the major entities amongst all types of intracranial lesions is not only responsible for death but also impart numerous complications in life. The different

types of intracranial hemorrhage like EDH, SDH, SAH and Intracerebral hemorrhage are of complex and diversity in nature to occur in traumatic head injuries. The survival rate of the victims sustaining such type of intracranial injuries depends to a large extent on the timely reorganization and treatment of ICH. Though many authors highlighted deaths and complications of ICH in details still no appropriate attempt had been made to evaluate such lesions in relation to different causative agents. Very little information regarding the epidemiology of ICH in head injuries with reference to causative agents is available. Present work focuses on variability of intracranial hemorrhage in relation to nature of trauma to the head is an attempt to establish the demographic profile, mode and extent of ICH due to head injuries by conducting a postmortem study on the corpse brought for medico legal autopsy.

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## Materials and methods

The present work on "Variability of intracranial hemorrhage in relation to nature of trauma to the head" was conducted in the department of Forensic Medicine and Toxicology of M.K.C.G. Medical College, Berhampur during the period from 01.01.2004 to 31.12.2005. 207 cases of head injuries brought for postmortem examination were taken into consideration as study materials. Each individual case was analyzed thoroughly with special attention to different types of intra cranial hemorrhage with relation to nature of trauma and other modified intrinsic and extrinsic factors. The circumstances of sustaining the injuries were collected from the relatives accompanying the corpse, from the investigating police officers and from available hospital records. The collected information and data were individually compiled and collectively evaluated to find out a specific conclusion.

## Observations

During this present study up on 1077 number of medicolegal autopsies conducted in the Morgue of F .M .&T Department of M.K.C.G. Medical College , Berhampur during period starting from 01.01.2004 to 31.12.2005 out of which 207 cases were isolated who died due to Head Injuries.

The commonest cause of head injury in Road Traffic accident 107 in number followed by fall from height 32 numbers. Railway related head injuries are almost par with falling from height 31 numbers. Head injury caused by assault as a whole is of having significant in number i.e. 37 next to RTA. Amongst the head injury caused by assaults hard and blunt weapon was the most common causative agents i.e. 24 out of 37 (64.86%). Cutting instruments although less frequently used to cause head injury very list number were produced by firearms. It also observed in the table that males are most vulnerable to all types of head injury be it accident or assaults. (Table-1)

In our observation we found that maximum number of cases were observed ion the age group 21-30 years followed by 31-40 years. It is also observed, in all age groups the males out numbered the females but it is less in

extremes of ages (Table -2).

It is observed that 182 cases out of total 207 head injuries were having some form ICH either solitary or in combination which constitutes 87.92 % of the total.. In the present series of 207 head injuries the mixed type (combination of more than one) of haemorrhage variety out numbered other types constituting 74 cases i.e. 35.74%. But taking individually into consideration sub-dural hemorrhage was the highest one 58 (28.01%) followed by extradural 20(9.66%), and subarachnoid 17(8.21%). The least one is intra cerebral hemorrhage 13 (6.28%). In 25 cases 12.07% no hemorrhages were noticed. (Table -3).

It is also seen that the combination of SDH and SAH is very common in all types of head injuries resulting in death followed by SAH and intracerebral hemorrhage both in accident and assaults in this present study. Combination of all verities i.e. EDH, SDH, SAH, and Intracerebral type were not detected at all and the combination many varities were also less frequent. Out of 182 cases of ICH 74 are present mixed type haemorrhage (40.65%) and the rest 108(59.34%) present alone. The highest incidence is combination of SDH + SAH which constitutes maximum number 19 (25.67%) followed by SAH &Intra cerebral type 14(18.91%), EDH &SDH and SDH &Intracerebral each 11 in number (14.86%) being EDH& Intracerebral type least common. (Table -4)

It is observed that majority of Intracranial hemorrhages (ICH) were due to Road Traffic accidents which constitutes 93 cases (86.91%) of total head injuries (107) due to RTA followed by fall from height 30cases(93.75%) out of 32 cases and railway accidents 25 (80.64%). In assaults, 24 cases of head injuries due to hard and blunt trauma had ICH (i.e. 100%), 8 cases out of 11(72.72%) are due to cutting weapons had ICH and 2 out of 2 (100%) in case of firearms. (Table-5).

Our observation reveals that EDH is common in temporal region 9(45%), followed by the frontal area 6(30%) and least being at occipital area 2(10%) and in 58 cases SDH 28(48.29%) are as situated on parietal area followed by 15(25.86%) cases on frontal , 11 (13.96%) on temporal and least in occipital and base of brain 2(3.44%). But SAH is predominant



at base area i.e 9 cases out of 17(53.94%) and 5(23.41%) at parietal area being least common at frontal and occipital area. Intracerebral haemorrhage is common at frontal area. Taking all types of ICH into consideration parietal area is most commonly involved 37(33.25%) followed by frontal area 27(25%) , temporal area 25(23.14%) and least common at occipital area 8(7.74%). The site of EDH are more common at temporal region, SDH at parietal area, subarachnoid at the base, intracerebral at frontotemporal area(Table-6).

## Discussion

During the study of sex wise distribution of head injuries in relation to causative agents (Table No – 1) it has been observed that, maximum head injury victims were males. The males were almost 3 to 4 times more affected in comparison to that of female population. It is also observed Road Traffic Accident is the commonest cause of head injuries in both males and females. The findings are almost similar to those of other workers like W. Mc. Kisson, J.C. Taylor, W. H. Bloom and K.Till (1960)<sup>1</sup>, T.H. Edna et al. (1979 – 1980)<sup>2</sup> and Singh Dalbir et al. (1996)<sup>3</sup>. It is because the males are more exposed to outside, more mobile and have more public contact in contrast to the females.

Age and sex wise analysis of head injury victims of the present study (Table – 2) it is found that maximum number of cases were in the age group 21 – 30 years followed by 31 – 40 years. People in two extremes of life i.e. in between 0 – 10 and above 70 years are least affected. This observation in connection with age in our study found to be similar with the study of Wolfgang, M. (1958)<sup>4</sup>. Dixit PC, Loya, F. (1986)<sup>5</sup>, Das Sanjay 1989, found majority of victims were males in age group of 20 – 30 years. Other author like Fimate,

L. (1989)<sup>6</sup>, and Mohapatro S.C. (1991), Pillay, V.V. (1992)<sup>7</sup>, Ghosh P.K. (1992)<sup>8</sup>, Subramanyam and Sheikh (1994)<sup>9</sup>, Banerjee K.K. (2000), Rao N.G. (2000)<sup>10</sup> had also got similar results as that of the study.

Prevalence of male victims in 21 – 40 years of age group are more active, and most commonly engaged in out door activities, thus increasing their chances of meeting traffic accidents and falls, leading to death.

On analysis of pattern of intracranial haemorrhages it has been observed from Table-3 that mixed type of haemorrhage is the commonest type. But taking single type into consideration subdural type of haemorrhage was the highest one 58 (28.01%) followed by extradural 20 (9.66%) and subarachnoid 17 (8.21%). The least one was intracerebral type 13 (6.28%). This observation is at par with the observations of Galbraith, S. 1976<sup>11</sup>, Yakamani, I. (1993)<sup>12</sup>, Jena, M.K. 1996<sup>13</sup>, Behera, A. (1988), Dayananda, B.R. (1971)<sup>14</sup> Rao, N.G. (2000).<sup>10</sup>

From the observation of Table -4 it is found that the highest incidence in case of combined hemorrhages is SDH & SAH which constitute 25.67% followed by SAH & Intracerebral, EDH & SDH and least being EDH & Intracerebral haemorrhage. Our observation is quite similar to the observation of the previous workers like Anjankar, A.J., Khajuria, B.K. and Tirpude B.H. (1998)<sup>15</sup>, Agarwal, G et al (1997)<sup>16</sup>.

The analysis of Table -5 focusing on types of ICH in relation to causative agents, reveals ICH is more common in falling from height in the accidental group i.e. 30 out of 33(93.75%) while in the assault group hard & blunt instruments & firearms produce more number of ICH. In RTA SDH is most common

**Table-1: Sex wise distribution of head injuries in relation to causative agents**

ACCIDENT	SEX	MALE	%	FEMALE	%	TOTAL	Percentage
ASSAULT	RTA	86	53.08	21	46.66	107	51.69
	Railway accidents	21	12.96	10	22.22	31	14.97
	Fall from height	22	13.54	10	22.22	32	15.45
	Hard and Blunt	22	13.54	2	4.44	24	11.59
	Cutting weapon	9	5.55	2	4.44	11	5.31
	Fire arm	2	1.23	0	0	2	0.96
	TOTAL	162	100%	45	100%	207	100%



form of ICH followed by EDH. So also SDH is found commonest in railway accidents, fall from height, assault with hard and blunt weapons and with cutting weapons. Our observations are at par with Dixit P.C. (1994)<sup>17</sup>.

In the present study it was interesting to find that the ICHs are to some extent area specific (Table-VI). EDH is common in temporal region followed by frontal area and least at occipital area whereas SDH is more common in parietal followed by frontal and temporal areas and SAH is at the base while intracerebral hemorrhage is commonly found in frontal area. In the present study occipital area of brain is least involved in ICH. This observation confirms the observations of Tyagi et al. (1986)<sup>18</sup>, Hava K: et al (1990) and Agarwal G. et al. (1997)<sup>19</sup>.

## Conclusion

Based on analysis of 207 cases of death due to Head injuries, out of total no. 1077 medico legal autopsies conducted in the Department of Forensic Medicine and Toxicology, M.K.C.G. Medical College, Berhampur for a period of two years it is observed that most of the victims are within 21 to 40 years (49.27%) age group, the youngest child was a female child of 3 years whereas the eldest one was a male of 79 years. RTA was found to be the most common cause of Head injuries revealing ICH (51.68%) whereas hard and blunt instrument was used to cause ICH in the most of the assault related Head injuries. Mixed type of ICH was detected in 35.74% followed by solitary SDH in 28.01%. The commonest site of EDH is found to be at temporal region (45%) followed by Frontal (30%), whereas SDH is more common over Parietal area (48.29%) followed by Frontal (25.86%). Occipital area is least affected in any type of ICH. Although RTA is the commonest cause of Head Injury, ICH is seen more in falling form height (93.75%) in comparison to RTA (86.91%).

Basing on the result of this study the author desires to suggest the following:

1. The autopsy surgeons are advised to open the cranial cavity in every case and to inspect the intracranial structures in detail, as there are possibilities of occurrence of ICH without any visible injury to the scalp or skull. The can avoid future allegations and counter

allegations.

2. As EDH and SDH are more common entity in all types of head trauma either alone or in combination with injury to other intracranial structures and since the complications arising out of most of the intracranial hemorrhages (rising intracranial pressure) are presentatable, the clinicians (Surgeons) should take utmost care in making an early diagnosis of such hemorrhages and to take immediate measures to save the life of the patients. Delay in diagnosis and subsequent intervention may be too late to save the life of the patients. Therefore in all cases of head injuries with or without gross damage to the brain tissue the first and foremost duty of the clinicians is to exclude any type of coexisting ICH to prevent subsequent epiphenomena (second accident).

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**Table-2: Age and sex wise distribution of head injury cases**

Age Group in Year	MALE	FEMALE	TOTAL	Percentage
0-10	5	3	8	3.86
11-20	16	1	17	8.21
21-30	47	9	56	27.05
31-40	36	10	46	22.22
41-50	25	8	33	15.94
51-60	15	6	21	10.14
61-70	14	6	20	9.66
>70	4	2	6	2.89
Total	162	45	207	100%

**Table-3: Pattern of intracranial haemorrhage**

SL. NO	TYPE OF ICH	TOTAL NO. OF CASES	%
1	EDH	20	9.66
2	SDH	58	28.01
3	SAH	17	8.21
4	ICH	13	6.28
5	MIXED	74	35.74
6	NIL	25	12.07
	TOTAL	207	100

**Table-4: Incidence of mixed ICH**

MIXED ICH	ACCIDENT	ASSAULT	TOTAL
EDH + SDH	9	2	11
EDH+SAH	8	2	10
EDH+Int. Cer.	1	0	1
SDH+SAH	17	2	19
SDH+Int. Cer.	10	1	11
SAH+Int. Cer.	11	3	14
EDH+SDH+SAH	2	0	2
EDH+SDH+Int. Cer.	2	0	2
EDH+SAH+Int. Cer.	1	0	1
SDH+SAH+Int. Cer.	2	1	3
EDH+SDH+SAH+Int. Cer.	0	0	0
Total	63	11	74



Table -5: Types of ich in relation to causative agents

ICH	EDH	SDH	SAH	Int. Cer.	Mixed	Total	% of head Injury		
Accident	RTA	11	30	8	8	36	93	86.91	
	Railway accident	0	9	0	2	14	25	80.64	
	Fall from height	7	9	6	1	7	30	93.75	
	Hard blunt	2	6	1	2	13	24	100	
Assault	Cutting weapons	0	3	2	0	3	8	72.72	
	Firearm	0	1	0	0	1	2	100	
	Total	20	58	17	13	74	182	87.92	

Table-6: Distribution of ich in relation to regions

Regions	Frontal	Temporal	Parietal	Occipital	Brain stem	Total
EDH	6	9	3	2	0	20
SDH	15	11	28	4	0	58
SAH	1	2	5	0	9	17
Int. Cer.	5	3	1	2	2	13
Total	27	25	37	8	11	108

Table-7: Comparative distribution of intracranial hemorrhage

Year/ Authors	EDH	SDH	SAH	ICH	MIXED
Galbraith. S.(1979)	15%	23%	NII	17%	NII
Yakamani. I(1993)	NII	33%	NII	NII	NII
Jena. M.K.(1993)	14.6%	49%	7.6%	6%	NII
Behera. A.(1988)	20%	40%	10%	10%	NII
Dayananda. B.R.	44.75%	NII	NII	NII	NII
Rao. N.G.(2000)	NII	77%	NII	NII	NII
Present Study	9.66%	28.01%	8.21%	6.28%	35.74%



## Originals and Papers

### Distribution pattern of pigmented moles on the exposed parts in humans

Fremington K. Marak\* & G. Shrikanthan\*\*

#### Abstract

A cross-sectional population based study by door to door survey of different areas of urban Pondicherry was conducted to determine the distribution of mole on the exposed parts of the body. The distribution of moles was more on the face accounting for 69.7% of the total subjects examined with the highest number of moles on the face in a single individual being eleven. It is followed by the forearm, the neck and the hand. The distribution of a single mole were found more on the right forearm and face accounting for 33% and 32.73% respectively. It is followed by distribution in the neck and hand and 41.96% of the individuals were in the age group of 11-22 years with only 4.55% of the individuals were in the age group of 1-10 years.

**Key words:** Moles, nevus & identity.

#### Introduction

Pigmented moles are the easiest and most commonly used tool in the identification of a person's identity irrespective of whether he/she is alive or dead. Selection of the pigmented moles on the exposed parts of the body for the purpose of identification by the examiner is as such a trial and error process which requires patience and keen observation. A normal pigmented mole (Nevus) is round to oval solid tan on the skin. The colour may range from brown to brownish black. The diameter in most cases does not exceed few millimeters and the edges are well defined. Though it is flat in most cases elevated or raised moles are not rare. They may be congenital or acquired. Most people have between 10 and 40 moles on the body. A person may develop new moles from time to time, usually until about age 40 years<sup>1</sup>. It has been suggested that acquired pigmented nevi are in part stimulated by exposure to sunlight<sup>2,3</sup>. They are also called melanocytic naevi as they are due to the proliferation of the pigment cells, melanocytes. In spite of the pigmented moles being studied extensively for its

relationship with melanoma, the paucity of published papers on the distribution pattern of pigmented moles has triggered to take up this systematic study of its distribution in the local population.

#### Materials and methods

A cross-sectional population based study was done by door to door survey of different areas of urban Pondicherry. The study subjects comprises of people in the age group of 1 year and 60 years belonging to both the sexes, selected at random. As no literature is available on the distribution of mole we would be conducting a pilot study on 660 individuals.

**Inclusion criteria:** Flat and raised moles with brown to brownish black colour will be read as a mole in this study.

**Exclusion criteria:** All atypical moles will not be counted as moles. People with absence of upper limb, deformity in any of the areas to be examined, and people with black colour skin were excluded from the study. The subjects were examined under broad daylight and the number of moles were counted on the six different exposed parts taken up for this study, which includes right forearm, right hand, left forearm, left hand, face with ears and neck. The values were simultaneously entered on the master chart, under each category, along with the sex and age of the subject in years and then tabulated.

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## Results

### Age and Sex Distribution

A total of 660 human beings were examined for flat and raised moles with brown and brownish black colour from their exposed parts of the body. Out of these 344 (52.12%) subjects were males and 316 (47.88%) subjects were females (Table – 1) and 41.96% were in the age group of 11-20 years, 24.7% were in the age group of 21-30 years, 11.21% were in the age group of 31-40 years, 8.79% were in the age group of 41-50 years and 51-60 years respectively and only 4.55% were in the age group of 1-10 years (Table – 2).

### Distribution pattern of moles on the exposed parts of the body

Table –3 shows the distribution of pattern of moles in the different exposed parts of the body such as the right forearm, right hand, left forearm, left hand, face and neck.

- a) **Right forearm:** A total of six moles were found in the right forearm in only 0.15% of the subject and single number of mole were found in the right forearm in 33% of the subjects. In 7.57% of the subject two moles were found in the right forearm, in 2.27% of the subject three moles, in 1.96% of the subject four moles and in 0.91% of the subject five moles.
- b) **Right hand:** Single number of mole were found in the right hand in 25.9% of the subjects examined and a maximum of nine moles were found in the right hand in only 0.15% of the subject. In 9.84% subjects two number of moles were found in the right hand, in 2.42% of the subjects three number of moles and in 0.75% of the subjects four number of moles.
- c) **Left forearm:** In the left forearm single number of mole accounted for 25.3% of the total subjects examined. In 0.15% subject five and six numbers of moles were found in the left forearm respectively. In 10.15% subjects two number of moles were found on the left forearm, in 2.58% subjects three number of moles and in 1.56% subjects four number of moles were found on the left forearm.

- d) **Left hand:** In the left hand single number of mole accounted for 24.39% of the total subjects examined. In 0.15% subject five and six numbers of moles were found in the left hand respectively. In 8.03% subjects two number of moles were found on the left hand, in 2.87% subjects three number of moles and in 0.6% subjects four number of moles were found on the left hand.
- e) **Face:** In the face single number of mole accounted for 32.73% of the total subjects examined. In 16.67% subjects two number of moles were found on the face, in 10.45% subjects three number of moles, in 5.45% subjects four number of moles, in 2.27% subjects five number of moles, in 0.6% subjects six number of moles, in 0.75% subjects seven number of moles, in 0.45% subjects eight number of moles were found on the face and in 0.15% subject nine and eleven numbers of moles were found in the face respectively.
- f) **Neck:** In the neck single number of mole accounted for 28.18% of the total subjects examined. In 12.58% subjects two number of moles were found on the neck, in 2.27% subjects three number of moles, in 1.21% subjects four number of moles, in 0.75% subjects five number of moles were found on the face and in 0.15% subject six and eight numbers of moles were found in the neck respectively.

### Distribution of raised moles on the exposed parts of the body

**Right forearm:** In the right forearm single number of raised mole accounted for 1.21% of the subjects examined (Table-4).

**Right Hand:** In the right hand single number of raised mole accounted for 0.15% of the subjects examined.

**Left forearm:** In the left forearm single number of raised mole accounted for 0.45% of the subjects examined.

**Left Hand:** In the left hand single number of raised mole accounted for 0.6% of the subjects examined.

**Face:** In the face there were 3.94% of the single number of raised mole and 0.6% of two numbers of raised moles.



**Neck:** In the neck three numbers of raised moles accounted for 0.6% of the subjects examined.

## Discussion

A cross-sectional population based study by door to door survey of different areas of urban Pondicherry was conducted. The present study was conducted to determine the distribution of mole on the exposed parts of the body. The distribution of moles was more on the face accounting for 69.7% of the total subjects examined with the highest number of moles on the face in a single individual being eleven (Table-3). This could be because of the face being more exposed to the ultraviolet rays of the sun than any other parts of the body. It is followed by the forearm, the neck and the hand. The distribution of a single mole were found more on the right forearm and face accounting for 33% and 32.73% respectively. It is followed by distribution in the neck and hand. Some people are born with moles. Other moles appear over time. Raised singular mole was also found to be more on the face than any other parts of the body which accounted for 3.94% in the present study (Table-4). It is followed by the right forearm (1.21%), left hand (0.6%), left forearm (0.45%) and right hand (0.15%). Even two number of moles were found to be more in the face which accounted for 0.6% of the cases. Three numbers of moles were found only in the

region of the neck accounting for 0.6% of the cases. To our knowledge, an analytical study on the distribution of pattern on moles on the exposed parts of the body has not been reported. The present study will give an insight as to where a person has to look for the identification of a mole, with respect to its prevalence and the relationship between the number of moles and age. It will also throw light into the decrease or increase in the number of moles with regard to the different body parts.

**Table-1: Sex distribution**

Sex	No. of individuals
Male	344 (52.12%)
Female	316 (47.88%)
<b>Total</b>	<b>660 (100%)</b>

**Table-2: Age distribution**

Age Group	No. of individuals
1 -- 10	30 (4.55%)
11 -- 20	277 (41.96%)
21 -- 30	163 (24.7%)
31 -- 40	74 (11.21%)
41 -- 50	58 (8.79%)
51 -- 60	58 (8.79%)
<b>Total</b>	<b>660 (100%)</b>

**Table-3: Distribution of pattern of moles on the exposed parts of the body**

No. of moles	Rt. F. Arm	Rt. Hand	Lt. F. Arm	Lt. Hand	Face	Neck
1	218 (33%)	171 (25.9%)	167 (25.3%)	161 (24.39%)	216 (32.73%)	186 (28.18%)
2	50 (7.57%)	65 (9.84%)	67 (10.15%)	53 (8.03%)	110 (16.67%)	83 (12.58%)
3	15 (2.27%)	16 (2.42%)	17 (2.58%)	19 (44.15%)	69 (10.45%)	15 (0.02%)
4	13 (1.96%)	5 (0.75%)	10 (1.56%)	4 (15.34%)	36 (5.45%)	8 (1.21%)
5	6 (0.91%)	1 (0.15%)	1 (0.15%)	1 (0.15%)	15 (2.27%)	5 (0.75%)
6	1 (0.15%)	0	1 (0.15%)	1 (0.15%)	4 (0.6%)	1 (0.15%)
7	0	0	0	0	5 (0.75%)	0
8	0	0	0	0	3 (0.45%)	1 (0.15%)
9	0	1 (0.15%)	0	0	1 (0.15%)	0
10	0	0	0	0	0	0
11	0	0	0	0	1 (0.15%)	0
<b>TOTAL</b>	<b>303 (45.91%)</b>	<b>259 (39.24%)</b>	<b>263 (39.85%)</b>	<b>239 (36.21%)</b>	<b>460 (69.7%)</b>	<b>299 (45.3%)</b>



Table-4: Distribution of raised moles on the exposed parts of the body

No. of moles	Rt. F. Arm	Rt. Hand	Lt. F. Arm	Lt. Hand	Face	Neck
1	8 (1.21%)	1 (0.15%)	3 (0.45%)	4 (0.6%)	26 (3.94%)	0
2	0	0	0	0	4 (0.6%)	0
3	0	0	0	0	0	4 (0.6%)
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0

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## Originals and Papers

### A study on pattern of fatal injuries in road traffic accidents in costal belts of Orissa

Satyasi Panda\*, Shaikh Khaja\*\* & Nayana Kishore Mohanty\*\*\*

#### Abstract

Purpose of study To find out the fatal injuries, survival times, correlation of injuries to different epidemiological parameters and to suggest steps on prevention basing on the findings. Cases of Road Accident Deaths sent to the Mortuary of S.C.B Medical College Cuttack for postmortem examination were studied. Out of 2394 PM Examinations conducted during the study period 21.67% (519) Were due to RTA. 87.11% (452) were Males & 12.9% (67) were Females. Maximum no of cases (25.04 %) were within the age group of 25 to 34 years (122 males & 8 females). Among different type of road users ; Highest no of victims belonged to pedestrians group (28.6 %) & 86.9% of them were males. Maximum no of female victims were Pillion Riders 45.8 % (22 out of 48 ). 257 victims (49.5% ) died due to cranio cerebral injury

which was the peak cause of Death . Trucks were found to be the major offending vehicle involved in 33.54% of incidences. Awareness among the Road users, development of safe roads & observation of traffic rules are the major suggestions for the prevention of accidents.

**Key words:** Fatal, road traffic accidents, road users, cranio cerebral injuries & awareness.

#### Introduction

An advisory group convened by the WHO considered Accidents to be an unpremeditated event resulting in recognizable damage. The American Safety Council expands the above as " Occurrence in a sequence of events which, usually produces unintended injury, death or property damage <sup>1</sup>.

Road traffic accidents can be defined as any accident involving any type of road user may it be a person walking, standing, running, riding, driving, traveling or working on the road where either of any motorized or non motorized vehicle is involved.

In 1896, two deaths were registered in Great Britain due to Motor vehicle. In 1902-The first fatal accident caused by motor cycle was registered in UK <sup>2</sup>. In 1995 , Road accidents contributed to about 8,85,000 deaths yearly in the whole world. Out of this 500,000 is being shared by developing countries. <sup>3</sup>

In 2001—an estimated 1.26 million people died due to RTA world wide ,90 % of them in low and middle income countries. Mortality rate was 20.8 per 1,00,000 population <sup>4</sup> .

By 2020, deaths & disabilities resulting from road accidents in comparison to other diseases will rise from current 9<sup>th</sup> to 3<sup>rd</sup> spot & the developing nations will account for 90 % of worlds traffic fatalities <sup>5</sup>.

In India, road accidents are one of the five leading causes of death <sup>6</sup>. In every 6 minute one die and 6 injured on Indian roads.<sup>7</sup>

6 % of worlds road accidents take place in India where 1 % of Worlds vehicles are running<sup>8</sup>.

India has one of the highest road accident rates in the World . One out of 42 vehicle in the country met with an accident in 1986.

Table-1 depicts the information on comparative death toll in various years<sup>9</sup>.

**Table- 1 :Comparative year wise death in India**

Year	No of deaths due to RTA
1980	24,000
1991	69,000
2004	90,000

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Table- 2 :Recent trends in India<sup>11</sup>

Year	All Roads			National Highways		
	Accidents	Persons killed	Persons injured	Accidents	Persons killed	Persons injured
1999	386,456	81,966	375,051	103,839	28713	98427(p)
2000	391,449	78,911	399,265	110,508	30,216	124,600
2001	405,637	80,888	405,216	115,824	32,108	119,592(p)
2002	407,497	84,674	408,711	131,738	33,621	132,307
2003	406,726	85,998	435,122	127,834	33,153	131,102
2004(p)	429,910	92,618	464,521	130,265	34,723	143,140

P--Provisional

One can predict the rate at which it is rising. Estimated by year 2015, number of deaths would be 154,600 ,no of serious injuries would be 3092000 and no of minor injuries would be 10,822,000.<sup>10</sup> Majority of the accidents are preventable .<sup>11</sup>

## Materials and methods

All the cases of dead bodies sent to the Mortuary of SCB Medical College Cuttack for Medico Legal autopsy during the period from 1<sup>st</sup> February 1999 to 31<sup>st</sup> October 2000 were examined and those which died due to road traffic accidents were included under this study.

For the purpose of this study Road accident death is defined as any death occurring as a result of Road Traffic Accident( as defined under introduction) within 30 days of incidence.

Details of History, P M Examination findings were entered in a separate case sheet specially designed for this study. Data thus collected were analyzed and the results were tabulated which are presented and discussed .

## Results

Total number(no)of PM Examination done during the study period were 2,394 out of which death due to RTA were 519 (21.67 %).

Thus 519 cases of road accident deaths were studied which comprised of 452 (87.11 %) Males and 67 (12.9 %) Females .All the victims were within 6 months to 86 years of Age group. Highest no of male (26.99%,122 out of 452 ) victims were found in the age group of 25 to 34 years and females were highest (32.83 %,22 out

of 67 ) in 45 to 54 years age group. Lowest cases were seen in 0 to 1 year & >85 year group (0.19%, 1 each). As far as Type of Road Users concerned (calculated for 345 cases out of 519 ) Pedestrians (28.6 % ) were the highest followed by Passengers (21.44 % ) in 2<sup>nd</sup> place. Cycle pedalist & Motor cyclist, both the groups comprising of 17.39% each lie in 3<sup>rd</sup> place. Highest number of male victims (86 out of 99) were seen among the pedestrians where as females were highest among Pillion rider group (22 out of 31). Considering about Manner of accident it was observed that in 27.5 % cases (143 out of 519) it could not be ascertained. Peak cases were caused by Lorry (Truck) 20.42 % (106 /519).Heavy vehicles contributed to 34.29% Of accidents (106 Truck + 32 Passenger Bus + 10 Tractors + 30 Mini bus, Van=178 /519) . 10.01 % of accidents were caused by motor cycles, scooters, autorickshawos together. 6.35 % of cases were caused by light vehicles, 1.15 % by cycles, 0.38 % by bullock carts and 3.46 % due to upturning of vehicles. 9.24 % of accidents were due to falling from running vehicle which includes 5.97 % of Pillion riders (31 /519). 2.89% due to hit with objects on the road or on the side of road including trees. 0.19 % each (1 each) of cases were due to fall from standing vehicle, falling of object from running vehicle and mechanical failure .Type of Road -Calculated for 310 cases as in 209 cases it was not ascertained. 36.4 cases occurred over National High Way no 5,19 % on connecting village road, 12.9 % on state roads, 10 % on town roads, 8.06 % on district roads, 6.45 % on state high ways , 3.87% on village roads and 1.6 % on express high ways



### Cause of death -Cranio cerebral injury

Was the cause in 49.51 % of cases(257) which was the peak. Shock & Haemorrhage (30.05 %) was the next(156), 5.97% (31) due to Brain Injury, 3.85 % (20 )due to Spinal injury, 2.5% (13 ) Septicaemia, 1.34 % (7 ) Cranio cerebral injury & Shock Haemorrhage combined together, 0.96 % (5 ) Fat Embolism and 5.78 % (30 ) died due to other causes. Distribution of Injuries over different body parts : 72.06 % cases sustained Head Injury (374/519 ) out of which 49.32% (256) were where only Head was involved & 22.73% (118) were associated with other body part injuries .28.70% (149) Chest Injury (8 only chest + 141 combined), 23.12% (120) Abdominal Injury (15 only abdomen +105 combined ), 9.05% (47) Pelvic Injury (2 only pelvis + 45 combined), 5.97% (31) Vertebral column Injury (10 only vertebral + 21 combined), 12.5% (65)Lower limb injury (8 only lower limb +57 combined ), 4.62% (24) upper limb injury (all combined with other body part injury) , 0.96% (5) Neck Injury (all combined with other body part injury) and 42.38% (220) of victims sustained multiple body part injuries .

### Pattern of head Injury

Cases of head injury peak cases (268 nos) were Intra cranial Haemorrhages (51.63%), followed by Brain Injury (50.28%), Fracture of Skull (46.62%) and Crush Injury involving all the structures of Head (3.46% ). Among the Intra Cranial Haemorrhages 39.11% (203 nos) were Sub Dural Haemorrhages, followed by Brain Stem Haemorrhage (15.22%), Intra Cerebral Haemorrhage (13.48%), Extra dural haemorrhage (12.71%) and sub arachnoid haemorrhage

(1.92%). Neck Injury : 0.96 % of cases were Neck Injuries , 2(0.38%) of those were Crush injuries .Chest Injury : 28.7 % of cases (149) sustained Chest Injury , 137 (26.39%) sustained fractures (Ribs , Sternum and Clavicle) , Lung injury was seen in 10.78% cases, Heart Injury in 2.79 % and Crush Injury involving all the structures were seen in 0.57% of cases . Abdominal Injury : 23.12% of cases sustained Abdominal injuries , 67 (12.90%) had Liver Injury, Kidney injury was seen in 33 (6.35%) cases ,Spleen in 22 (4.23%) cases and Crush injury was seen in 5 (0.96 %) cases. Pelvis Injury : 47 (9%) cases sustained Pelvic Injury,

Fracture Pelvis was seen in 36 (6.93 %) nos, Bladder Injury in 10 ( 1.92%) and Crush injury was seen in 6 (1.15%) cases. Lower Limb: 65 (12.5%) cases had lower limb injury, Fracture Femur was seen in 31 (5.97 %) and Fracture both Tibia & Fibula was seen in 23(4.43 %) cases. Upper Limb : 24 cases had upper limb injury ,12 (2.31 % ) had fracture Radius & Ulna and 10 (1.92%) sustained Fracture Humerus. Vertebral Injury: 31 (5.97 %) victims sustained vertebral injuries, 31(5.97%) had fracture of vertebra (20 cervical, 4 thoracic & 7 other) and 22 (4.43%) had injury to spinal cord.

### Fatal injury involving single region

Head in 256 (49.32%) cases, Abdomen in 15(2.89%) cases , Vertebral Column in 10(1.92%) cases , Chest in 8 (1.54%) ,Lower Limb in 8(1.54%) and Pelvis in 2 (0.38%) cases borne fatal injuries without involving any other body parFatal injuries involved Multiple body parts were present in 220 (42.38%) cases.

**Table-3:Comparison between percentage of body part injuries in different types of road users**

Region of body	Pedestrians	Bicyclists	Motor cyclists	Pillion riders	Passengers	Drivers
Head	68.68	83.33	76.66	80.64	64.86	76.19
Chest	18.18	25	21.66	6.45	40.54	33.3
Abdomin o pelvic	25.25	25	33.3	6.45	29.72	38.69
Vertebra	5.05	3.33	1.66	6.45	13.5	0
Limb	6.06	10	16.66	9.67	17.56	19.04



**Table- 4: Comparison on percentage of road accident cases out of all autopsies**

Sr. No	Author	Place Of study	Period of study	Total no of Autopsies done during the period	No of RTA cases	%
1	Saumil P Merchant <sup>12</sup>	Ahmedabad	1995 to 1999	4388	600	11.14
2	Archana <sup>4</sup>	Allhabad	Dec 2003 to Nov 2004	2246	950	42.29
3	Y.N.Singh <sup>13</sup>	Gauhati	1 <sup>st</sup> jan 1999 to 31 <sup>st</sup> dec 2003	7852	1872	23.84
4	Harnam Singh <sup>14</sup>	Rohatak	20 <sup>th</sup> may 2000 to 19 <sup>th</sup> may 2001	1510	450	29.81
5	Arvind Kumar <sup>15</sup>	Delhi	2001 to 2005	7008	2472	35.27
6	Present	Cuttack	1 <sup>st</sup> Feb1999 to 19 <sup>th</sup> Nov 2000	2394	519	21.67

**Table-5: Comparison of sex and age group**

Author	Total	%Male	%Female	0-10yr	11-20yr	21-30yr	31-40yr	41-50yr	51-60yr	>61yr
Harnam Singh <sup>14</sup>	450	89.33	10.77	7.8	17.3	27.3	20.6	12	8.3	6.7
Arvind Kumar <sup>15</sup>	2472	88.22	11.77	5.09		34.06	20.18			
Archana Kaur <sup>4</sup>	950	75.05	24.94	5.38	Peak is in 25 to 44 year group=33.68%					7.37
Saumil P Merchant <sup>12</sup>	600	86.3	13.7	NA						
Present study	519	87.11	12.9	2.5	Peak is in 25 to 34 yr (25.04%).45.27% of cases are in 25 to 44 year.					>65yr =4.04 %

**Table-6:Percentage of injuries observed by various authors over different regions of body**

Author	Head & Neck %	Chest %	Abdomen %	Pelvis%	Spinal cord & Vertebrae %	Upper limb %	Lower limb %
Harnam Singh <sup>14</sup>	77.6	44	31.8		12.96		
Aravind Kumar <sup>15</sup>	68.73			15.29	6.35	10.92	20.83
Saumil P Merchant <sup>12</sup>	81.5	25	27.5				
Present Study	73.02	28.7	23.12	9.05	5.97	4.62	12.52



**Table -7: Comparison of pattern of head injury**

Author	Fracture skull	EDH	SDH	SAH	ICH	Brain INJ	Crush inj	% of Total no
Harnam Singh <sup>14</sup>	51.6		44.7	34.7		24.2		450 RTA deaths
Aravind Kumar <sup>15</sup>	69.63	20.24	89.11	79.28	16.60	16.01		1699 head injuries
Arvind Kumar (re calculated)	47.85	13.91	61.24	50.16	11.40	11.003		2472RTA deaths
Present study	46.62	12.71	39.11	1.92	28.70	50.28	3.46	519 RTA deaths

**Table-8: Comparison of pattern of chest Injury**

Author	Fracture-Rib	Inj Heart	Inj Lungs	Crush Inj
Harnam Singh <sup>14</sup>	36.9		29.8	
Arvind Kumar <sup>15</sup>	33.62	4.33	--	--
Present Study	26.39	2.69	10.78	2.01

**Table-9: Comparison of pattern of other injury**

Author	Inj Liver	Inj Spleen	Inj Kidney	Upper Limb fracture	Lower Limb fracture
Harnam Singh <sup>14</sup>	29.9	12.7	3.8	25.6	42.2
Arvind Kumar <sup>15</sup>	21.52	9.42	10.59		
Present Study	12.90	4.23	6.35	4.6	12.5

## Discussion

Out of 2394 autopsies done in the study period 519 (21.67%) were due to road accidents.

Death due to road accidents are increasing every year (from 11.14 in year 1995 to 1999 to 42.49 in 2003 to 2004) which is evident from table no 4 irrespective of region of study.

All the studies show more or less same observation that the most vulnerable age group is within 25 to 44 years. Nothing to disagree that it is directly proportional to active period of life with less experience on others behavior as it is an essential factor to predict the behavior of everything around you to minimize accidents when you are on road.

Head is the region which is most frequently injured which out numbers other regions as observed by all authors in table no-6.

Fracture of skull and subdural haemorrhage are the frequently observed cranio cerebral injuries by all authors. There is a difference of frequency of subarachnoid bleeding observed in the present study and other authors the reason of the same

may be diagnostic difficulty to differentiate between SDH and SAH when both coexist (ref table no 7). The other possible explanation is the frequency of brain injury which is 50% in present study in comparison to 11% and 23% in other studies. Table no 8 and 9 show almost similar pattern of observation by all authors.

## Conclusion

There is a rapid rise in incidence of vehicular accident fatalities. Adequate training and exposure should be imparted to all the citizens in the schools and colleges before they enter the high risk age group. Not only at the time of issuing driving license but also at high school certificate examination road behavior and road etiquette should be made mandatory for all to learn as it was observed that pedestrians are the most frequently affected victims followed by the motor cyclists.

Not only the bike riders but also all road users need helmet when on road as head injury



is observed in highest percentage in all type of road users(table 3).Thus this study does not support the law on forcing the bike riders only to use helmet sparing other road users.

It is high time to rethink on role of traffic police to only prosecute rule breakers or to concentrate on road safety conditions ,educating the road users and anticipating accident prone place and times.

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## Originals and Papers

### Radiological study of epiphyseal fusion at elbow region in relation to physiological findings in 12-17 years age group

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#### Abstract

Detremination of age of an individual, whether living or dead, is a vexing problem for a medical expert. An extensive work has been carried out on the theme in different states of India and abroad as well. However, very little work has been reported with reference to Gujarati population. Present work was undertaken in 100 school going children (with known chronological age).

**Key words:** *Fusion, elbow region, physiological findings & radiology.*

#### Introduction

Many of civil as well as criminal matters course with the age of victim or even accused. The importance of 14, 16 and 18 years of age in either gender is well documented in literature. Among various joints of a human body elbow and wrist contribute greatly in assessment of age in this age groups. In the developed part of world, reference atlas for age estimation are also in routine use.<sup>1</sup> Eruption of tooth and fusion of ossification centers at elbow are useful for ascertaining age range in the group 12-17 years.<sup>2</sup> The areas of interest with reference to appearance and fusion of ossification centers at elbow region include lateral epicondyle with capitulum, trochlea with capitulum, conjoint with shaft and medial epicondyle with shaft of humerus, head of radius with shaft and olecranon process with shaft of ulna.<sup>2</sup> Available data show significant deviation with variation in geographical region. Distal end of humerus showed complete fusion at the age of 15.5 in females and at age of 16 in males at Indian Knoll.<sup>3</sup> Sangma et al<sup>4</sup> reported that in North east region girls fusion at elbow region was found completed at the age of 16 years. The regression equation reported was  $18.54 + (0)X$  with 4.14 as standard error.

Memchoubi<sup>5</sup> also concluded the age 16 in Manipuri girls with reference to completion of fusion at elbow region. However, Basu & Basu<sup>6</sup> have reported the age 17 for complete fusion at elbow region in young Bengali girls.

#### Aims and Objectives

The present study comprising of natives of Gujarat state was aimed to:

1. Study the process of union of epiphysis of different bones at elbow region in either sex, in relation to age & physiological findings;
2. Compare the results with other reports; &
3. Find out its relationship with eruption of canine, second bicuspid, second molar and third molar teeth.

#### Materials and methods

The study was carried out at the Department of Forensic Medicine & Toxicology, B.J. Medical College, Ahmedabad during January 1999 to September 2000. Students of two schools of age group 12-17 years in either sex making the total sample size of 100. All the samples had documentary evidence of birth (school leaving certificate, S.S.C. Marksheet) and was considered as proof of chronological age. Written informed consent was taken from all the subjects and females were examined in presence of a female attendant. Cases with old trauma at elbow were excluded. General particulars, physical measurements, eruption of teeth, secondary sexual characters were entered into

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master chart with radiological findings at elbow region.( distal end of humerus, head of radius and olecranon process of ulna) .Mckern and Stewart criteria<sup>7</sup> were considered to decide stages of fusion. Tabulated data was utilised for discussion.

## Observations

Table-1 depicts the number of male and female subjects in each age group. Maximum number were from 14-15 & 13-14 age groups. (Here age group 11 to 12 is considered as those of who have completed 11 years of age but yet to complete 12 years of age and similarly for other age groups).

### Fusion of trochlea to capitulum

It is clear from table-2 that in male subjects the majority of cases in age group 11-12 and 12-13 did not show fusion, whereas in age groups 13-14 and onwards majority of cases showed fusion(++++).

Table-3 reflects that in female subjects in age group 11-12 years no case showed fusion whereas subsequent age groups showed fourth degree fusion in majority / all case. Noticably in age group 12-13 years majority of male subjects did not show fusion whereas female subjects of the same age group showed quite higher number of cases showing fourth degree fusion.

### Fusion of lateral epicondyle to capitulum

Table-4 shows that in the age group 11-12 and 12-13 majority of case did not show fusion whereas in subsequent age groups the number of cases showing fourth degree fusion was higher.

Table-5 reflects that in female subjects in age group 11-12 years no case showed fusion whereas subsequent age groups showed fourth degree fusion in majority / all case. Noticably in age group 12-13 years majority of male subjects did not show fusion whereas female subjects of the same age group showed quite higher number of cases showing fourth degree fusion.

### Fusion of conjoint epiphysis to shaft of humerus

Table-6 shows that in male subjects of age group 11-12 and 12-13 all cases fell in category of no fusion. In the age group 13-14 almost half of the cases showed third degree fusion with almost equal number of cases on either sides of non fusion and fourth degree fusion. In

subsequent age groups( 14-18) majority or all case showed fourth degree fusion.

In female subjects no case of fusion was observed in age group 11-12 years and there was gradual and steady increase in degree of fusion and number of cases as well with increase in age. The significant gender based difference was observed in age group 12-13 and 13-14. In age group 12-13, all male subjects did not show fusion whereas almost half of female subjects showed fusion of third or fourth degree. Similarly in age group 13-14, majority of the female subjects showed fourth degree fusion whereas in male subjects majority of male subjects showed fusion of third degree with reasonable number of non fusion cases.

### Fusion of medial epicondyle to shaft of humerus

Table-8 depicts that majority of male subjects didn't show fusion in age group 11-16 years and in age group 16-18 fourth degree fusion was observed in majority of cases. More or less similar pattern was also observed in female subjects( Table-9) but the cases showing fourth degree started increasing from age 13 whereas in male subjects it was age 15.

### Fusion of olecranon process to ulna

Table-10 shows that in male subjects there was uniform distribution of cases with reference to degree of fusion in age group 14-15. In earlier age groups majority of cases did not show fusion in subsequent age groups the degree of fusion showed a rise. More or less similar pattern was also observed in female subjects( Table-11) but the cases showing fourth degree started increasing from age 13 whereas in male subjects it was age 15. (in age group 13-14 in females showed almost of half of the case with fourth degree fusion)

### Fusion of head to shaft of radius

It is obvious in Table-12 that in male subjects majority of the case showed no fusion up till age 16 and only after that the fourth degree fusion was increasing. Contrary to that in female subjects the number of cases with fourth degree fusion started increasing from the age 13 only. There was no relationship between height, weight and secondary sexual characters with fusion of centers at elbow region in either sex of subjects studied. (Tables not included for constraint of space- editor-JIAFM).



Table-1: Number of students examined in different age groups (known)

Age groups in years	Male	Female	Total
11-12	01	01	02
12-13	07	09	16
13-14	11	12	23
14-15	07	18	25
15-16	05	10	15
16-17	05	12	17
17-18	02	00	02
Total	38	62	100

Table-2: Showing various degree of fusion of trochlea to capitulum according to age groups in male

Age groups in years	No. of cases showing various degree of fusion	Total cases
11-12	0	1
12-13	6	7
13-14	2	11
14-15	-	7
15-16	-	5
16-17	-	5
17-18	-	2

\* Figur in the brackets in table indicate percentage .

Table-3: Show various degree of fusion of trochlea to capitulum in different age groups in female

Age groups in years	No. of cases showing various degree of fusion	Total cases
11-12	1 (100%)	1
12-13	3 (33.33%)	9
13-14	-	12
14-15	-	18
15-16	-	10
16-17	-	12
17-18	-	0



Table-4: Show various degree of union of lateral epicondyle to capitulum in different age groups in male.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	5 (71.42%)	-	-	-	2 (28.57%)	7
13-14	1 (9.1%)	-	-	-	10 (90.40%)	11
14-15	-	-	-	-	7 (100%)	7
15-16	-	-	-	-	5 (100%)	5
16-17	-	-	-	-	5 (100%)	5
17-18	-	-	-	-	2 (100%)	2

Table-5: Show various degree of fusion of lateral epicondyle to capitulum in different age groups in female.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	3 (33.33%)	-	-	-	6 (66.66%)	9
13-14	-	-	-	-	12 (100%)	12
14-15	-	-	-	-	18 (100%)	18
15-16	-	-	-	-	10 (100%)	10
16-17	-	-	-	-	12 (100%)	12
17-18	-	-	-	-	-	0

Table-6: Showing various degree of union of conjoint epiphysis to shaft of humerus in different age groups in male.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	7 (100%)	-	-	-	-	7
13-14	3 (27.27%)	1 (9.1%)	-	5 (45.45%)	2 (18.18%)	11
14-15	1 (14.28%)	-	-	1 (14.28%)	5 (71.42%)	7
15-16	1 (20.00%)	-	-	-	4 (80.00%)	5
16-17	-	-	-	-	5 (100%)	5
17-18	-	-	-	-	2 (100%)	2



Table-7: Showing various degree of union of conjoint epiphysis to shaft of humerus in female.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	5 (55.55%)	-	-	1 (11.11%)	3 (33.33%)	9
13-14	1 (8.33%)	1 (8.33%)	-	-	10 (83.33%)	12
14-15	1 (5.5%)	-	-	-	17 (94.44%)	18
15-16	-	-	-	-	10 (100%)	10
16-17	-	-	-	-	12 (100%)	12
17-18	-	-	-	-	-	-

Table-8: Showing various degree of fusion of medial epicondyle to shaft of humerus in male.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	7 (100%)	-	-	-	-	7
13-14	10 (90.99%)	1 (9.1%)	-	-	-	11
14-15	7 (100%)	-	-	-	-	7
15-16	4 (80 %)	-	-	-	1 (20.00%)	5
16-17	-	-	-	-	4 (80%)	5
17-18	-	-	-	-	2 (100%)	2

Table-9: Showing various degree of fusion of medial epicondyle to shaft of humerus in female.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	8 (88.88%)	-	-	-	-	9
13-14	9 (75%)	1 (11.11%)	-	1 (8.33%)	2 (16.66%)	12
14-15	8 (44.44%)	-	1 (5.5%)	2 (11.11%)	7 (38.88%)	18
15-16	-	-	-	1 (10%)	9 (90.00%)	10
16-17	-	-	-	-	12 (100%)	12
17-18	-	-	-	-	-	-



Table-10: Showing various degree of union of olecranon process to shaft of ulna in different age groups in male.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	6 (85.71%)	-	-	-	1 (14.28%)	7
13-14	5 (45.5%)	1 (9.11%)	2 (18.2%)	2 (18.2%)	1 (9.1%)	11
14-15	1 (14.28%)	2 (28.57%)	2 (28.57%)	2 (28.57%)	1 (14.28%)	7
15-16	2 (40%)	-	-	-	3 (60.5%)	5
16-17	-	-	-	-	5 (100%)	5
17-18	-	-	-	-	2 (100%)	2

Table-11: Showing various degree of fusion of olecranon to shaft of ulna in relation to different age groups in female.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	6 (66.66%)	1 (11.11%)	1 (11.11%)	1 (11.11%)	-	9
13-14	2 (16.66%)	2 (16.66%)	1 (8.33%)	2 (16.66%)	5 (41.66%)	12
14-15	-	-	-	6 (33.33%)	12 (66.66%)	18
15-16	-	-	-	-	10 (100%)	10
16-17	-	-	-	-	12 (100%)	12
17-18	-	-	-	-	-	-

Table-12: Showing various degree of fusion process of head of radius to shaft of radius in different age groups in male.

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	7 (100%)	-	-	-	-	7
13-14	10 (90.90%)	-	-	-	1 (9.10%)	11
14-15	7 (100%)	-	-	-	-	7
15-16	4 (80%)	-	-	-	1 (20.00%)	5
16-17	-	-	-	-	5 (100%)	5
17-18	-	-	-	-	2 (100%)	2



**Table-13: Showing various degree of union of head of radius to shaft of radius in different age groups in female.**

Age groups in years	No. of cases showing various degree of fusion					Total cases
	0	+	++	+++	++++	
11-12	1 (100%)	-	-	-	-	1
12-13	8 (88.90%)	-	-	-	1 (11.10%)	9
13-14	3 (20%)	2 (16.6%)	2 (16.66%)	1 (8.33%)	4 (33.33%)	12
14-15	1 (5.5%)	2 (11.11%)	-	2 (11.11%)	13 (72.22%)	18
15-16	-	-	-	-	10 (100%)	10
16-17	-	-	-	-	12 (100%)	12
17-18	-	-	-	-	-	-

**Table-14: Comparison of age of fusion by different workers**

Auhtor	Present study		Basu & Basu		Gastaun		Sangma et al	
	M	F	M	F	M	F	M	F
Troclea to capitulum	14-15 13-14		- 12-13		11-16 10-12		- -	
Lateral epicondyle to capitulum	14-15 13-14		- 12-13		11-16 10-12		- --	
Conjoint to shaft of humerus	16-17 15-16		-	-	-	-	-	16
Medial epicondyle to humerus	17-18 16-17		-	13-14	16 14		-	16
Head to shaft of radius	16-17 15-16		-	13-14	16 -		-	16
Olecranon to shaft of ulna	16-17 15-16		- 13-14		17 15		-	16

## Discussion

It is clear from the observations that fusion of different ossification centers occur one year earlier in female subjects as compared to male subject studied. This is in consonance with various observations that in long bones females show fusion earlier than male.<sup>1,2,3</sup>

The sequence of fusion at elbow region is in following order: 1. trochlea to capitulum and lateral epicondyle to capitulum, 2. Conjoint

epiphysis to shaft of humerus, 3. olecranon process to shaft of ulna, 4. head to shaft of radius and 5. medial epicondyle to shaft of humerus.

Comparison of observations of present study has been made with other workers in Table-14, with reference to age of fusion in both sex. It is obvious that fusion of all centers in Gujarati population in both sex is later than all other indian and foreign workers. This indicates



that relying upon other data in Gujarat will give inaccurate results , specifically, non fusion may be interpreted as age less than chronological age.

Hence we recommend further study of larger sample size, larger geographical area and statistical tests for near scientific opinion in age assessment cases.

## Conclusion

The sequence of fusion at elbow region was almost similar with other workers , however the range varied, which can be attributed to many among other reasons i.e.geographical variation, nutritional factors etc . As no statistical tests were applied in present study that is also with relatively smaller sample size, we would feel to suggest larger study with statistical methods for incorporating the observations of present study as regional database.

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## Preliminary Report

### Detection and identification of Profenophos-An organo phosphorous insecticide in autopsy material

A.K.Jaiswal\*, Adarsh Kumar\*\* & Vinod Dhingra\*\*\*

#### Abstract

Profenophos is a broad spectrum organophosphorous insecticide used in field crops. The easy availability of Profenophos is frequently encountered in forensic cases. Routinely Gas Liquid Chromatography & High Performance Liquid Chromatography are used for analyzing it, which is not only costly but requires good infrastructure. Now an attempt has been made to develop a new method for analysis of Profenophos in biological samples using TLC technique which is inexpensive, accurate and non-destructive. The aim of present paper is to describe symptoms, postmortem changes found in a reported case of Profenophos insecticide and detection and identification of insecticide in visceral material by T.L.C. method.

**Key words:** Profenophos, Organophosphorus, Insecticide, TLC.

#### Introduction

Profenophos is a broad spectrum organophosphorous insecticide. It is effective against both sucking and chewing insects of various crops. It has Trans-laminar action, as a result it can kill insect on both sides of leaves therefore mainly used in cotton crops. Profenophos has a chemical formula (O-4-bromo-2-bromophenyl O-ethyl S-propyl phosphorothioate)  $C_{17}H_{15}BrClO_3$ <sup>1-10</sup>

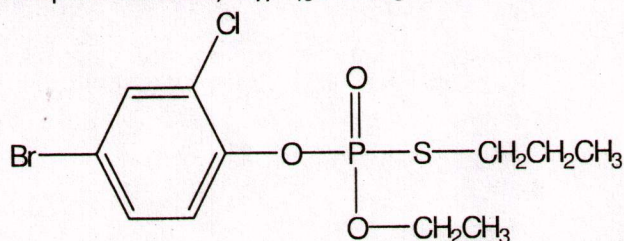


Figure-1: Chemical structure of Profenophos

The review of literature on analytical methods for analysis of Profenophos reveals that gas liquid chromatography and high methods

for analysis of Profenophos reveals that gas liquid chromatography and high performance liquid chromatography has been extensively used, but this method is not only costly but time consuming also. An attempt has been made to analysis profenophos by using TLC which is very cheap and takes very less time for analysis and can be performed in any laboratory in a very simply way<sup>11-15</sup>.

#### Case Summary

A case of alleged poisoning from suspected organophosphorous pesticide by a person of 30 years was received. He was admitted in the hospital on 23-04-03 at 10 A.M. due to consumption of pesticide 3hours earlier. The common symptoms of pesticide poisoning were observed. The treatment record suggested patient was unconscious had normal pulse with blood pressure 110/70 m.m. pupil were pinpoint and lungs were clear.

#### Autopsy findings

The patient died on the same day at 4 P.M. i.e. total survival period of about 9 hrs. Post-mortem examination was conducted and following findings were reported by the autopsy surgeon: froth was coming out from nostrils and mouth, all abdominal organs and mucosa were

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congested with emanation of pungent smell. The cause of death was kept pending and viscera were preserved. In the present communication, we have detected Profenophos by using T.L.C. Method.

## Material and Method

### a) Extraction of Profenophos from biological materials

About 50 g. viscera [(I) pieces of stomach and intestine with contents (II) pieces of liver, spleen, kidney and lungs said to be containing organophosphorous insecticides were taken. Material was cut into fine pieces and minced carefully, 100 ml of hexane and 10 ml of acetone was added. The contents were shaken in a separating funnel several times and solvent removed. The process was repeated several times and solvent layers collected separately and passed through alumina (neutral) packed column. The purified sample was dried with anhydrous Sodium Sulphate and used for further analysis.

### b) Preparation of Palladous chloride reagent

1.0 g. of Palladous chloride dissolved in 100 ml of water containing 0.5 ml of conc. Hydrochloric acid.

### c) Thin Layer Chromatography

Standard glass T.L.C. plates were coated with slurry of silica gel G in water (1:2) to a thickness of 0.25mm and activated at 110° C for one hour. The Microgram quantity of a commercial standard solution (1mg per ml in ethanol) of Profenophos, and purified extracted visceral material were spotted on different plates. These plates were then developed in pre-saturated T.L.C. chamber using hexane and acetone (9:1) solvent system. After the solvent had traveled 10 cm up; the plates were removed from the chamber and allowed to get dried in air, then sprayed with palladous chloride reagent solution which gave yellow coloured spots at 3, 4, 5, 8 cms.

## Result & Discussion

Profenophos is a broad spectrum organophosphorous insecticide used in field crops. The easy availability of Profenophos is frequently encountered in forensic cases.

Routinely Gas Liquid Chromatography & High Performance Liquid Chromatography are used for analyzing it which is not only costly but requires good infrastructure. Now an attempt has been made to develop a new method for analysis of Profenophos in biological samples using TLC technique which is inexpensive, accurate and non-destructive.

Profenophos was extracted by solvent extraction method, after purification extract was spotted on TLC plate coated with silica gel G of 0.25mm thickness. After the solvent had traveled 10 cm up; the plates were removed from the chamber and allowed to get dried in air, then sprayed with palladous chloride reagent solution which gave yellow coloured spots at 3, 4, 5, 8 cms. The Thin layer chromatogram developed with the spray reagent gave R<sub>f</sub> value of extracted samples which was matched with the commercial grade standard sample of Profenophos at R<sub>f</sub> 0.30, 0.40, 0.50, & 0.80, with yellow colour spots. Therefore this method can be used as routine identification of the Organo-phosphorous insecticide -Profenophos which is accurate and reproducible.

## Acknowledgement

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## **Preliminary Report**

### **High level bifurcation of common carotid artery with cervical carotid siphon**

*K. Aravindhan\* & A. M. Singh\*\**

#### **Abstract**

During routine dissection in Anatomy department, a variation in the branching level of common carotid artery was noted. The common carotid artery has divided into internal and external carotid arteries above the level of hyoid bone, which is much higher than the normal site. This rare case is presented and discussed herewith having potential medicolegal implication.

**Key words:** *Common carotid artery, external carotid artery, internal carotid artery, thyroid cartilage & hyoid bone.*

#### **Introduction**

The common carotid arteries are direct and indirect branches of arch of aorta and brachiocephalic trunk on the left and right side respectively. Normally, the common carotid bifurcates at the level of upper border of thyroid cartilage.<sup>1,2</sup> Rarely there may be variations in the branching level and an anomalous branch.<sup>3,4,5</sup>

#### **Case history**

During routine dissection in Anatomy department, a variation of bifurcation of common carotid artery was noted in an adult male cadaver. The bifurcation was above the level of tip of the greater horn of the hyoid bone on both sides. Knowledge of such rare case will be useful to the autopsy surgeons during the dissection of neck.

1. The common carotid arteries were bifurcated at higher level than usual i.e. one inch above the tip of the greater horns of hyoid bone (Figure- 1).
2. The internal carotid arteries have curved course instead of usual straight course.
3. All branches arose from the external carotid artery within the digastric triangle except the

superior thyroid artery which is emerged from the common carotid just below its bifurcation.

#### **Discussion**

Common carotid arteries ascend in the left and right sides of the neck and bifurcate at the level of upper border of thyroid cartilage<sup>1,2</sup> Rarely there may be variations in the branching level and an anomalous branch.<sup>3,4,5</sup> In the present case the common carotid arteries were bifurcated at higher level i.e. one inch above the tip of the greater horns of hyoid bone. In the present case all branches arose from the external carotid artery within the digastric triangle except the superior thyroid artery which is emerged from the common carotid just below its bifurcation, which is in agreement with the observations of many workers.<sup>1,6,7,8</sup> The internal carotid artery which has straight course in the neck<sup>3,9</sup> bends backwards, upwards and forwards forming an 'U' shaped loop with convexity backwards before entering the carotid canal. It resembles the 'carotid siphon', which is formed within the cranial cavity. This is an exceptional finding and may be named as 'cervical carotid siphon' to differentiate it from the siphon which is in the cranial cavity. Perhaps, this loop could be for the regulation of blood flow to the brain like carotid siphon at the cavernous sinus and / or to allow the free movement of the neck without any undue stretching of an internal carotid because of high level bifurcation of common carotid artery. The significance of such deviation in medicolegal cases is manifold. Firstly,

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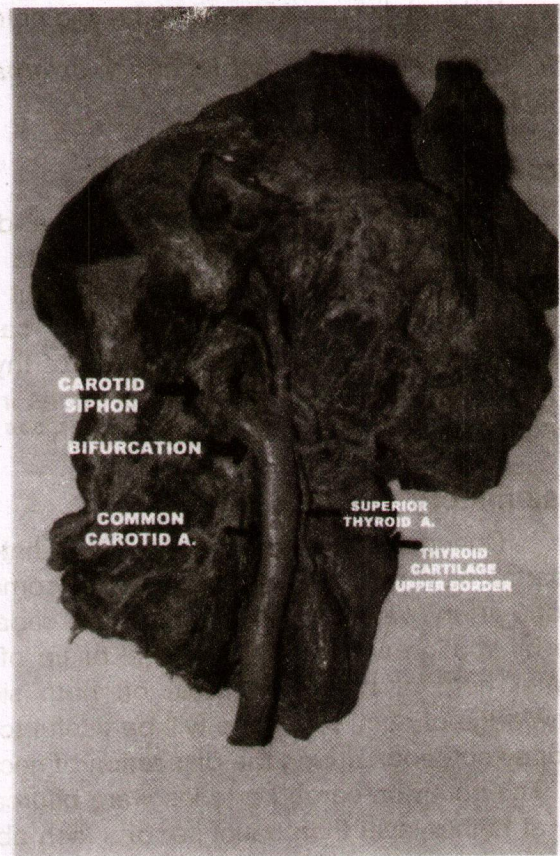
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it can influence the incidence of transverse tears in intima of carotids in case of hanging and hence the research work on that theme shall include only common course or artery. Secondly, any such rarity may pose some difficulty in vascular or other surgery at neck region and in case of mishap opinion of medical negligence shall consider normal or rare course of any vessel.

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**Figure-1: Higher level bifurcation of common carotid artery**



## Case Report

### Hanging or strangling?-A case report of suicidal hanging without knot at the neck

Sobhan K. Das\* & Saurabh Chattopadhyay\*\*

#### Abstract

Strangling is generally homicidal, hanging commonly suicidal. Some kind of knot is generally present in the noose at or near the neck in almost all cases of hanging particularly suicidal hanging. If any case with history of hanging is found without any knot at the neck strongly arouse suspicion of strangling and therefore ruling out probability of strangling is essential. Here we report a rare case of suicidal hanging in a 80 yrs Bengali male where multiple turn of cotton rope around the neck was used as ligature but no knot could be detected at the neck.

**Key words:** Suicidal hanging, multiple turn, absent knot & strangling.

#### Introduction

In rural Bengal hanging is the most preferred method of ending the self life only next to poisoning. Strangulation is the most common form of suffocation in which expert opinion is requested in forensic medicine practice. Strangulation causing suffocation is of three types under the generic term "strangulation" - 1) Hanging 2) strangling 3) throttling.

Hanging is strangulation by means of a ligature where the neck is compressed passively by the individual's partial or entire own weight which becomes suspended from the ligature.

Strangling refers to neck compression where the instrument/ligature used is not tightened passively by the weight of the body but actively by outside force<sup>1</sup>.

Hanging is a form of violent death almost invariably associated with either deliberate or accidental self suspension<sup>2</sup> whereas strangling is commonly homicidal rarely suicidal may be accidental.

Presence of some form of knot in the noose for hanging is almost a constant finding and hanging is classified typical and atypical

according to position of knot at the neck. Commonly single turn and less likely more than 2-3 turns around neck is found in cases of hanging.

In strangling cases knot may not be present. Single or multiple turns of ligature material around neck without knot generally indicative of strangling. In strangling cases single or multiple complex type knot are suggestive of homicide unless very strong circumstantial evidence proved the contrary manner.<sup>2,3</sup>

In medicolegal practice it is often required in cases of death from strangulation to establish whether it is hanging or strangling.

Authors describe this present case of strangulation death with multiple turns of cotton rope ligature around the neck without any knot at the neck in the noose.

#### Case History

##### Inquest

A fair complexioned 80 yrs old male subject, a childless widower, was suffering for long time from chronic painful diseases, living alone in his house. In the morning found hanging from a ceiling fan and the door was not locked. A hand written suicidal note supposedly by the deceased was recovered from the adjacent other room where he mentioned that he was a childless and widower living alone and suffering from painful ailments for long time therefore ending the painful lonely life. History of previous failed attempt of suicidal hanging due to breaking down of weakligature material.

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## Post mortem examination

### External Findings

Nine turns of ligature of thick new cotton rope wound round the neck with two ends dangling loosely by the sides of the body without any knot at or near the neck (Figure-1). Rigor mortis-present all over the body. Eyes clear, face swollen, tongue tip protruded between almost closed teeth line. Tongue, lips, fingernail beds-bluish. Dried up stain of nasal secretion vertically downwards on the upper lip from nostril(Figure-2), petechial hemorrhage in the dependant parts of forearm and legs.

In the neck multiple ligature compression marks, two of them completely encircling the neck, lowermost one almost horizontal, circular, deep and another uppermost one obliquely round the neck. Other ligature compression abrasion marks are incomplete, indistinct, crisscrossing and overlapping at places on each other. On anterior neck there is excoriation of superficial skin due to friction abrasion with evidence of ecchymosis in and adjoining small area of excoriation. Two ligature abrasion mark is almost vertically upwards from behind the angles of mandible to the parietal eminence area of scalp on either side of neck and head (figure-3). On both side the mark is prominent behind the angles of mandible and showing evidence of friction abrasion on the skin over angles.

### Internal Findings

Undersurface of ligature marks condensed, whitened and parchmented particularly under the prominent ligature compression marks but there is no sign of extravasations of blood in the subcutaneous tissue or strap neck muscle. Hyoid bone and thyroid cartilage healthy. Muscles and all abdominal viscerae congested. Lungs-voluminous congested. Brain pale, edematous, clear. Collection of 40 ml of serous fluid in subdural space. Liver showing granular cirrhosis and multiple medium sized gallstones in the gallbladder. Stomach- healthy, contains 120 gram partly digested food material without characteristic smell of any known poison.

## Discussion

Multiple turns of ligature around neck without any knot at or near the neck, found in a room with door not locked in a case of one old aged person living alone - raises a suspicion on the cause and manner of death whether it is a case of strangling or hanging?--suicidal, accidental or homicidal?

In strangling cases more than 2-3 turns unusual and generally complex type knot is found tightly at and behind the neck where ligature compression marks are lowdown, horizontally circular except in very rare cases of lifting garroting when two ligature ends may be obliquely upwards but then multiple turns most unusual.

Knight reports a strangling case with multiple turns of ligature with a fixed knot at the back of the neck tightly on skin and opined that a case of strangulation by ligature, suicidal in manner which was proved by circumstantial evidences.<sup>4</sup>

In Taylor's book a case is mentioned where as many as 18 (eighteen) turns of ligature was found without knot or other tie at the neck in a case of 72 yrs woman and that proved to be a case of strangling where probability of homicide was ruled out in favor of suicide from strong circumstantial evidences<sup>2</sup>

Hanging with multiple turns of ligature is not uncommon but in all these cases there were some form of knot present may be varying in position, number or in type. In accidental hanging in cases of playacting, sexual asphyxia[masochistic] type accident, there is probability of multiple turns of ligature but knot is commonly present whereas in all other type of accidental hanging noose with knot in the neck quite unusual. Homicidal hanging is rare and very unusual without causing any other injury on the body or drugging the person even in this old aged person but there also some type of knot at or near neck is very unlikely to be absent.

Virendra kumar reported a case where a 35 yrs. Chinese man committed suicide by hanging with a ligature material made by electric wire but there was no knot present on the noose.<sup>5</sup>



In any type of hanging ligature compression marks are generally oblique, non continuous, placed high up in the neck except rarely in cases of partial hanging when ligature mark may be horizontal, low down, almost completely encircling the neck particularly when body is almost horizontal with only head is above the ground and ligature is tightly compressed on the neck.

In any type of strangulation many turns of ligature round the neck is very much suggestive of deliberate self application therefore indicative of suicidal manner.

In this case on completion of P.M examination on further query police revealed that the subject was found completely hanging from a ceiling fan where both free ends of the rope from the neck tied to the rod of the ceiling fan by many turns almost made into a heap on the rod. A chair on the cot just under the fan was noted at the scene of incident. The hand written suicidal note was indeed written by the deceased though not known on exactly what date and time. There was no history of animosity with the neighbors neither with his immediate kith and kin who have been living away in Kolkata but were caring and concerned.

Multiple stones in gallbladder corroborate the history of suffering from chronic painful diseases.

Deep grooving of ligature mark behind the angles of mandible and friction abrasion on the skin at angles indicative that ligature were locked behind the angles of mandible thereby prevented unwinding of ligature from neck. In this case, unexpected finding of paleness of brain when muscles and all other viscerae congested, could be explained by the drainage of blood from head and brain to the dependant part through vertebral venous plexus due to prolong hanging where ligature compressions were not so tight<sup>3</sup>.

The way deceased secured both free ends of thick new cotton rope to the rod of ceiling fan but forgetting to apply any knot at the neck is very much suggestive of his determination of ending own life without fail this time and that leads to severe anxiety and mental confusion at the time of preparation of commission most likely a sequel of his last experience of failed attempt due to breakdown of weak rope.

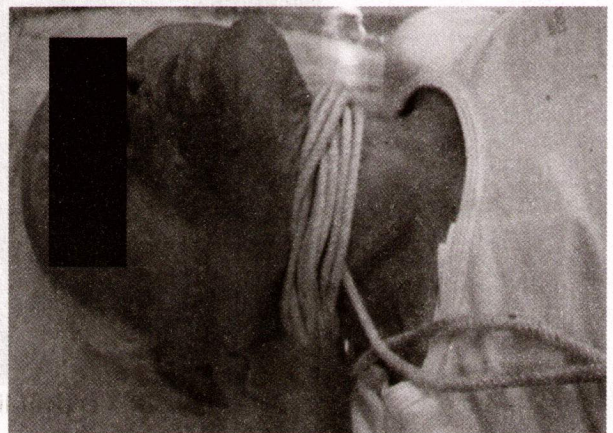
## Conclusion

Autopsy findings and available circumstantial evidences positively and strongly suggestive that "Death was due to the effects of hanging, suicidal in manner". and rules out the possibility of strangling- homicidal or suicidal.

In cases of any type of strangulation by ligature circumstantial evidences play a very important role in deciding a case whether it is strangling or hanging and also whether the manner of death is suicidal, homicidal or accidental.

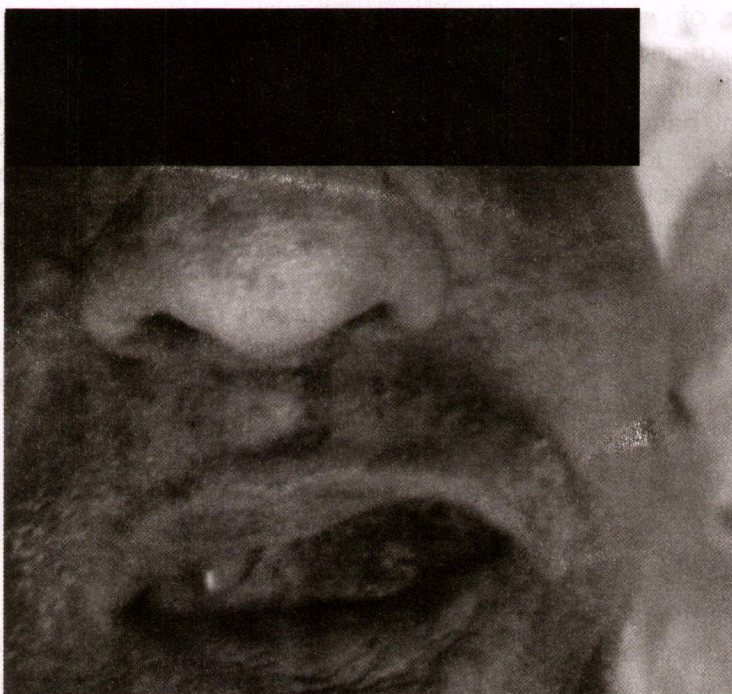
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**Figure-1:Multiple turns of rope but no knot .**





**Figure-2: Vertically downwards dried mark of nasal secretion**



**Figure-3: Vertical ligature marks on scalp.**



## **Case Report**

### **Sudden death due to acute haemorrhagic pancreatitis**

*Prateek Rastogi\* & Vikram Palimar\*\**

#### **Abstract**

In deaths occurring suddenly and unexpectedly the non availability of clinical history compounds the already existing problem for the forensic pathologist in arriving at the cause of death. Sudden death following acute haemorrhagic pancreatitis although reported is an uncommon phenomenon. A case is reported wherein an apparently healthy male aged 45 years and a known alcoholic was found dead in his room. Post mortem examination and histopathology confirmed it to be a case of sudden death due to acute hemorrhagic pancreatitis.

**Key words:** *Acute haemorrhagic pancreatitis, alcoholic & sudden death.*

#### **Introduction**

Acute pancreatitis is defined as acute and sudden inflammation of the pancreas that may involve the peripancreatic tissue and various organ systems. Generally, it is a mild disease, associated with recovery within few days of onset of the illness.<sup>1</sup> Acute pancreatitis represents a spectrum of disease, characterised by inflammation of the pancreas ranging from a mild, transitory illness to a severe, rapidly progressive hemorrhagic form, with massive necrosis and mortality rates of up to 24%.<sup>2</sup> The reported incidence of acute pancreatitis diagnosed first at clinicopathologic autopsy ranges between 30% and 42%.<sup>3</sup>

Though deaths due to acute haemorrhagic pancreatitis are uncommon; however as it is a common entity in developing countries like India, its causal relationship with sudden death should be kept in mind. Here, we report a case where in an apparently healthy male was found dead in his room. Autopsy and histopathology confirmed it to be a case of sudden death due to acute hemorrhagic pancreatitis.

#### **Case history**

As per the information furnished by police

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a 45 year old male was found dead in his room which was locked from inside. An empty alcohol bottle was found near the dead body. External examination showed bilateral conjunctival congestion with left sided sub conjunctival hemorrhage and few dried blood stains at nostrils. No external injuries were present on the body. All other natural body orifices are intact. On Internal examination: Brain and lungs were congested and oedematous. Coronaries and aorta showed mild atheromatous changes with patent lumen. Stomach contained partially digested light brown colour, unidentifiable food particles with some abnormal odour. Liver was enlarged, congested and showed mottled appearance. Pancreas appeared hemorrhagic (Figure- 1) and both kidneys were congested.

Chemical analysis of routine viscera and body fluids was positive for alcohol.

Histopathology of pancreatic tissue revealed patchy necrosis with hemorrhage and inflammatory cells. Liver histopathology was suggestive of cirrhosis.

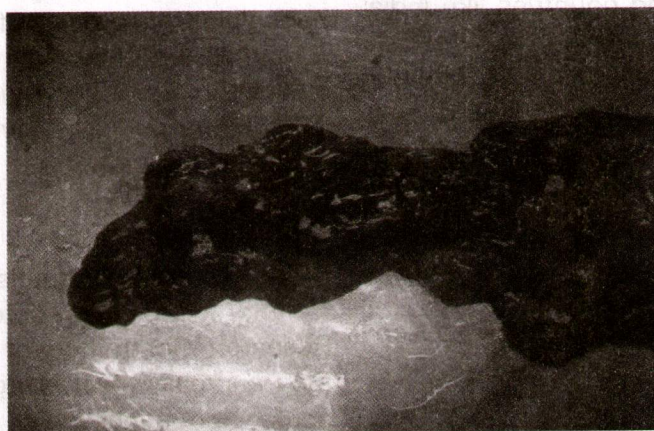
#### **Discussion**

Acute pancreatitis is diagnosed according to the diagnostic criteria proposed by the Research Committee of Intractable Diseases of the Pancreas, which suggests following features<sup>1</sup> acute abdominal pain and tenderness in the upper abdomen,<sup>2</sup> elevated pancreatic enzyme levels in blood, urine, or ascitic fluid, and<sup>3</sup> radiologic abnormalities characteristic of acute



pancreatitis. Acute pancreatitis can be diagnosed when two or more of the above criteria are fulfilled and other causes of acute abdominal pain are excluded.<sup>4</sup> Major etiologic factors are chronic alcoholism, common bile duct stones along with viral hepatitis and idiopathic causes.<sup>1</sup> Acute inflammation of the pancreas, formation of necrotic areas on the surface of the pancreas and in the omentum, accompanied by hemorrhages into the substance of the gland characterizes the condition.<sup>5</sup> The most frequent symptom in acute and recurrent pancreatitis is abdominal pain, followed by vomiting. Cases of sudden death due to acute pancreatitis have been reported in the past where diagnosis could not be made until autopsy.<sup>6,7,8</sup> Serum amylase levels, ultrasonography and computed tomography are recommended for early diagnosis.

In the present case, the deceased was apparently healthy, but was a known alcoholic which is corroborated by the finding of cirrhosis of liver on histopathology. Acute haemorrhagic pancreatitis is known to occur in chronic alcoholics. The autopsy surgeon should always keep this condition as one of the differential diagnosis in cases of sudden death, more so if there is a history of pain abdomen or vomiting prior to death in a person who is a known alcoholic.



**Figure -1: Cut section of pancreas showing hemorrhage**

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## Case Report

### Mysteries of perforated wounds

P.K. Tiwari\*, Deepak Sharma\*\* & S.R. Kochar\*\*\*

#### Abstract

Life is a stage with one entrance but many exits will power and trust in the almighty that helps to person for survive the ordeal of being impaled with about five feet arrow (bhala) in right shoulder. A 20 years old electrician met with an incident on 27 April 2008. He called his friend for help and traveled about 90 km. with bhala in right shoulder. After that he was admitted in hospital for treatment. He was operated within 6 hour after admission and was fortunate enough to survive.

**Key words:** *Perforated, punctured, penetrated, wounds, accidental, homicidal.*

#### Introduction

The degree of difficulty in conducting surgery on victim was more because of no diagnostic test could be conducted with the bhala stuck in the his body. After consideration of x-ray finding person was operated and bhala removed with out any major internal organs damage, Operation was done by orthopedic surgeon with the help of neurosurgeon.

#### Case History

A 20 years old electrician met with an incident on 27 April 2008. He called his friend for help and traveled about 90 km. with *bhala* in right shoulder. After that he was admitted in hospital for treatment. He was operated within 6 hour after admission and was fortunate enough to survive.

#### History of other cases

There are so many cases in country in this year equally miraculous July 12<sup>th</sup> '2008. One person 23<sup>rd</sup> years old was on his way to work HCL in Gurgaon in Office cab. The driver was allegedly speeding and according to victims family he fell asleep at wheels Car hit a Metro Baricade at full speed. A five feet long Iron Rod from Construction side rammed into the bonnet at the

car pierced the dash board and impaled in person. Sitting in front. Patient operated by team at AIIMS trauma centre.

Astrid Oates, a pregnant woman from Bournemouth in England, survived being speared through the chest by a wooden stake. The stake narrowly missed her heart and womb. She was passenger in a car that swerved to avoid a fox. The car hurtled into a fence and once of the posts speared through her right breast. Surgeons took four pounds, 11 ozs weeks later.

A 36-year-old woman car driver survived after an 8-ft long metal rod crashed through the windshield and impaled her head in Utah. The rod bounced on the highway after another vehicle passing by ran over it. The piece of metal struck the woman's face, passed through the base of her neck and speared in to the front seat. Amazingly, it the road. A passerby called for help after seeing her in that horrible condition. After a reconstructive surgery, she made a happy recovery.

Birmingham builder Keith Sweeney was impaled by a metre-long steel rod, He fell on it while working. He survived. The pole entered his left thigh, went up through his leg and into his stomach. From there it moved up through his chest and exited close to his right nipple. Friends rushed to help. The 37-year-old father-to-be was airlifted to hospital.

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#### Discussion

Slight negligence of a person can cause danger to life. Road side accident are increasing



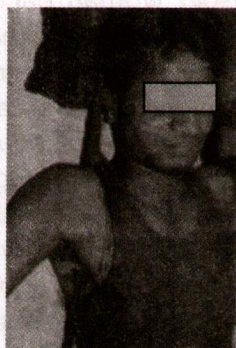
day by day. These type perforated wounds in various part of body are serious challenge for doctors because no diagnostic test could be conducted as no time and angle stuck in body in various position. Biggest challenge in these cases in operation theatre is to anaesthetized to person. The angle was so placed that the doctor could not make him lie down on operation table. so the anesthesia was given in sitting position. So in these situation precaution is better then cure.

## Conclusion

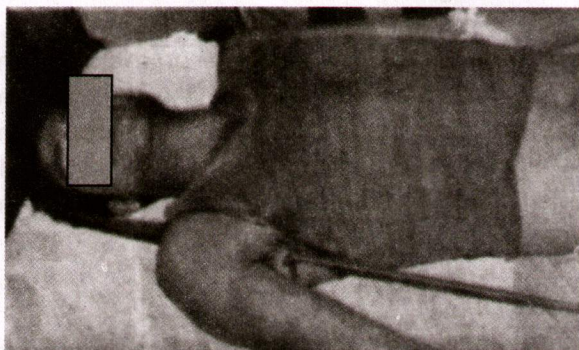
Educating the masses through the media by showing regarding speed of vehicle, road conditions and working conditions risk factors together with epidemiological data and call attention to make strategies to prevent these accidents. Steps should be taken not only to minimize the morbidity and mortality but also to prevent and reduce their incidence at least in cases where human error plays a role.

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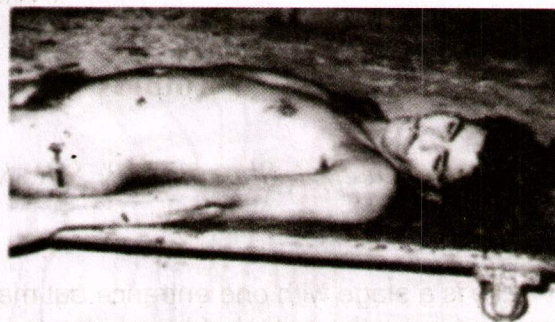
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**Figure-1: Perforated wound in right shoulder**



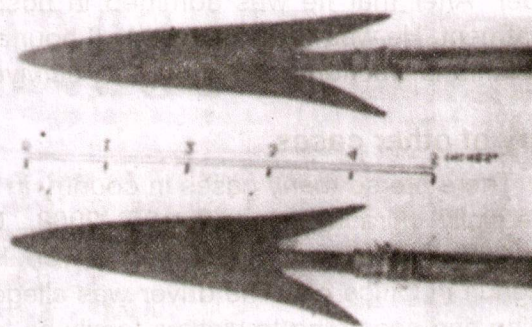
**Figure-2: Perforated wound in right shoulder**



**Figure-3: Death due to penetrating wound injuring It. Common iliac artery. Note the site of injury Which ended intra abdominally. Note a few drops of blood**



**Figure-4: Arrow injuries. Arrow in position. Victim survived after operation.**



**Figure-5: Arrow heads removed from victim in figure-4.**



## Case Report

### Tubal ligation: Can be fatal?

Mohammed Iliyas Sheikh\*, Pranav Prajapati\*\* & Vijay Kaushik\*\*\*

#### Abstract

A 25 years old female had consulted to a gynecologist for permanent abdominal tubal ligation. After few hours of operation, she developed itching all over body, breathlessness and abdominal pain. She went into shock gradually. The gynecologist had given emergency and supportive treatment but she succumbed and was declared death. Cause of death was given as "Cardio-respiratory arrest". Medico-legal examination was demanded by her husband to know the cause of death. Autopsy revealed hemo-peritoneum due to cut over left ovarian vessels. Legal, medical and ethical aspects are discussed in this paper.

**Key words:** Abdominal tubal ligation, negligence, cardiac arrest, post operative death & anaphylaxis.

#### Introduction

Tubal ligation surgery in India is performed for family planning as permanent sterilization. Most of the women undergo the tubal ligation surgery to avoid unwanted and unintentional conception. There are two way of tubal ligation procedure: reversible and irreversible. In reversible type the fallopian tubes are tied or blocked with a ring or clip. In irreversible type the fallopian tube is cut and sealed by using an electric cautry, which form a scar. Several techniques are used to expose the fallopian tubes for surgery. The most common are laparoscopy, posterior colpotomy (approach through the rear of the vagina) and minilaparotomy (approach through an incision just above the pubic hair line). Once the fallopian tubes are identified, a small section of each tube is blocked with silicone ring bands or cut free and stitch both ends. If an incision was made, the skin is closed with sutures or clips, which usually removed after one week of surgery.<sup>1</sup>

Tubal ligation surgery requires very less time for admission as well as completion of procedure. Though it is an ordinary outdoor

procedure but one can get a unique experience of medical recuperation as along with the best medical state of art facilities.

It is important to be aware of the potential risks of tubal ligation. Complications can range from nausea and vomiting to paralysis or even loss of life. Minor complications, such as minor infection or bleeding, bruising or collection of blood at incision site, burn on the skin, abnormal or painful scar formation, allergic skin reaction, delayed return of bowel and/or bladder function are usually temporary. Depending on the individual situation, major complications like injury to major vessels or internal organ may lead to longer stay, blood transfusion or a repeat surgery. Fortunately major complications from tubal ligation occur in less than 1 out of 100 procedures. Mortality following tubal sterilization is estimated to be 72 per 100,000 for all methods. Laparoscopic procedures carried the mortality rate of 5-10 per 100,000 compared to 7 per 100,000 for puerperal ligation.<sup>2</sup>

During abdominal tubal ligation surgery, organs like bladder, ureters, ovaries, fallopian tubes, uterus or ovarian vessels and abdominal aorta may be damaged. If any injury does occur, the treatment options will vary depending on the damage. In most cases, these injuries are found right away, and can be repaired and will heal without a problem. If they do not heal, another surgery may be needed. Sometimes an injury to an organ may not appear at the time of the operation, but shows up later. This may also

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require another surgery to overcome the complications.<sup>3</sup>

### Case history

A 25 years old female had a female child of 3 years and 10 days old male child who was delivered eleven days before her death. After ten days of delivery, she was admitted for abdominal tubal ligation on dated 25/6/2008 at 9.30 a.m. She was absolutely fit for surgery according to the Anesthetics & Surgeon. On the next day, tubal ligation surgery was performed by a Gynecologist. After 2 to 3 hours of operation, patient was complaining of itching all over the body (including scalp) & breathlessness. The patient was gradually going into the shock condition (hypotension, tachypnea, semi-conscious, body cold). Emergency and supportive treatment was given to her but she could not be survived. The treating doctor declared dead at 1:30 p.m on the same day and giving the cause of death "Cardio-respiratory arrest". Her husband alleged that her health was good before going to the operation and her death was occurred in suspicious condition. He lodged a police complaint and requested for legal inquiry.

As strong suspicious of death following tubal ligation surgery maneuver was there, an inquest was held. Medico legal postmortem was conducted at Forensic Medicine & Toxicology department, SMIMER, Surat on dated 27/06/09 at 9:35 a.m. Post-mortem findings were as mention below.

### External findings

- Nail beds of both hands were bluish in color.
- Abdomen was distended.
- Blood stained fluid was coming out from vagina.
- Inj. Mark present over front of right wrist & over lumbar region.
- Surgical stitched wound was present over front of abdomen in midline.

### Internal findings

- Peritoneal cavity contains 1.5 liter of clotted and fluid blood.
- Fallopian tubes tied with black thread on both side.
- Ovarian vessel of left side showed clean cut and free.
- Extravasation of blood was present around

the surrounding tissue.

- Uterus was enlarged; thickness of its muscle was 2cm.
- Placental site was irregular and presence of small clots at places.
- Cervix: Soft and contused, shreds of endometrium mixed with blood stained fluid coming out.
- All internal organs were pale.

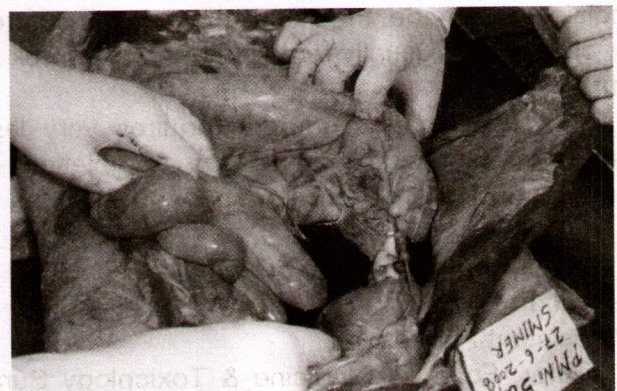
Viscera were sent for histo-pathological examination to the Pathology dept, SMIMER and also sent to the Forensic Science Laboratory for chemical analysis.

After post-mortem examination, the cause of death was given as "Shock as a result of intra-abdominal hemorrhage due to cut over left ovarian vessels, however viscera preserved for histo-pathological and chemical reports".

On receiving the histo-pathological report and chemical analyzer report, final cause of death was given as "Shock as a result of intra-abdominal hemorrhage due to cut over left ovarian vessels".

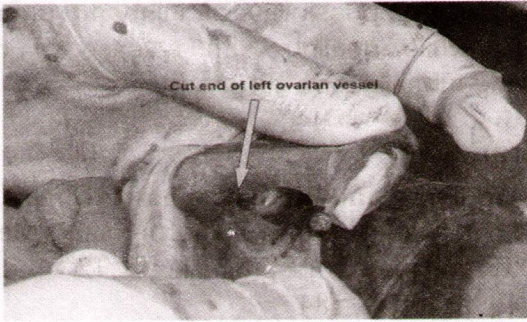


**Figure-1: Presence of midline surgical stitches in the abdominal wall**



**Figure-2: Haemoperitonium**





**Figure-3: Cut free ends of left ovarian vessels**



**Figure-4: Uterus cut & opened showing signs of recent deliver**

## Discussion

No surgery is completely free of risks. However, tubal ligation has been done for many years with good results and few complications or problems. Major or minor complications of tubal ligation surgery are treatable by proper care, medication and repeat surgery. Pre-operative or Post-operative health check up is a duty of doctor in minor / major operation to avoid life threatening conditions.

The question of criminal negligence may arise in a criminal court, when the defence counsel may attribute the death of an assaulted person to the negligence or undue interference of the medical attendant in the treatment of the deceased. For criminal negligence, the medical practitioner, whether qualified or unqualified, may be prosecuted by the police and charged in a criminal court with having caused the death of his patient by doing a rash or negligent act which shows gross carelessness, gross negligence, or gross ignorance during administration of an anesthetic, performance of an operation or any other treatment.<sup>4</sup>

According to the section 304A I.P.C, whenever death of any person occurred by any rash or negligent act not amounting to homicide, the offender is liable to be punished with imprisonment of either description for a term which may extend up to 2 years, or with fine, or with both.<sup>5</sup>

In the present case, within few hours of tubal ligation surgery the patient was went into shock condition with complains of itching all over body, breathlessness and abdominal pain. Vitals of the patient were not stable indicating red alarm of shock condition. In this condition, the Gynecologist had given only emergency and supportive treatment instead of investigating the cause of shock. It is advisable to rule out the possibility of shock by proper examination, ultrasonography of abdomen, blood profiles or taking opinion from another Gynecologist / Surgeon. The possibility of major complications (injury to organ or vessels) should be keep in mind and in emergency when free fluid is found in the abdomen; laparotomy should be done to find out the cause of bleeding which should be manageable.

The Gynecologist shows absence of reasonable care and skill during operation and in post-operative management of the patient. During operation, ovarian vessels were cut by sharp cutting operative instrument and before closing the abdomen she did not make any conformation about leakage of blood from any vessels. After operation when the victim was complaining about breathlessness and abdominal pain, the Gynecologist didn't use her skill to search cause of complication.

In any surgery or every operative procedure the treating doctor should keep in the mind about the possibility of complications and their management. As we know that no operation is free from complication, minor or major complications which are treatable when they are diagnosed in proper time by using skill to save the patient from life threatening condition. Complications occur during or after operation are not negligence but complications which are not managed by the treating doctor due to lack of care and skill causing bodily injury or death of patient put him in professional negligence. The treating doctor is liable for criminal negligence



when he show gross absence of reasonable skill or care during treatment, resulting in serious injury to or death of the patient.

In the present case, the Gynecologist failed to do her duty towards the patient and due to lack of proper post-operative skill and care, the patient had lost her life. So, the Gynecologist comes under the dome of criminal negligence who is punishable under section 304A I.P.C.

## Conclusions

1. The treating doctors / Gynecologist should keep in the mind about the possibility of complications of surgery and their emergency management to save the patient from life threatening condition and to save him self from such legal litigations.
2. The forensic experts would do well to

remember the possibility of injury to organ or vessels while dealing with a case of death following tubal ligation surgery.

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## Case Report

### Injury to precordium to relieve pain

*K. U. Zine\*, S. N. Rathod\*\*, M. R. Sane\*\*\* & B. M. Anand\*\*\**

#### Abstract

A case of sudden death of cardiac cause is presented where to relieve the pain of ischaemia the precordial was rubbed forcefully and was brought in dead condition to casualty section of the hospital with injuries to precordium. The injury over precordium can itself lead to death of a person. If proper history is not available such injuries may be misinterpreted as homicidal. Being uncommon the case is presented.

**Key words:** *Myocardial infarction, anginal pain, precordial injuries & coronary thrombosis.*

#### Introduction

Myocardial ischaemia clinically presents as severe pain and feeling of compression of chest. The patient may change posture on bed to get some relief of pain. Some times the patient may ask to press his chest to accompanying person and this may cause injury to chest wall. A case is presented, where due to forceful rubbing on precordial area (to relieve pain of ischaemia), contusions and abrasions were found.

#### Case History

A 51 years old male, a semi government organization servant, developed pain in his chest. He was received in dead condition at the casualty section.

At autopsy, on external examination, he was well nourished average built person. There was cyanosis of the fingernails. A reddish abrasion was found on precordium extending to midline measuring 14 x 8 cms directed towards midline. (Figure-1)

Internally the abrasion was associated with underlying contusion in intercostal muscles. The heart was weighing 350gms. External surface showed whitish milky patch on left ventricle. On dissection, left ventricle was hypertrophied. (Figure-2) Whitish fibrotic areas of old intramural infarcts

were present at places in the wall. The coronaries showed narrowing at ostia. (Figure-3) The left anterior descending branch showed calcification and narrowing. (Figure-4) Numerous atheromatous plaques were also found in ascending aorta. The organ pieces were preserved for histopathological examination. There was no evidence of fresh myocardial infarction.

#### Discussion

A heart attack may occur while at work, either incidentally by normal progression of a chronic disease process or due to unusual physical or mental strain. Some cardiologists feel that a heart attack never occurs after physical efforts, while others believe it can occur. If the attack occurs within seconds or minutes after unusual effort, the causal connection can be established. Causal connection can be established with certainty only in direct trauma to the heart occurring during work. Attacks occurring few days later may be due to haemorrhage in an atherosclerotic plaque in the coronary artery which initially narrows the lumen, but later causes occlusion.



**Figure-1: Contusion to precordium**

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**Figure-2: Hypertrophy of left ventricular wall with evidence of old intramural infarct**



**Figure-3: Atheromatous plaques in ascending aorta with narrowing of ostia.**



**Figure-4: Significant narrowing of Left anterior descending artery with about 10% patent lumen**

Pain is the most common presenting symptom in patients with myocardial infarction. The pain is deep and visceral; adjectives commonly used to describe it are heavy, squeezing and crushing, although occasionally it is described as stabbing or burning.<sup>1</sup>

In younger people infarction is usually accompanied by severe crushing chest pain and signs of shock.<sup>2</sup>

A blow or some physical trauma may precipitate a myocardial infarct or arrhythmia. The emotional upset that accompanies injury, or even the threat of fear of an injury, can cause death due to transient hypertension or tachycardia that may precipitate a subintimal haemorrhage, arrhythmias, or cerebral or subarachnoid haemorrhage. Physical effort which can damage

a diseased heart in some cases can be traced to unusual job or to the performance of unfamiliar or unaccustomed work, to accidents or other trauma, and to the extra physical demands while working with defective equipment.

In peri-mortem injuries (that occur during the act of dying), haemorrhage may be seen involving the soft tissues. Contusion-abrasion of chest wall, fractures of ribs, fractures of the sternum, contusions of the heart, contusions and lacerations of the liver and spleen, rupture of the heart and duodenum usually occur during resuscitation.<sup>3</sup>

Ismailov RM et al<sup>4</sup> found that Independent of confounding factors and coronary arteriography (CA) status, Blunt Cardiac Injury (BCI) was associated with 2.6-fold increased risk for AMI in persons 46 years or older. When the diagnosis of AMI was confirmed by CA, BCI was associated with 8-fold risk elevation among patients 46 years and older and a 31-fold elevation among patients 45 years and younger. Abdominal or pelvic trauma, irrespective of confounding factors and CA status, was associated with a 65% increase in the risk of AMI among patients 45 years and younger and 93% increase in the risk of among patients 46 years and older. When the diagnosis of AMI was confirmed by CA, abdominal or pelvic trauma was associated with 6-fold risk elevation among patients 46 years and older.

In the present case the deceased was taken to hospital from a distance of 50 kilometers. To get some relief from the chest pain the person forcibly rubbed the chest causing injury.

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## Case Report

### Suicide by electrocution

*B.D.Gupta\**, *R.A. Mehta\*\** & *M. M. Trangadia\*\*\** & *P.C. Vaghela\*\*\*\**

#### Abstract

Deaths due to electrocution are not uncommon in this part of the world. Most of such deaths are accidental in nature. We report a case of suicide by electrocution. The deceased himself was an electrician. His occupation must have prompted him to use such method of committing suicide. It is also obvious from the fact that he rightly used 'black' and 'red' wires to electrocute himself. Most of the suicides by electrocution world over are committed by persons who had knowledge of electricity. In India it is probably a second reported case of suicide by electrocution. Because of rarity of the suicide by electrocution in this region case is reported.

**Key words:** *Suicide, electrocution, Forensic pathology, Forensic science, India.*

#### Introduction

Use of electricity is almost universal. Deaths due to electrocution, though rare, are not uncommon. Most of such deaths in India are accidental.<sup>1, 2, 3</sup> Due to good safety measures accidental deaths are rare in other parts of the world though rarely they do occur<sup>4</sup>. In Western Countries, however, suicides by electrocution do occur.<sup>5, 6, 7, 8, 9</sup>

Indian authors have reported suicide by electrocution in their literature. But the references they have quoted are from news papers and of western incidents<sup>1, 3</sup>. However, recently, Khandekar et al published a case of suicide by electrocution<sup>10</sup>. In our experience of about 250 cases of electrocution spreading over thirty years of medico legal practice we found our first case of suicide by electrocution. To best of our knowledge probably this is the second case of suicide using electricity in India.

#### Case history

It was a case report from Navy, a wing of

military. The deceased was about 43 years old. He was found dead at 8.30 A.M. in his room which was locked from inside.

We conducted the postmortem examination after about 6 hours at 3.30 P.M. On external Examination, he was found to be of good built and nourishment. He had put on shirt and a pair of trousers. The shirt showed mark of burn due to electric current at a site where the left wrist was resting on the body. [Figure- 1]

There was no cyanosis, no oozing of fluid from any of the orifices. The mouth was closed and tongue was inside the mouth. The eyes were closed and pupils were dilated. Rigor mortis was well developed involving the whole body. Well marked postmortem lividity was seen on the back.

We found that both of his wrists were tied individually with un-insulated copper wires. The left wrist was tied with a black wire while the right wrist was tied with red wire. The third green wire was lying as such unused. [Figure-2]

On removing the metallic wires from the wrists we found more or less same findings on both the wrists. This was in the form of groove due to ligature by copper wire encircling the whole wrist. The groove and adjacent skin was blackened in width of about 0.5 cm to 4 cm. At places the epidermis was peeled off. The grooved regions showed typical dried parchment type of electrocution marks. There were few more marks of contact burns due to un-insulated wire coming in contact with the skin of abdomen where the

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right wrist was resting. [Figure- 3]

Near the main marks of electrocution, smaller areas of blackening and peeling up of epidermis were also seen on both the wrists. These marks were probably due to loose fibrils of un-insulated copper wire coming in contact with the skin of forearm or due to heat effect of electrocution.

Internally, there were no characteristic findings. However, brain and other viscera were found to be congested. We concluded that the deceased had died due to electrocution.

## **Discussion**

Accidental deaths due to electrocution are not uncommon in India. Most of these deaths are due to faulty wiring, broken wires, broken plugs, wet or damp electricity gadgets and probably due to lack of observation of due safety precautions. Suicide by electrocution requires preparations. It may include even an elementary knowledge of functioning of electrical devices.

Suicidal electrocution has been reported from Australia and Bulgaria <sup>5,6</sup>. Chan et al report a ten year study having 25 cases <sup>5</sup>. Study of Dokov consisted 59 victims.<sup>6</sup> Various other authors have also reported sporadic cases of suicide by electrocution <sup>7,8,9,10,11</sup>.

In most of the cases it was the low voltage, 220 volts, which was used for committing suicide. This is the voltage which is in use in most of the countries like India, Sri Lanka, Bulgaria, France etc in domestic electrification. <sup>6, 8, 9, 10, 11</sup>. In present case also it was 220 volts. However, Tirasci et al report in their study of 123 accidental deaths due to electrocution the range of voltage was 110 to 380 <sup>4</sup>. High voltage current is commonly used either for lines transferring current or in industrial fields.

The most common method which emerged from review of literature was direct contact with the live electrical cable<sup>5,6,9</sup>. In present case it was not only direct contact with live cable but it was also in such a way that circuit gets complete and the act is accomplished. Other most common method includes using bath tub or water body with electrical device immersed in water. In India the use of bath tub is not very common and restricted only to elite society

therefore even in cases of accidental deaths due to electrocution we did not get any case of such nature. However, electrocution due to wet or damp electrical device and in rainy season is not infrequent.

Dokov reported that the second most common method of committing suicide by electrocution is climbing up and touching high voltage power transmission line <sup>6</sup>. As suicide by electrocution is very rare we have not found any such case in published Indian literature.

However, in our unpublished data we did find a case of accidental electrocution of a person by high voltage transmission line. The victim went up to the top of loaded truck to unload it, while the high voltage line was just passing above the truck. The person got into the arc of high voltage current and got electrocuted.

Those who have opted electrocution as a mode of committing suicide, most of them either had worked or were currently working as electrician including the present case. <sup>5,8,9</sup>

In one of the cases reported by Eren et al the victim, a retired electrical technician, was found with bare copper wire at his left wrist and neck. The other end of the wire was connected to the wire going from switch to plug. An extension cord running along the floor was plugged into a wall outlet supplying 220-V current. The victim was despondent over a labour accident eight years ago. He had undergone several spinal operations and also had depressive personality changes.<sup>8</sup> Marc et al reported cases in which bare wires were applied to complete the hand to hand circuit <sup>12</sup>. Similar method of hand to hand contact was used in present case. The deceased used the wire which was supplying current to a refrigerator. He disconnected the wires from the refrigerator and used the main and negative wires to tie at his wrists and then switched on the plug to complete the circuit. [Figure- 4] The Victim of present case was 43 years old but was residing alone. He had a bizarre personality. He would read books on religion and Ayurveda would remain aloof and alone. As psychiatric consultations in India are not very frequent, no clear cut documentation of psychiatric disorder could be traced.



## Conclusion

Though most of the deaths due to electrocution are accidental, some cases of suicides are also reported. The present case was a case of suicide by electrocution. The deceased was an electrician himself and was residing alone in military campus. Being an electrician, he probably chose electrocution to commit suicide. Suicide by electrocution is very rare in India. Because of rarity of the case, the case is reported.

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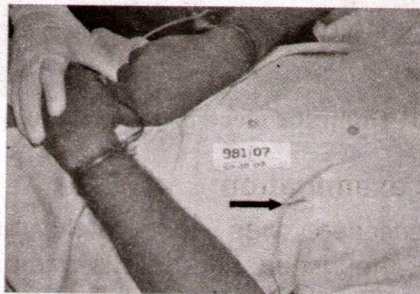


Figure- 1 : See electrocution mark on the shirt.



Figure -3 : See bare copper wires tied at both the wrists. Also see electrocution burns marks on the abdomen.



Figure- 2: See the position of red and black wires in right and left wrist respectively

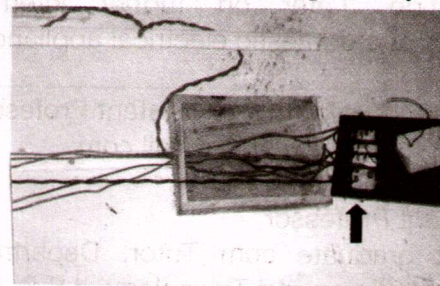


Figure-4 : See the plug from which wires of refrigerator are coming out.



## Case Report

### Fatal electrocution by electrical weapon

H.V.Chandrakant\*, Arun M\*\*, Pramod Kumar G.N\*\*\*\* & Ananda Reddy\*\*\*\*

#### Abstract

Homicidal electrocution is a very uncommon or perhaps under reported phenomenon. This type of murder narrates a picture of a very ruthless offender, the crime itself being premeditated and planned. Passage of electric current through the human body is an aberration, and commission of such an act purposefully is diabolical. We are presenting a case report, where husband had murdered wife using the electrical appliance. The uniqueness in this case was the manner in which the murder was committed by using domestic electrical appliance.

**Key words:** Electric deaths, homicidal electrocution & murder.

#### Introduction

Electrocution is usually accidental, of course suicidal cases of electrocution are also on the record but this is a rare and unusual method for homicidal means. Very few cases have been reported in this regard.

Deaths due to electrocution are infrequent. Virtually all such deaths are accidental in nature with suicides much rarer and homicides least common. Deaths due to electrocution virtually involve alternating current, it being more commonly used in this country. Another factor could be that humans are about 4-6 times more sensitive to alternating than to direct current. A rare case of homicide by electrical weapon is reported. Associated circumstances have been compared with the available literature.

#### Case history

A young adult deceased female was brought to JSS medical college mortuary for postmortem examination with alleged history of electrocution. Later on further interrogation revealed that a domestic electrical appliance in

the form of water heating immersion coil (Figure-1) had been used by the husband of the deceased with the intention of terminating her life.

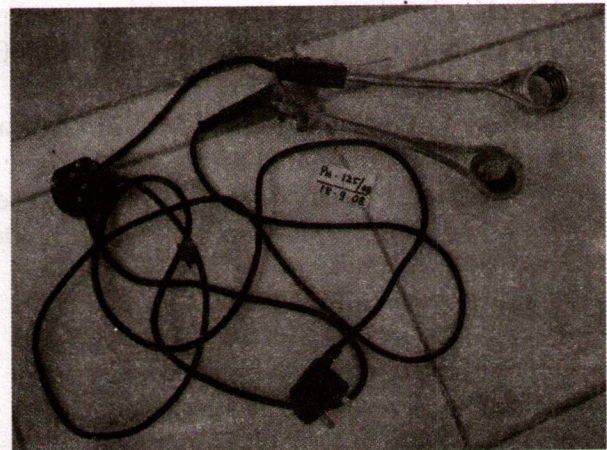


Figure-1: Domestic electrical gadget in question

#### External examination

Deceased was moderately built and adequately nourished, rigor mortis was present all over and postmortem staining was present over the back, front of chest and neck. Evidence of blood stained froth from the nostrils and mouth.

The following external injuries were noted

1. Irregular burn mark with central depression present over inner aspect of left forearm measuring 13cmx6cm, reddish brown in color.(Figure-2)
2. Circular contusion measuring 2cmx2cm present over inner aspect of upper 1/3<sup>rd</sup> of left arm.

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3. Irregular multiple abrasions over the back of left hand in an area of 6cmx5cm.
4. Irregular contusion over inner aspect of middle 1/3<sup>rd</sup> of right arm, measuring 4cmx2cm.(Figure-3)
5. Irregular contusion 3cmx2cm over inner aspect of middle 1/3<sup>rd</sup> of right arm, 3cm below injury no 4.

All injuries mentioned were fresh and antemortem in nature. On Internal examination all the organs were intact and congested.



**Figure-2: Irregular electrocution mark at left forearm.**



**Figure-3: Irregular contusion over inner aspect right arm**

## **Discussion**

The most common method of homicide with electrical current is to drop a "live" (plugged-in) electrical device into a bath tub when an individual is taking a bath. There are usually no electrical burns in such a case and if the device is subsequently removed, the cause of death cannot be determined.<sup>1</sup>

As observed by Knight<sup>2</sup> homicide is occasionally committed by electricity. He reported a typical bath tub death of a woman with an electric fan heater immersed in the bath tub by her husband. He had borrowed the book "The Do-It-Yourself Home Electrician" from the public library the previous day!

Another notable homicide reported by Knight concerned the wrapping of bare electrical wires around a women's neck by her husband. This wire was a thick 30 amp cooker cable with 40 cm of insulation stripped except for the extreme tips. Although he gave a very unlikely explanation for this (he was using this wire to test his electric shaver!), he could not be prosecuted for lack of evidence.<sup>2</sup>

Knight and Cox reports that the vast majority of electrocutions are accidental in origin but a few are suicidal and the circumstances are usually obvious. Occasionally homicide may be perpetrated by electrocution.<sup>3</sup>

The rarity of electrocution used for procuring homicide is also noted by the Indian commentator Modi. He comments, "homicide by electricity though extremely rare is quite possible".<sup>4</sup> Another Indian author, Parikh comments that "homicide though rare is possible. An electrical shock may be given in malice!"<sup>5</sup>

Recorded homicidal electrocutions are scarce to find. Polson quotes a case in which a husband attached the household supply switch ingeniously to a soap dish used by his wife.<sup>6</sup> A similar case was reported by Taylor.<sup>7</sup>

Manish Shrigiriwar and others in their study reported two cases of homicidal electrocution in one case bare electric wire was tied around left index finger of pregnant woman and in another husband killed 38 year old female by putting live plug pin inside oral cavity while she was asleep suspecting her infidelity.<sup>8</sup>

A similar case was reported by Thanjara<sup>9</sup> mentioned here has remarkable similarities to the above mentioned literature.

A piece of tissue from the injury no 1 was subjected for HPE. This showed complete loss of epidermis with presence of collagen in epidermal & sub epithelial region with elongation of nucleus, Features were consistent with changes induced by electrical burns. Cause of death was opined to be due to electrocution.



## Conclusion

Injuries and death from homicidal electrocution have considerable medico legal significance because of its rarity. Death due to electrocution needs to be thoroughly investigated and documented for reasons of compensations and for instituting required measures in prevention of such crimes.

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## Case Report

### Terror strikes courtyard

Manoj K. Patahk\*, Rajesh Chaturvedi\*\*, Prashant Agarwal\*\*\*, Senti Toshi\*\*\*\* & S.K. Tripathi\*\*\*\*\*

### Abstract

Acts of terrorism, recent catastrophes, and disasters have created an urgent need for new classifications to characterize, report, and analyze injuries, sequelae of injuries, and deaths associated with these events<sup>1</sup>.

The aim of this report is to provide a detailed analysis of the autopsy findings of victims of the Varanasi courtyard bombings in 2007, and emphasize the importance of scene investigation and autopsy procedure for deaths due to terrorist bombings.

The data of the materials were collected from the nine deceased that were brought for postmortem examination. Nine Cases for the present study were selected from the dead bodies brought into the mortuary of the Department of Forensic Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India, for medico legal postmortem examination from various police stations of Varanasi and surrounding areas.

**Key words:** RDX, ball bearing, bicycles, blast effect & terrorism.

### Case history

It was like any other day at the three district courts in Lucknow, Faizabad and Varanasi on Friday. That was till 1.10 p.m. The next 20 minutes were devastating as six blasts rocked the courts. Six consecutive serial blasts rocked Lucknow, Varanasi and Faizabad courts in Uttar Pradesh on 23 November 2007 afternoon in a span of 25 minutes, in which reportedly many people were killed and several others injured. Bombs were explicitly targeted to the lawyers who were working in courts premises at these cities. The first blast occurred in Varanasi civil court and collectorate premises. Two successive blasts occurred in Faizabad, making four casualties, district court around 13:12 and 13:15, closely followed by one at Lucknow at 13:32.

Three consecutive blasts claimed most

lives in Varanasi; Pandemonium reigned after the deafening sound of the first blast. Soon, another bomb exploded 200 meters from the site of the first. The victims were immediately rushed to the hospitals. In all 9 people were killed including two lawyers and 42 others were injured. Bombs were tied to bicycles which exploded around 13:05-13:15.

Nine bodies came to the mortuary in the dept. of Forensic Medicine for postmortem examination on the same very night. Survival period in those victims was between instantaneous deaths to few hours. Five victims died due to shock and hemorrhage, three victims died due to coma and one victim succumbed to death instantaneously as a result of blast effect to vital and visceral organs.

### Observations

All of victims of this blast were male. Majority of them belonged to age group 21-40 years (44%) followed by 51-60 years of age group (34%) (Table: 1). About 2/3<sup>rd</sup> of deceased (67%) were inhabitants of rural areas, during that unfortunate event (Table: 2).

All the 9 victims of this blast incident suffered tissue penetration either by spherical

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pellets (i.e. ball bearings) or by molten metallic pieces of bicycles as intense heat energy liberated from explosion, which a result of secondary blast effects. Multiple penetrating wounds of about 4 to 5 mm in diameter, surrounded by a black colored ring of de-epithelialised dermis resembling the entrance wounds of bullets were seen on the body surfaces of the victims. During autopsy of these bodies, small pellets about 6 mm diameter similar to those used in cycle ball bearing's were recovered from the vital organs along with the melted metallic parts of the bicycle which acted as splinters during explosion.

Skin lacerations were seen in autopsies of all deceased. Skull fracture and brain lacerations were observed in 3 cases. Cervical vertebrae fracture and dislocation at the level C<sub>2</sub>-C<sub>3</sub> along with rupture of spinal cord occurred in 1 case. Lungs were lacerated in 2 cases and in 1 case heart was also lacerated. The abdominal cavity was filled with about 1.5 to 2.5 liters of blood. Liver was lacerated in 3 victims. The most frequently injured organ in the thorax and abdomen was liver (3 cases) followed by Lungs (2 cases). Upper limbs were spared in all the observed victims but lower limbs were injured in 2 cases having traumatic fracture of tibia and fibula of right side in both the cases due to blast effect (Table-3).

During autopsy metallic materials i.e. steel balls (ball bearings) were recovered from 4 cases (44%) and molten metallic pieces of bicycles from 5 victims (56%) (Table: 4).

The cranial region was found to be the most common region in one organ injuries – 2 cases, while the abdominal region has the highest frequency in multiple organ injuries 3 injuries/9 cases (Table-5).

Of the nine victims with bodily injuries, one died instantaneously as a result of injury of cervical spine and spinal cord, others survived for few minutes to few hours i.e. on the way to hospital or in the hospital as evident from interrogation of eyewitnesses, attendants/ relatives, friends of the victims, hospital records/death certificates if hospital death occurred. Among the remaining victims, shock and hemorrhage was the commonest cause of death (5victims) followed by coma 3 cases (Table-6).

**Table -1: Number and percentage of total male victims.**

Age (in years)	No. of victims	%
0 to 10	0	0
11 to 20	1	11
21 to 30	2	22
31 to 40	2	22
41 to 50	1	11
51 to 60	3	34
total	9	100

**Table- 2: Residential status of victims of court blast**

Residential status	No. of victims	%
Rural	6	67
Urban	3	3
Total	9	100

**Table- 3: Autopsy findings of court blast cases**

Body region	Body parts	No.of cases
Head	Scalp	3
	Skull fracture	3
	Brain lacerated	3
Neck	Skin lacerated	1
	Vessels ruptured Cervical vertebra fracture & dislocation (C2-C3)	1
	Spinal cord ruptured	1
Thorax	Skin lacerated	2
	Lungs lacerated	2
	Heart lacerated	1
Abdomen	Skin lacerated	3
	Liver lacerated	3
	Cavity filled with blood (1.5 to 2.5 liters of blood)	3
Lower Limbs	Skin lacerated	2
	Fracture of tibia and fibula	2



**Table -4: Foreign body (splinter) identified at autopsy**

Sr. No	Foreign body identify	No. of cases	%
1	Metal pieces (bicycles)	5	56
2	Metallic ball-bearings (pellets)	4	44
	Total	9	100

**Table -5: Distribution of nine cases according to body regions places fatal injuries**

Body region	Parts	No. of victims
Injury to single body region	Cranial wounding	2
	Injury to neck	1
	Injury to thorax	1
	Injury to abdomen	0
	Injury to extremities	0
Injury to multiple body regions	Head and abdomen	1
	Chest and abdomen	1
	Abdomen and extremities	1

**Table- 6: Cause of death of court blast victims**

Cause of death	No. of cases	%
Coma	3	33
Shock and hemorrhage	5	56
Asphyxia	0	0
Instantaneous death	1	11
Due to spinal injury	0	0
Total	9	100

## Discussion

Skin lacerations were seen in all the victims. Soft tissue injuries or lacerations were most common injuries<sup>2</sup>. Teare Donald R<sup>2</sup> stated that ball bearings from terrorist bombs produce entrance wounds remarkably similar to those

caused by bullets. This may be a source of confusion to both surgeons and pathologist. He further described that the characteristic punched out hole surrounded by a ring of de-epithelialised dermis is virtually identical with the picture of a shot from, say, 0.303- caliber weapon fired a considerable distance from the body. Mayo Ami and Yoram Kluger<sup>3</sup> stated that of the 91 victims of terrorist bombing with bodily injuries, 20 died on the scene, and among the survivors, all the 32 severely injured suffered tissue penetration by the spherical pellets. In our study head injuries were seen in 3 cases, either along or in combination with abdominal region. Thoracic injuries were seen in 2 victims. Abdominal injuries were present in 3 cases. Lower limbs were injured in 2 deceased. M.S.Yavuz et. al.<sup>4</sup> in their study reported that in the majority of cases, there were fractures in the several bones. Head injuries have pursued extremities injuries (Table-3). In our study various foreign materials were removed from corpses of 9 cases (100%). Metallic ball-bearings (pellets) were recovered from 4 victims and molten metallic pieces of bicycles which were used for planting bombs were recovered from 5 cases. Mayo Ami and Yoram Kluger<sup>3</sup> in their study about terrorist bombing reported that projectiles like steel balls, nails, screws and nuts packed around the explosive causes secondary blast injuries and the wounds reflect their velocity and shape. Multiple penetrations of such pellets result in increased mortality and devastating injuries, and such were encountered in many suicide bombing incidents. Teare Donald R<sup>2</sup>. Reported in his study of ball bearing – bomb injuries that the type of injury caused by ball bearings had remarkable similarity with the entrance wounds caused by bullets fired from orthodox weapons. Ball bearings have a high initial velocity, which is thought to be quickly lost. In one case there were seven entrance wounds and five exit wounds, only two ball bearings being recovered from the body. One had lodged in the anterior abdominal wall, and the other in the body of the fifth lumbar vertebrae. In shooting there is generally some aim taken and some expected direction of fire, but in terrorist bomb explosions the direction of flight of objects such as ball bearings is random (Table-4). M.S.Yavuz et al.<sup>4</sup> In their study they further stated that, total ratio



determined for head injuries was 55% (n=66), for thoracic injuries was 58.3% (n=70) and for abdominal injuries was 54.2% (n=65). Auditory barotraumas was commonly diagnosed in other bomb studies<sup>4</sup>. In this study, examination of ears was not noted in autopsy reports. Additionally some authors emphasize that dust arising from the ground may stick into the skin and consequently may lead to dark shapes like a tattoo<sup>4</sup>. Such a description was not observed in the autopsy reports documented in this study that this may have been due to non-documentation.

Several authors emphasize the requirement of radiological investigations to detect the localization of such foreign material<sup>4</sup> (Table-4). In our study multiple traumas were seen in 3 cases i.e the ratio was 33%. In a study conducted in Paris one a bomb explosion, the ratio of multiple traumas was reported as 47 %<sup>4,5</sup> (Table-5). Polytrauma are frequent with bombings. We mentioned that per patient, 5.4 body regions were injured in the most severely wounded group<sup>5</sup> (Table-5). In the present study shock and hemorrhage was the commonest cause of death of victims i.e. in 5 cases. It was followed by coma in 3 cases and instantaneous death in 1 deceased. It was reported that head injuries are the leading cause of deaths due to bomb explosions. Thoracic injuries and burns follow it<sup>4</sup> (Table-6).

Foreign materials removed from the corpses are very important in determining the attribution of the events and types of the bomb<sup>7</sup>. I have observed that radiology is important for postmortem identification<sup>4</sup>.

Laposwata<sup>4</sup> have prepared a protocol to guide the forensic examiners in the collection of trace evidence from the bombing victims. Forensic examination after bombing events include the collection of foreign materials, the definition of the cause of death, and the determination of mortal wounds and the mechanisms of injury according to procedures<sup>4</sup>.

While conducting our study, we saw that although those scenes were investigated by experienced policemen and those autopsies were performed by experienced forensic examiners there were some inadequacies at scene investigations and at autopsies of corpses died as a results of bombings.

## Conclusions

Terrorist bombing have emerged as a constant threat. Forensic tests have confirmed the use of ammonium nitrate and RDX in the three Uttar Pradesh civil court explosions similar to the low-intensity serial blasts that ripped through the crowded Golghar market area of Gorakhpur on May 22, 2007 injuring six people. Police said that bicycles were used in blast and had identified the shops from where bicycles used in the explosions were bought.

A thorough understanding of detonation and blast dynamics by the treating teams is required to better correlate the injury patterns presented. Help in preserving the scene of crime so that Forensic Experts can come to the conclusion easily as terrorist violence is criminal and requires an expert forensic investigation.

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## **Case Report**

### **Obstructive asphyxia- A case of choking in a psychiatric patient**

*R. K. Punia*

#### **Abstract**

Choking refers to blockage of the internal airways, usually between the pharynx and the bifurcation of the trachea. Choking while swallowing food or drinks is a cause of death that has long been known and studied among the psychiatric population. Choking from objects being lodged in the throat is commonly seen in the very young, elderly, psychiatric patients or in the infirm, acute alcoholic intoxication, particularly where the ability to swallow or masticate is severely impaired. This is a case of accidental choking of food particle in a mentally ill patient.

**Key words:** *Choking, asphyxia, psychiatric patients, obstructive asphyxia.*

#### **Introduction**

Choking is a form of asphyxia caused by an obstruction within the air passages. Choking while swallowing food or drinks is a cause of death that has long been known and studied among the psychiatric population. Choking from objects being lodged in the throat is commonly seen in the very young, elderly, psychiatric patients or in the infirm, acute alcoholic intoxication, particularly where the ability to swallow or masticate is severely impaired. Choking commonly occurs during a meal when food is accidentally inhaled especially, when the victim is laughing or crying. Choking is mostly accidental. This is a case of accidental choking of food particle in a mentally ill patient.

#### **Case history**

Dead body of a 38 year old male was kept in the mortuary of SMS hospital, Jaipur by staff of Government Psychiatric hospital, Jaipur attached with SMS hospital. The patient was mentally ill and was admitted in the Government Psychiatric hospital for treatment. As per history, he had bouts of coughing and respiratory distress while he was taking food. He collapsed on the floor and in spite of prompt resuscitative measures; he could not be revived and declared dead. The body was shifted to mortuary for post mortem

examination. Since the death was sudden and unnatural, police was informed and inquest was conducted. On the requisition of the investigating officer, post mortem examination was done by a panel of doctors and findings noted.

#### **External examination**

The subject was averagely built and nourished. Rigor mortis was fully developed. Post mortem staining was present and fixed over the back and dependant parts of the body. There was bluish discolouration of finger, toe nails and lips. There were no external injuries seen during examination.

#### **Internal examination**

On internal examination, all viscera were congested. Stomach contained undigested food particles. Identical food particles were present in the oesophagus and trachea in middle part with blood stained froth in trachea. Lungs were oedematous exuding dark red colour bloody fluid. Viscera were preserved and sent for chemical analysis of common poisons and any sedative drugs. Viscera were also sent for histopathological examination to rule out other pathologies. Both the analyses gave negative results.

The cause of death was due to asphyxia due to choking. Circumstances were consistent with accidental choking.

#### **Discussion**

In choking, the air passage is occluded

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either by some foreign materials or due to some pathology or foreign substance in the neighbouring structure (e.g. Esophagus). It is a form of asphyxia caused by impaction of a foreign body in the glottis or the windpipe. Death by choking is quite common. Mostly they are accidental in nature but occasionally it may be homicidal and at times, suicidal in case of mental patient. Complete blockage of the air passage is not required to cause death by choking. Death can occur from laryngeal spasm, when small objects block the lumen only partially. It is to be noticed that regurgitated stomach contents may reach respiratory passage after death, due to pressure of the putrefactive gases but even then that cannot reach bronchioles as will occur in case of ante mortem choking by regurgitate food.

Death in choking could be due to asphyxia, vagal inhibition or laryngeal spasm. When a foreign body gets impacted at the bifurcation of trachea all of a sudden it can cause death by both asphyxia and reflex parasympathetic cardiac inhibition. A large proportion of deaths occur suddenly before any possible hypoxic manifestations have time to take effect; these fatalities must be caused by neurogenic cardiac arrest, either purely neurogenic or accelerated by excess catecholamine release from the adrenaline response.

Certain groups of people are generally seen as at risk for choking: young children, the elderly, neurological patients, alcoholics and drug addicts and, of course, institutionalized psychiatric patients. Among these last, the high

rate of aspiration asphyxia was well known in psychiatric hospitals before the psychotropic era. Choking incidents are still quite common in psychiatric wards. Their etiology is various but generally preventable. A protocol for first aid to the choking patient should be available in every psychiatric ward, and simple preventive measures should be put into practice.

Café coronary syndrome is most frequent in well nourished businessmen, who die suddenly and unexpectedly during a meal with no signs of respiratory distress or any of the classic 'signs of asphyxia'. Initially thought to be coronary heart disease, autopsy revealed bolus of food, often steak lodged in pharynx or larynx.

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## Case Report

### Bullet in the head- crime surfaces from ashes!

Luv Sharma\*, P.K. Paliwal\*\* & Basant L. Sirohiwal\*\*\*

#### Abstract

Murder is as old as man is. The first recorded murder was of one of the sons of Adam,<sup>1</sup> Abel who was murdered by his brother Cain. Since that fatal day, enumerable people have been made victims to the hand of homicide. Forensic experts come face to face with this aspect of civilization on a daily basis. With the advance of science, the methodology of murder has changed, yet the basic criminal intent of man to commit this sin remains the same. The murderer often tries to destroy all evidence of his act by disposing off the dead body. The usual methods are burial in a desolate place, throwing the body in a water source or burning it beyond recognition. The following paper relates to a case in which the victim was shot in the head, his body burnt near railway tracks and left as such. When the police recovered the dead body, it had no clue whatsoever regarding cause and manner of death. All that was left of the body were badly charred bones including skull and ashes. Careful autopsy revealed a bullet hole in the skull with recovery of a deformed and burnt bullet from ashes. The illustrations are self explanatory.

**Key words:** *Conflagrated bones & firearm wounds.*

#### Introduction

Murder by firearms is very common nowadays. Gunshot wounds impact severely on the criminal justice as well as health care systems. In the U.S. for 2001, there were 29,573 deaths from firearms, distributed as follows by mode of death: Suicide 16,869; Homicide 11,348; Accident 802; Legal Intervention 323; Undetermined 231. This makes firearms injuries one of the top ten causes of death in the U.S. The number of firearms-related injuries in the U.S., both fatal and non-fatal, increased through 1993, but has since declined steadily.<sup>1</sup> However, firearms injuries remain a leading cause of death in the U.S., particularly among youth<sup>2</sup>. Out of 265 autopsy examinations from July 2005 to June 2006 alleged to be homicides, 39% of deaths were related to terrorist acts while previous enmity was recorded in 35% of cases. The

commonest method of homicide was firearms (31%).<sup>3</sup> In India There are an estimated 40 million firearms in India, the majority of which are illicit. India accounts for the majority of small arms in South Asia, which has an estimated 75 million firearms (63 million of which are in civilian possession).<sup>4</sup> In India total firearm-related death rate per 100,000 populations in one year is 0.93.<sup>5</sup>

Disposal of the dead body of a murder victim may involve burial in some barren and desolate area, disposal of the dead by throwing in a water source (most commonly a canal in the State of Haryana) or disposal by burning the body. Any disposal of a dead body which is contrary to common decency is an offense at common law. It is a crime at common law to burn a body in such a manner that, when the facts should in the natural course of events become known, the feelings and natural sentiments of the public would be outraged.<sup>6</sup> By sheer hard work the police, the forensic science team and forensic experts may be able to solve cases of homicide in which the human remains are in the form of badly burnt/charred bones.

#### Case history

This instant case is regarding the abduction and subsequent murder of a youth

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from an adjoining district by a gang due to some old enmity. There were eyewitnesses to the fact of abduction by unknown persons. The parents got a F.I.R. lodged; the police started the investigation. A long time passed and no clue of the victim or abductors was available. A railway employee chanced to see some badly burnt stuff on one of his far spaced rounds of tracks in a desolate area near the victims hometown. On peering closely, he could identify badly charred remnants of bones peeking out of a 'bori' lying amongst some dense bushes alongside the tracks. He informed the General railway police. The police found two boris and a badly burnt hockey stick. They completed all formalities and sent the unknown bones for post-mortem examination to the nearest general hospital, from where they were referred to our department for expert post-mortem examination.

#### **Findings of post-mortem examination**

Two 'boris' were brought by the police. The first 'bori' was opened up and found to contain the following remains (Figure 1)-

1. Skull (with parts missing) containing cooked up brain matter.
2. Some individual badly burnt pieces of the cranium.
3. Right sided upper limb (upper 1/3<sup>rd</sup> of the right humerus and right wrist were missing). The right hand was separated, badly charred and remnants of a wrist band and jersey cuff portion were adherent to the hand.
4. Left sided upper limb with upper 1/3<sup>rd</sup> of left humerus missing.
5. Right lower limb up to lower 1/3<sup>rd</sup> of femur with rest burnt off.
6. Anterior 2/3<sup>rd</sup> of left foot.
7. Multiple badly burnt pieces of bones including vertebrae.
8. A piece of the right clavicle.

The above bones were nearly devoid of overlying tissues (only strips of cooked up burnt tissues were present at places). The bones emitted typical burnt smell.

#### **Injuries**

There was an entry wound of diameter 1 cm on right temporal region of skull situated 13 cm left of midline and 10 cm behind the left orbital margin, with lower rim margin showing a

linear radiating fracture from the rim downwards (Figure- 2 & 3).

The bones available were typically male in character. All permanent teeth had erupted with mild attrition over the occlusal surfaces. The overall age was estimated from ossification of available long bones and teeth to be between 22-25 years.

The second bori contained about 10 kg of ash (Figure- 4). A thorough search of the ash revealed a small badly burnt bone, two metallic rings of which one still showed inscription i.e. initials faintly ( Figure- 5) which were blackened and somewhat melted and surprisingly a badly deformed metallic bullet with a separated yellow metallic cap. Another whitish shiny bullet was also retrieved ( Figure -6). The cause of death was opined as due to gunshot wounds to the head. The bullets and cap were sent for ballistic examination, the complete bones sent for DNA analysis.

#### **Discussion**

In his book "Buried Alive - the Startling Truth about Neanderthal man" Dr. Jack Cuozzo tells of his work on the "Broken Hill" skull. Dr. Cuozzo believes this is actually a modern skull, which was deformed from a disease, and the 2 holes are actually entrance and exit wounds of a bullet. It had a very strange, almost symmetrical hole in the left side of the head (temporal bone).<sup>7</sup> Other such interesting cases have been quoted in forensic literature in which bullet holes have been discovered in badly burnt skull bones. In the present case, two deformed bullets were found scattered in the ash of the deceased persons near the place where his body had been burned, that too after quite a long gap. Tell-tale evidence in the form of bullets in a bori full of ash along with the finding of a bullet wound in the badly burnt and incomplete skull (that portion survived the flames) led to conviction of criminals in a otherwise blind murder.

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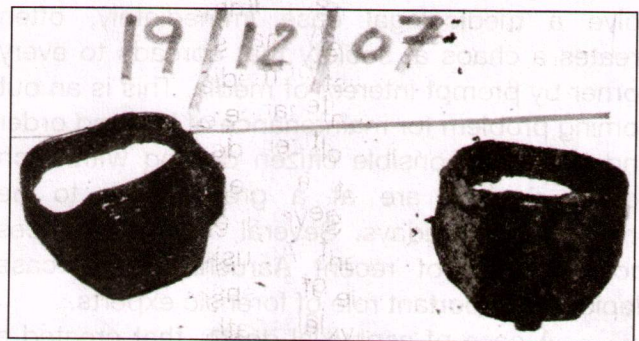
**Figure- 1: The contents of the first 'Bori'.**



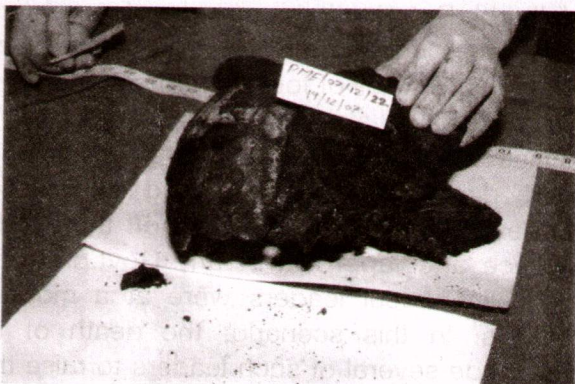
**Figure- 4: Contents of the 2<sup>nd</sup> 'Bori'. Here within ash lay the bullets and rings!**



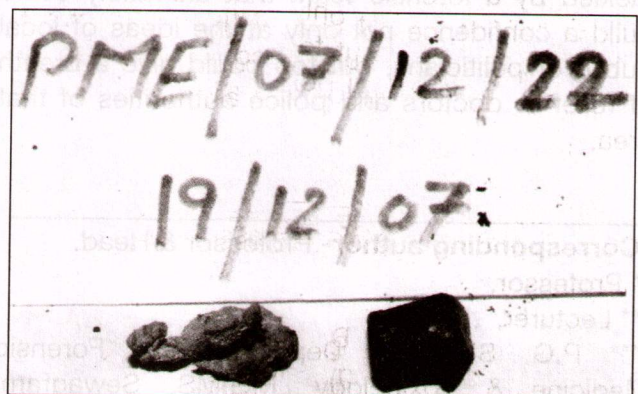
**Figure- 2: The badly charred skull piece. The bullet hole is clearly visible.**



**Figure- 5: The two metallic rings found with the bullets in the ash.**



**Figure-3: The charred skull piece with the bullet hole.**



**Figure- 6: The two deformed bullets found after filtering through the ash.**



## Case Report

### Importance of autopsy and crime Scene visit by Forensic expert

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#### Abstract

It was a hot, humid rainy day of June 2008 when a case of strangulation was reported at MGIMS, Sevagram from a village about 80 Km away. Relatives and local politicians had a firm suspicion of murder. An angry mob of about 1000 people were not ready to allow the local government doctors to conduct autopsy. Forensic team of MGIMS ultimately had to proceed for post-mortem examination and crime scene visit. After detail observation and medical history of deceased, the case came out to be an unusual case of suicidal hanging. Besides the medical responsibilities, the immediate action of the team was a sense of relief for law and order authority.

**Key words:** *Strangulation, unusual case, responsibilities& suicidal hanging.*

#### Introduction

It needs no mention that with the advent of different types of crimes in both number and peculiarity, the on growing demand by public to solve a medicolegal case immediately, often creates a chaos at society that spreads to every corner by prompt interest of media. This is an out coming problem for maintenance of law and order and being responsible citizen dealing with such cases, doctors are at a greater risk to be challenged nowadays. Several crime incidences including that of recent Aarushi murder case depict the important role of forensic experts.

A case of asphyxial death, that created a lot of chaos locally, was reported to MGIMS, Sevagram with an urgent call. The situation was tackled by a forensic team that ultimately could build a confidence not only at the ideas of local public or politicians, but too could give a breath of relief to doctors and police authorities of that area.

#### Case history

Deceased was a male, 47 years of age. He was a farmer with good of property of his own. He also had a small farm house with adjoining orchard of oranges; number of cattle's that helped him earning considerably by selling milk and milk products daily. A small family with two young sons used to be busy always to look after this wealth.

This man was found at around 10-10.30 AM, hanging, at his own farm house. The ligature material, as inferred by villagers, was not sufficiently strong to carry the weight of the body of such a man if he jumps from height for suicide. Also the noose surrounded the neck at least twice.

Farmer's death is a common occurrence at Vidharbh. But death or suicide of a relatively rich farmer is uncommon. Naturally, relatives and villagers found smell of foul play immediately.

Recently, a trend has come up in purchase of village lands by few dishonest property dealers who purchase land from villagers at a cheap rate and latter on sell off that land at high price after approval of any Govt. project at that locality. Local leaders were at a mood to resist this. In this scenario, the death of this farmer made several of such leaders to raise their brows up and the strong belief of homicidal

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strangulation captured the minds of people.

Along with full support of public and relatives, local leaders went to the doctors of Rural Hospital who, besides being a soft target, otherwise also were always at a back foot for generally regular complaint of satisfy people. Though there was provision to conduct post-mortem and Forensic team was requested to conduct the autopsy.

It was a monsoon day of JUNE 2008 with heavy rain. The team of MGIMS started for the locality about 75-80 km away with more than 2 hours journey through hilly area and jungle, at the approach road.

#### **Findings at autopsy in short**

- 1) It was a body of well built, well nourished 47 year male.
- 2) Sign of dribbling of saliva was noted.
- 3) At neck region, 3 ligature marks were present anteriorly and laterally at both sides while at back ligature mark was single.
- 4) 4)3 small contused abrasion were present at right lateral and 1 contused abrasion at submental region were noted.
- 5) All wounds mentioned above were ante mortem in nature.
- 6) Fracture and dislocation of atlanto occipital joint found with oedematous spinal cord and congestion at the fracture site.
- 7) No other injury including defence wound was found at body. No remarkable abnormal finding was appreciated at other internal organs. Stomach was empty.

#### **Crime Scene**

Crime scene visit was conducted on the same day of autopsy. The farmhouse was found located 80 meters from a major road. No sign of mishandling seen at the spot where body was found hanging. The spot was visibly easy to be located from even 100 meters distance.

#### **Discussion**

It was a case of suicidal hanging. The case was dealt with three approaches.

Firstly, the autopsy was done and findings were atypical and unusual like multiple ligature marks which later were corroborated by the photographs taken initially by the police at the

farmhouse. In fact the body of deceased was taken down by police in presence of villagers. In case of strangulation or hanging, where unmistakable signs of death are observed, the first officer at the scene should do nothing to the body. If there is a danger that the rope might break, the officer may attempt to support the corpse, but it should not be cut down. If obvious signs of life are present, the officer must try to save the person.<sup>1</sup>

Secondly, the crime scene investigation on the same day that mainly showed the generally impossible task by single or more people to strangle a well built farmer of 47 years at open daylight and hang him at such a place which was very much visible from a village road. Homicidal hanging is rare. It is not ordinarily possible with an adult victim, if he is not intoxicated or not made unconscious by some other means like head injury. There will be presence of evidence of pulling/dragging of the victim; Signs of struggle may be present on the body of victim and at the place<sup>2</sup>. All these signs were absent at this incidence.

Thirdly, the detailed medical history from one of the sons of deceased who showed prescriptions where it was found that deceased was a case of Endogenous Depression where suicidal tendencies are common risk of fatal incidences.

It is unusual for a suicidal hanging to be sufficiently violent for damage to the cervical spine to occur as length of drop is usually too short. If the person jumps from high place with a rope around his neck, only occasionally it is possible<sup>3</sup>. In this case damage to cervical vertebra was due to jump from height as was found at the crime scene.

Death is almost instantaneous, if the cervical vertebrae are fractured as in judicial hanging<sup>4</sup>. So the contusions at neck which were major points of suspicion by public to be the nail/scratch marks of the victim to save himself in trying to loose the noose while being strangled, were in fact contused abrasions caused by rough ligature material while the deceased jumped for suicide. He had no time to grasp the ligature at neck. In photograph of police also, the right hand was seen placed at wooden plank by the side of the body.



## Conclusion

Atypical findings of hanging are not uncommon. Crime scene visit is also often a duty of Forensic Experts. But this case is specially mentioned as it shows how a prompt action of Forensic team can fruitfully deal medicolegal cases.

Primarily, the rural medicos were relived as the mounting pressure was shared by a team of another medico.

Law and order persons could satisfy the hostile mob who were not even ready to move the body from there locality. So the mob was happy as autopsy was conducted at their hospital only.

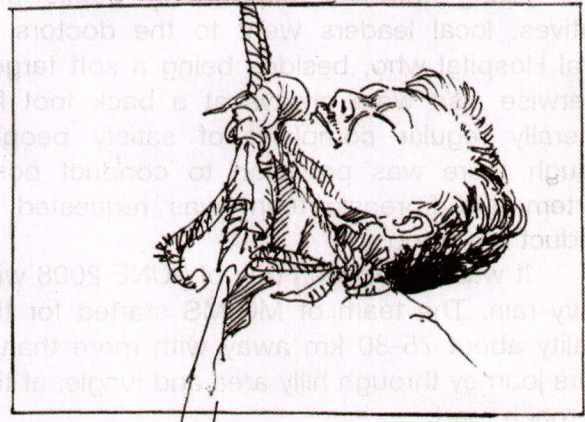
The politicians and of course the media could not create any further hue and cry at smooth village life where one single monsoon day is supposed to be very precious at "near - drought" condition of vidarbha this year. So every villager was eager to see at least some positive step which was taken obviously by seeking expert opinion and villagers were satisfied.

Police authority was happy as a whole ,as the situation did not go out of control as there was no delay in conduction of autopsy and the body did not decompose further at hot humid weather.

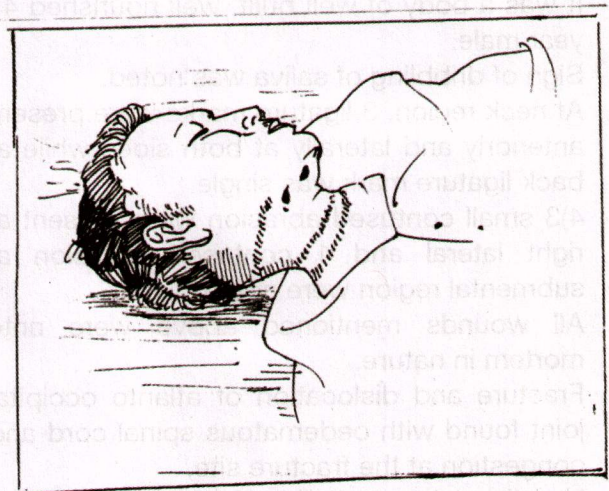
At quick approach of Forensic team from a Medical College at such a long distance in adverse weather condition, formed a sure confidence at this subject.

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THE LIGATURE AND THE NOOSE



AFTER REMOVAL OF LIGATURE . NOTE THE  
CONTUSED ABRASIONS AND LIGATURE MARK  
(AT RIGHT SUBMANDIBULAR AREA) (NECK REGION)



THE CRIME SCENE (FARMHOUSE) AS HE FOUND BODY WAS FOUND  
HANGING BY THE SIDE OF 'GHARPAI' AS SEEN



## **Review Article**

### **Assisted reproductive technology - Medical, legal and psychosocial Issues**

*Hareesh.S.Gouda\* & Umadevi .R. Hiremath \*\**

#### **Abstract**

Assisted Reproductive Technologies are challenging our understanding of parenthood and biological relationships. These techniques have enabled millions of people in the world to have biological children who otherwise would not have been able to do so. According to World Health Organisation, incidence of infertility is about 10% of the couples of reproductive age group worldwide. Assisted Reproductive Technology has helped numerous couples to overcome the physiological or social barriers of reproduction which in previous generations would have made it impossible for them to have children. Assisted Reproductive Technology is a boon for those facing the problem of infertility. But, at the same time such technologies are also associated with many medical, legal as well as psychosocial issues.

**Key words:** *Assisted reproductive technology, infertility & women's health.*

#### **Introduction**

In the modern world, sex is no longer the only method for human beings to reproduce. A new group of medical options, known as **Assisted Reproductive Technologies (ART)** are challenging our understanding of parenthood and biological relationships. In recent times, due to the rising incidence of infertility, ARTs are rapidly becoming the new tool to manipulate woman's body. This is because of the unfortunate social stigma associated with the involuntary childlessness or infertility.

ARTs have enabled millions of people in the world to have biological children who otherwise would not have been able to do so. Over half a million babies are born with the help of the In Vitro Fertilisation technique every year.<sup>1</sup> ARTs have transformed the way we view reproduction.

According to Centers for Disease Control and Prevention, ART includes all fertility treatments in which both eggs and sperm are handled. In general, ARTs involve surgically removing eggs from a woman's ovaries,

combining them with sperm in the laboratory, and returning them to the woman's body or donating them to another woman. They do not include treatments in which only sperm or ovum are handled or procedures in which a woman takes medicine only to stimulate egg production without the intention of having eggs retrieved.<sup>2</sup>

#### **Discussion**

As per the World Health Organisation statistics, incidence of infertility is about 10% of the couples of reproductive age group worldwide.<sup>3</sup> Infertility is an International Health problem. Indian Council for Medical Research has developed guidelines for accreditation of ART centres. These guidelines govern the physical requirements of the centre, training of the staff, informed consent and confidentiality. There are more than 400 ART centres in India. <sup>4</sup> ART is a boon for those facing the problem of infertility. But, at the same time it is also associated with many medical, legal as well as psychosocial issues.

#### **Medical Issues**

Medical science assumes that women will undergo anything to be pregnant and this is definitely true. Reproductive technology is an important issue for women because it relates directly to their bodies and health. All countries have focused mainly on legal and ethical issues surrounding human embryos and neglected the

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issues related to the health of the women. It is women who give up their bodies to severe programmes of medical intervention in their determined effort to bear a child by these means. Men's bodies are not much interfered in the programme as compared to that of women.

Majority of reproductive technologies are complex treatments involving the use of drugs and surgery. More is known about the short term risks than the long term effects to a woman's health. Complications in the short term include problems associated with over stimulated ovaries, the complications associated with a general anesthetic and surgery, and an increased likelihood of a caesarean birth. There are risks to the baby as well. These include an increased likelihood of premature birth and/or multiple birth and the associated consequences of these outcomes like experiencing sickness after the birth, hospitalization in the first year, impairment and disability etc.

As per a research on In Vitro Fertilization procedures, physical side effects encountered among women are, breast tenderness, ovarian pain, abdominal discomfort and bloating which increases in concert with rising estradiol levels caused by ovarian stimulation. However, an equally important symptoms reported by the women is low energy. Fatigue will be more during the active stages of treatment.<sup>5</sup>

Finally, many of the procedures employed in ART are questionable, and many of the drugs used in these procedures put women's health and lives in jeopardy. Without long-term studies, the risks to women and their children are unknown.

### **Legal Issues**

Many a countries have made efforts to develop a consistent legal framework to govern technological conception. Statutory standards or guidelines have been premised on the view that the whole area will remain one of public interest and also of controversy.

ARTs raise a variety of complex legal issues. For example, with ART it is now possible for a child to have three biologically related parents—the man who provides the sperm, the woman who provides the egg, and the woman who gestates the child and gives birth—as well as one or more additional social parents who intend

to raise the child after it is born. If dispute arise among these individuals, how should the law allocate their respective rights and responsibilities? Some courts have held that parental rights should be based on the intent of the parties at the time of conception; thus, when one woman gives birth to a child conceived with another woman's egg, the woman who intended to act as the child's parent will be considered the mother. Other courts have rejected this intent-based approach in favor of clear rules favoring either genetic or gestational bonds. In many jurisdictions, the law in this area remains unsettled.

Conflicts also can arise over the disposition of cryopreserved gametes and embryos. When individuals die before their frozen gametes or embryos have been used, should a surviving spouse or partner have the right to use the frozen specimens without the donor's explicit consent? When a couple freezes their embryos for future use and then divorces, may one partner use the embryos to have a child over the other partner's objection? Internationally, courts have taken widely differing approaches to these issues. To avoid disputes over frozen gametes and embryos, many authorities suggest that people should leave written instructions regarding their future disposition wishes. However, some courts have suggested that, even when such instructions exist, individuals retain the right to change their minds at a later date.

Law also governs the relationship between ART practitioners and the patients they serve. Physicians have been accused of understating the risks associated with ARTs, particularly the likelihood and consequences of multiple gestations, as well as overstating the likelihood that treatment will result in a live birth. Such practices may form the basis for legal claims of misrepresentation or failure to obtain informed consent.

Questions of medical responsibility usually arise in situations which involve risk taking. A child may be born affected after the use of ART for several reasons. To begin with, some adverse effects on the child may be connected to ART.

The question may arise, whether someone is liable for a birth of an affected child in such cases. In this context, it is extremely important



that professionals pay attention to informed consent procedure, and present the anticipated risks before decision-making.

Secondly, in case of a negligent medical action, the birth of an affected child may be regarded as damage, for which parents may present claims of 'wrongful birth' against a genetic counselor or doctor. The parents may claim that, as a result of the fault, they have been deprived of the opportunity to eliminate or terminate the pregnancy and they are burdened with a sick or handicapped child. Both false-positive and false-negative test result as well as false interpretation of the consequences of the result might be equally serious and lead to, for example, unintended family planning decisions, such as giving birth to an affected child or a termination of pregnancy based on misinterpretation of the results.

Also, a child might bring a claim in respect of its 'wrongful life' on the basis of his/her impaired existence or 'prenatal injury' thorough the negligence of the medical expert. A high proportion of such cases result from laboratory errors, which are in general clearly recognisable as negligent. The claims are usually rejected on the grounds that it is not better to be dead or aborted than alive with deficiencies.

In the continental legal tradition, the general rules of liability require both fault (negligence) and a causal connection between the fault and the consequence. In case of negligence, one ought to have acted otherwise. The fault is in causal connection, if in its absence the damage could have been prevented. Lesions to meiotic spindle during Intra Cytoplasmic Sperm Injection could be considered malpractice. In case of a wrongful birth or wrongful life, the physician cannot be held responsible for causing the illness; the damage to which he contributed is the birth of the affected child, to the extent of having disabled the pregnancy or its termination. Different arguments can be reasoned when considering the compensation of the damage in such cases. If the clinical procedures, including informed consent, have been appropriate, diligent and in accordance with professional standards, and the parents have made a voluntary autonomous decision on starting the treatments and pregnancy, grounds for successful wrongful

birth actions should not exist.

Consequently, there is a clear need for more experience and data, as well as basic research in many aspects of In Vitro Fertilisation, in particular follow-up studies of long-term effects on artificially conceived children. Moreover, there is lack of empirical data on the psychosocial consequences of ART. Long-term monitoring of developmental and psychological outcomes for parents and offspring, and their inter-relations is hence needed.

### **Psychosocial Issues**

Procreation is one of the central religious and moral imperatives, and hence infertility is sometimes treated as a type of social deviance. Infertility is a challenge a couple probably never expects. Facing this problem and its treatment can be emotionally frustrating and can put a strain on even the best of relationships. It is natural to feel discouraged and confused by the problem, however there are good reasons to be optimistic. In most instances, highly skilled professionals can find the source of the problem and provide appropriate solutions to help overcome it. Recognizing and taking into account the psychosocial and emotional dimensions of the experience of infertility is an important factor when considering all the implications of assisted human reproduction. The literature, in describing personal experiences of 'involuntary childlessness', shows that it is often closely associated with feelings of intense emotional turmoil. Feelings of anxiety and even of desperation are commonly cited. It is rightly said that "Desperation is the word most commonly used either by infertile people themselves or by those who describe them. Both men and women strongly identify with parenthood, and infertility can bring about a huge sense of personal sadness and loss."

Anxiety and isolation are also common among the infertile couple. Some couples feel it difficult and distressing to be in the presence of pregnant women and small children. Many women experience their narrowing circle of communication over the years after the discovery of their infertility. Being different (childless) meant slowly drifting away from their previous peer groups, and for many becoming lonely, isolated, and increasingly focused on their misfortune. This



isolation can also result from outside forces, which may both unconsciously and consciously discriminate against childless couples, leaving them with a sense that they do not 'fit in' with the rest of society.

Fertility is an important value in Indian society and women often feel pressured to conceive. As a result, women increasingly turn to the ARTs provided by private industry. These unregulated procedures could have harmful impact on women's health and pose pressing ethical questions, such as the selling of human eggs for profit. However, little information exists on the subject.

Apart from the psychological impact of the diagnosis of infertility, ARTs pose emotional challenges for a couple attending treatment. The process of a cycle itself is stressful, for example, the frustration and disappointment of several unsuccessful attempts, the concern for the health of the future child and so on. The situation is uncontrollable and unpredictable. Furthermore, the presence of a genetic defect may first have been detected unexpectedly during the treatment process. It is not surprising that psychological support may be needed.

Many families in developing countries depend on children for economic survival. Without children, men and women may starve to death, especially in old age. In some communities, infertile people are ostracized as they are perceived to be unlucky or the source of evil, or they become the object of public humiliation and shame. Some, even, choose suicide over the torturous life and mental anguish caused by infertility. In other communities infertile men and women are often denied proper death rites. For women in developing countries, infertility may occasion life-threatening physical as well as psychological violence. Childless women are generally blamed for their infertility, despite the fact that male factor causes contribute to at least half of the cases of infertility around the world. In developing countries, especially, motherhood is often the only way for women to enhance their status within the family and community.

## **Conclusion**

There is a burgeoning demand for children and there are many childless couples, therefore,

there is a demand for ART. Most people who use ART do so because they are infertile and other methods of treating their infertility have proven unsuccessful. Some people without fertility problems also use ART to minimize the risk of transmitting certain genetic disorders or to reproduce without a partner of the opposite sex.

ART has helped numerous couples to overcome the physiological or social barriers of reproduction which in previous generations would have made it impossible for them to have children. At the same time, they have generated significant ethical, religious, and legal issues about which no societal consensus yet exists. As developments in Arts continue to proceed, the challenge will be to promote the beneficial use of technology while minimizing the social harms

Technologies are developing rapidly and our knowledge of genetics and the causes of genetic diseases, or even characteristics, increases all the time, which easily leads to demands for new applications. Evidence supports the conclusion that there is a compelling need for infertility treatment beyond prevention. In many instances, ART is the last hope or the only means to achieve a child for couples. There is a heightened need for ART in developing countries. While developing countries have generally not established adequate infertility programmes, mainly due to arguments based on over population and cost, some notable exceptions.

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## Review Article

### Specialized scales for criminal responsibility assessments

V. Vijaynath\*, M. R. Anitha\*\* & G. M. Raju\*\*\*

#### Abstract

Two specialized scales were developed in the 1980s to standardize and facilitate insanity evaluations: the Rogers Criminal Responsibility Assessment Scales (R-CRAS) and the Mental State at the Time of the Offense Screening Evaluation (MSE).

**Key words:** *Mental status, severity & law.*

#### 1. Rogers Criminal Responsibility Assessment Scales (R-CRAS)

Of the Forensic instruments mentioned by respondents, the R-CRAS was most common. The Rogers Criminal Responsibility Assessment Scales<sup>1</sup> was the first standardized measure of criminal responsibility, and is currently the only instrument of this type..Borum and Grisso's<sup>2</sup> reported that, Forensic experts rarely or never use forensic instruments in criminal responsibility evaluations.. Rogers notes that it may be applicable to the M'Naghten standard as well.<sup>3</sup>

The R-CRAS serves as a guide for the evaluator to ensure that key issues are evaluated, and is scored on the basis of interview and testing of a defendant. This addresses the severity of psychological impairments that are relevant to the insanity evaluation, comprises 30 items that are rated on a 5- or 6-point ordinal scale, with 0 = no information, 1 = not present, 2 - clinically insignificant; a score of 3 to 6 indicates the degree of severity of clinically

relevant symptoms.<sup>3</sup>

The R-CRAS items are grouped into the following five areas: Patient's Reliability, Organicity, Psychopathology, Cognitive Control, and Behavioral Control.

Several studies by Rogers and his colleagues have examined the interrater reliability of evaluators, which was evaluated by independent evaluators conducting separate interviews, often several weeks apart.<sup>3</sup> Interestingly, factor analysis of the R-CRAS items results in three factors that do not mirror the five scales just noted. The three factors are bizarre behavior, high activity, and high anxiety.<sup>4</sup>

Criticisms of the R-CRAS have centered on the use of an ordinal rather than an interval scale and the limitations inherent in quantifying the relationship between a particular symptom and the criminal act.<sup>5</sup> Rogers and Shuman<sup>3</sup> counter that nearly all clinical assessment is ordinal and that the R-CRAS has demonstrated superior reliability and validity compared to the Mental Status Exam. Perhaps the clear value of the R-CRAS is that it, as Golding<sup>6</sup> concluded, serves "the heuristic value of (a) highlighting the aspects of the defendant's psychological state that are relevant, (b) describing a purported relationship to control and judgment capacities, and (c) organizing data about the empirical relationships between disorder and capacities in various states and situations"

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## 2. Mental State at the Time of the Offense Screening Evaluation (MSE)

The Mental State at the Time of the Offense Screening Evaluation (MSE) is a semi-structured interview technique that was developed as an outpatient screening device to screen out defendants who clearly did not have "significant mental abnormality" during the time of the offense.<sup>7</sup> The use of screening would allow cases in which mental disorder is not an issue to be evaluated in a short period of time, thus resulting in both economic and time savings as well as minimizing the detention of pretrial defendants. Melton and colleagues<sup>5</sup> also proposed the use of MSE "to detect the obviously insane individual for whom a more comprehensive evaluation is unnecessary".

The MSE comprises three parts.

**Part I:** Historical Information assesses defendants' premorbid psychological and cognitive functioning.

**Part II:** Offense Information gathers information of the offense from both the defendant and some external sources.

**Part III:** Present Mental Status Examination examines current mental status.

The limitations of the MSE have been debated.<sup>8</sup> Given the lack of reliability research and only limited validity data, the MSE should perhaps be most appropriately viewed as a guide for evaluators to ensure that relevant areas are reviewed. Indeed, evaluators can include the MSE and the R-CRAS in a comprehensive evaluation that would include multiple sources of data.

## 3. Assessing the Link between Mental Disorder and Legal Abilities

The mental disorder must cause these cognitive or volitional impairments. Nevertheless, most psychologists appear to consider a discussion of the relationship between psychopathology and legal capacities an essential feature of criminal responsibility reports.<sup>2</sup> As Borum<sup>4</sup> comments, neither the R-CRAS nor the MSE provide much guidance in assessing this link

between a defendant's mental disorder and his or her alleged offense. However, several other sources of information may be useful. First, a growing body of research has investigated the link between mental disorders and crime, particularly violent crime.<sup>3</sup> Paranoia and command hallucinations,<sup>9,10</sup> substance abuse<sup>11,12</sup> and neuropsychological impairments<sup>13,14</sup> have been shown to be associated with violence. A second source of data in proposing a link between mental disorder and cognitive and volitional impairments is through a detailed review of the circumstances of the crime, particularly the sequence of events, evidence of planning, and possible motivations.

In order to assist evaluators in answering this question on the link between mental disorders and criminal responsibility, additional research on causal links proposed by clinicians and those that are accepted by the court would be valuable.<sup>4</sup> However, it is important to note that clinicians need not provide definitive links but rather descriptive information and hypotheses that the courts can use to guide their decision.<sup>15</sup>

In suggesting these causal hypotheses, Ogloff and colleagues<sup>16</sup> recommend that clinicians strive to provide possibilities without offering conclusions on the ultimate legal issue. Various positions have been taken on whether psychologists should address the ultimate legal issues.<sup>4</sup> Overall, the prevailing opinion appears to be that clinicians should avoid offering ultimate opinions.<sup>16</sup>

## 4. Common Criticisms and Challenges

Forensic evaluations, particularly criminal responsibility evaluations, have been the target of great criticism, and concern has been expressed that these evaluations have fallen short of their promise.<sup>17</sup> The criticisms, there is evidence that these evaluations have improved and promise that they have the potential to further improve.

One common criticism is that evaluators have a tendency to ignore the



functional legal abilities relevant to these evaluations and to incorrectly reformulate legal concepts as mental health concepts. Rogers, Turner, Helfled, and Dickens<sup>18</sup> surveyed forensic psychiatrists and psychologists and found their understanding of the legal standards for the insanity defense to be very poor. Also, Heilbrun and Collins<sup>19</sup> found that these functional legal abilities were not routinely addressed in a sample of community-based criminal responsibility evaluations.

Another contentious issue is whether mental health professionals are able to diagnose mental disorders reliably.<sup>20</sup> Over time, there is evidence that the ability of mental health professionals to diagnose mental illness reliably has improved with the delineation of explicit operational definitions of mental disorder.<sup>21</sup> However, as noted, in criminal responsibility evaluations a retrospective assessment is required.

Adding to this, these evaluations occur within a highly charged, adversarial setting. In this context, psychologists may feel pulled by the party they are hired by to obtain findings that support this party's position.<sup>22</sup> It might help to reduce this pressure by communicating results to the lawyer they are employed by in advance of writing a report.<sup>4</sup> Lawyers can then decide whether they wish to have a report. Also, there is considerable apprehension that defendants undergoing criminal responsibility evaluations mangle mental disorders. Given this climate, it is recommended that response biases routinely be evaluated in some form.

## Conclusion

Criminal responsibility evaluations are extremely challenging because of the pressures of the adversarial setting in which they occur, the climate of distrust toward insanity pleas, the retrospective nature of the assessments, and the constantly changing legal standards. The consequences at stake for defendants are enormous. Also, in comparison with other types of forensic evaluations such as

competency evaluations, there has been less research in this area and fewer developments in forensic assessment instruments.<sup>4</sup> Within this context, it is important for clinicians to be aware of potential limitations in their evaluations, explicitly acknowledge these limitations, and strive to provide high-quality evaluations that meet ethical, empirical, and legal standards.

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## **Review Article**

### **Ethical and legal issues in AIDS-An Indian perspective**

*Ashok Kumar Jain\*, B.P.Dubey\*\*, S.P.Garg\*\*\* & Manish Nigam\*\*\*\**

#### **Abstract**

The global epidemic of AIDS is "spinning out of control" and it is reported that the soaring number of cases of AIDS and of infected with HIV, are alarming in India. The HIV virus has been deeply rooted and spreading day by day like wildfire and posing a challenge to the medical scientists and the judiciary in India. Law and medical ethics are two disciplines with a considerable overlap. Law lays down the established rule for conduct, the violation of which creates criminal or civil liability; ethics is more about expected conduct that is what ought to be? The two key issues in medical ethics are confidentiality and consent have great importance in HIV and AIDS. The fact that often patients confidentiality and public interest come into conflict further complicates matter. Whether it is with regard to marriage or employment, there is no national law yet, as to which can be used as a guideline. For the time being, these state of affairs in India had been managed by the provision of Penal laws and personal laws. The issues related to human health to some extent are protected by these statutory provision; and more so under the Fundamental Rights and Directive Principles of the Constitution.

**Key words:** *AIDS, HIV, medical ethics & legal issues.*

#### **Introduction**

The legal rights of an HIV-infected person and the ethical duties of the medical profession and general public are not explicitly defined till date. An attempt will be made here to focus attention on some of the basic issues like confidentiality, consent of the person before taking blood sample for HIV test, discrimination in the employment when a person is tested as HIV positive.

As per legal provision medical malpractice is violation of a specific law. A case of malpractice resulting in loss or harm to the patient

qualify as unethical conduct and the doctor liable for penalty. Today patients are more aware of their rights.

The Medical Council of India (MCI) lays down their ethical guidelines. These ethical guidelines are a set of principles which doctors must apply in each situation, together with their judgement, experience knowledge and skills. Code of medical ethics by the MCI was amended in 2002. It is called Indian Medical Council (Professional Conduct, Etiquette, Ethics) Regulation, 2002. According to aforementioned regulation, consent and confidentiality are the two important issues in connection with HIV infected patients in medical practice.

#### **Consent:**

As per this regulation: Before performing an operation the physician should obtain in writing the consent from the husband or wife, parent or guardian in the case of a minor, or the patient himself as the case may be. In an operation which may result in sterility the consent of both husband and wife is needed.

No act of *in vitro* fertilization or artificial insemination shall be undertaken without the informed consent of the female patient and her

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spouse as well as the donor. Such consent shall be obtained in writing after the patient is provided, at her own level of comprehension, with sufficient information about the purpose, methods, risks, inconveniences, disappointments of the procedure and the possible risks and hazards.

A registered medical practitioner shall not publish photographs or case reports of his/her patients without their permission, in any medical or other journal in a manner in which their identity could be made out. If the identity is not to be disclosed, the consent is not needed.

There is no mention that one has to take consent before taking a blood test for HIV.

### Confidentiality

Another important aspect of doctor – patient relationship is based on doctor's duty of maintaining secrecy. A doctor cannot disclose to a person any information regarding his patient which he has gathered in the course of treatment nor can the doctor disclose to anyone else the mode of treatment or the advice given by him to the patient.

The amended code of ethics of MCI states, "Confidential information entrusted by patients to a physician should never be revealed unless their revelation is required by the laws of the state. However to protect a healthy person against a communicable disease to which he is about to be exposed the physician should act as he would wish another to act towards one of his own family members in similar circumstances." The Registered Medical Practitioner shall not disclose the secrets of his patient that have been learnt in the exercise of his/her profession except:

1. In a court of law under the orders of the judge.
2. Notifiable disease.
3. In circumstances where there is a serious and known risk to a specific person and/or community.

In 1999, when a hospital in India had disclosed the patient's HIV status to his fiancé's family, the patient challenged the hospital's action on the ground that the breach of confidentiality had irreparably damaged his right to marry, and sued for damages. The court at first instance held that HIV positive people did not

have right to marry (Mr. X vs. Hospital Z. AIR 1999 SC PG 295). Subsequently the SC upheld the right to marry (Mr. X vs. Hospital Z, 2002. SCCLCOM 701).

There is increased discrimination against people with HIV which needs a legal and social response. The World Health Organization (WHO) Global program on AIDS (GPA) and VDT passed a resolution on 'Avoidance of discrimination in relation to HIV-infected people and people with AIDS'. GPA has laid certain principles regarding partner notification, as part of a comprehensive AIDS prevention and control program, which must be adhered to.

### Partner notification should:

- 1) Respect the human rights and dignity of the partners and the index person.
- 2) Be a balanced part of a comprehensive AIDS prevention and control program on sexually transmitted diseases (STD, maternal and child health, family planning, and substance abuse prevention).
- 3) Be voluntary and not coercive, and index person and their partners should have full access to the available services independent of their willingness to cooperate with partner notification activities.
- 4) Be confidential, including written records, locating information for partners, and, in provider referral, the identity of the index persons may be able to be inferred.
- 5) Be undertaken only when appropriate support services are available to the index persons and partners; the minimum requirements are counselling on the implications of having been exposed to infection, the availability of voluntary, confidential HIV testing with pre-and post-test counselling and appropriate health and social services; the quality of these services should be assured and regularly monitored.

There is thus an apparent conflict between patient confidentiality and Public Health. We are happy that the Amended Ethical Code 2002 of the Indian Medical Council has taken care of this point.

### Criminal liability for transmission of dangerous disease

A person who knowingly communicates the disease of AIDS by sexual relations or



otherwise, will be guilty of an offence under section 269 or section 270 of the Indian Penal Code. The conduct in order to be punishable must be malicious or negligent, so as to cause the spread of an infectious disease dangerous to life.

### **AIDS and matrimonial law**

The fact that one spouse is suffering from AIDS can have certain implications in matrimonial law. Section 13 (1) (iv) of the Hindu marriage act, 1955 provides that either party to the marriage may seek divorce through the court on the ground that the other party is suffering from a venereal disease in a communicable form.

In Ms. Rajini's case the court has made a big leap while deciding a divorce petition filed by the aggrieved wife. The husband Mr. Kanshi Krishnan married to the petitioner in April 1998, immediately after marriage and before the marriage was consummated, she came to know that her husband was infected with HIV positive. The wife wanted to sever the marital tie and filed this petition in August 1998, i.e. just four months after the marriage. The statutory provisions related to divorce, on the ground that the spouse has developed an infectious or communicable disease; would be applicable only after the completion of one year of the marriage. The court, keeping in view, the gravity of the nature of the disease HIV virus and the immediate and future health risk likely to be caused to the petitioner, overlooked the statutory restriction of "one year after marriage" and granted a divorce as requested by the petitioner. By this decision, the court on one hand protected the rights of the wife and on the other prevented the spread of the disease further in the interest of public health.

### **Employment and HIV positivity**

While deciding the question of discrimination in the employment when a person is tested as HIV positive, the courts in India relied on the findings of the United States' Supreme Court in *MS. Airlines* case. In this case, the question observed by the court was the "whether a carrier of a contagious disease such as AIDS could be considered to have a physical impairment, or whether such a person could be considered, solely on the basis of

contagiousness, a handicapped.

In a landmark judgement, the Supreme Court of India protected the freedom of employment and held that "government jobs or services cannot be denied to any person on the ground that he/she is infected with HIV virus".

There are many instances where applicants with HIV positivity are denied jobs. Mr. X was denied a job by the State Bank of India because he was HIV positive. On Jan 16, 2004, Bombay High Court upheld employment of HIV infected person. The court said that protection and dignity of HIV-infected persons is essential for the prevention and control of HIV/AIDS.

### **The HIV/AIDS Bill 2006**

There is, however, no comprehensive legislation in India addressing HIV/AIDS. There have been some court decisions, which also have been changing with the better understanding of the disease by the public and lawyers. Considering the importance of this subject an advisory group was set up to initiate the process of creating a legislation in 2002, by Mr. Kapil Sibal and the Project Director of the National AIDS Control Organization (NACO). The presence of a nationally applicable statute would lend consistency, clarity, and predictability for the courts to effectively pass judgment in HIV/AIDS cases. They approached an NGO (Lawyers Collective Unit) to draft legislation on HIV/AIDS. The Lawyers Collective HIV/AIDS Unit (LCHAU) has consulted all the concerned organizations and involved people and drafted legislation. The Union Health Ministry has sent the bill for a feedback from the state and union territory governments, which have been approved.

### **Conclusion**

The court have always interpreted the law and applied the law so as to promote the cause of justice to meet the expectations and aspirations of the society as per the mandates of the constitution. Similarly, in the absence of any statute it becomes the binding duty of the judiciary, under its discretionary powers, to protect the interest of the society.

Therefore in absence of direct legislation, it becomes the obligation of the judiciary to prescribe guidelines and rules that fill the dearth



and thus work as an indirect legislation. These guidelines would be followed by the Indian judiciary whenever any similar matter relating to AIDS/HIV appears before them, and this would become a 'PRECEDENT' until a wholesome legislation on AIDS is enacted by the legislature in near future.

Although a national initiative has requested lawyers to collectively draft a bill, to provide clarity, consistency and predictability, and the bill prepared in 2006 has been submitted to government of India.

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## Review Article

### Impact of amendment in the section 176 of the Code of Criminal Procedure, 2005

P.S.Thakur

#### Abstract

Section 176 of the code of criminal procedure (Cr.P.C) amends in the year 2005. In this article we discuss what are the changes in the section 176 of Cr.P.C. and what will be the effect of this amendment.

**Key words:** Ammendment, Cr.P.C. & impact.

#### Introduction

The code of criminal procedure Cr.P.C. amends in the year 2005 & was brought into force on 23/6/06. Previously section 176 of Cr.P.C. provides that :-

- i) In case of death of a house wife within 7 yrs of her marriage if it is a case of suicidal or if there is any cause of suspicion covering her death,
- ii) In case of death in police custody or in any other custody authorised by the magistrate or the court,
- iii) In case of exhumation,
- iv) In case of deaths due to police firing,
- v) In any case of unnatural death mentioned in the sub section (I) of section 174, any executive magistrate so empowered may hold an inquiry into the cause of death either instead of or in addition to the investigation held by the police officer.

But after implementation of the code of criminal procedure (Amendment) Act.2005. in the section 176 of the principal Act,-

1. in sub-section (1), the words "where any person dies while in the custody of the police or" shall be omitted;
2. after sub-section (1), the following sub-section shall be inserted, namely- "(1A) where:-
  - a. any person dies or disappears or
  - b. rape is alleged to have been committed

on any woman, while such person or women is in the custody of the police or in any other custody authorised by the magistrate or the court, under this code in addition to the inquiry or investigation held by the police, an inquiry shall be held by the judicial magistrate or the metropolitan magistrate, as the case may be, within, whose local jurisdiction the offences has been committed."

3. after sub-section (4), before the explanation, the following sub-section shall be inserted, namely-"(5) The judicial magistrate or the metropolitan magistrate or executive magistrate or police officer holding an inquiry or investigation, as the case may be, under sub-section (1A) shall, within twenty four hour of the death of a person, forward the body with a view to its being examined to the nearest civil surgeon or other qualified medical man appointed in this behalf by the state government, unless it is not possible to do so for reason to be recorded in writing."

#### Discussion

Inquest by judicial magistrate V/S executive magistrate . Till the amendment in the section 176 of Cr.P.C. the inquest or inquiry into the cause of death in case of death in police custody or in any other custody authorised by the magistrate or the court was held by the executive magistrates .

As we all know that in our system the executive magistrate (Collector , ADM, SDM,

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Tahsildar etc.) & the police are working together for the enforcement of law and order all over country. So naturally when you have to work together for prolonged period automatically a bond of understanding & affection developed for each other, same thing also happens between administration & police system and whenever any death occurs in the custody of police we can presume that there is a possibility of soft corner of the executive magistrate for the police personals involved in the incidence & it can affect the inquest of the custodial death in few cases.

Another reason is that executive magistrate are holding several responsibility regarding revenue services so it was seen at various occasion that inquest or inquiry into the cause of death in case of custodial death delayed for months or even some time for 1 to 2 years. Definitely it affect and delayed the process of justice in such type of cases.

But after amendment in the section 176 of Cr.P.C. Judicial Magistrate has to hold inquest in such type of cases it has got few positive impact :

1. Body shall has to be forwarded to the nearest civil surgeons or other qualified medical man appointed in this behalf by the state government for the postmortem examination within 24 hrs of the death of a person.
2. Judicial magistrate shall has to hold the inquest within a time limit, so Judicial Magistrate can summon doctor, relative, and other personels for their statements. So now

inquest may be speedy one and as there is a systematic working in the judiciary the inquest can be held in time & justice to the dead can be given .

As dead body has to be referred to the civil surgeon or qualified medical man (That literally means forensic expert) within 24 hrs of death it raises the hope that postmortem conducted will be meticulous one & report will be detailed & clear one.

The possibility of soft corner between revenue and police system is also ruled out because of judicial inquiry.

## **Conclusion**

After amendment in the section 176 of Cr.P.C the Judicial Magistrates has to hold inquest under the guidance of District Session Judge and under observation of honourable High Court of various states. I am hoping for process of inquest in the cases of custodial death to became speedy one and chances of justice in such type of case definitely increased which will certainly reduce the number of such type of incidences in the custody in our country .

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## Review Article

### Is chemical safety to food hazardous?- Dangers of food preservatives

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#### Abstract

The present paper is for the interest of Clinical/Environmental Toxicology which compasses the study of chemicals which are contaminants of food/water<sup>1</sup>. With the revolution in food technology, modern packaged convenience foods of all kinds are in vogue. The hazards of preservatives, nutrients, flavors, colors, and processing agents which are being added in food are deemed necessary to be discussed here because although they are essential for food storage, the cumulative effect of their hazards as "slow poisons" will increase the risk of becoming a host to disease or premature death. Authors feel that the article would be help to the disciples of various specialties like Clinical Toxicology, Preventive medicine, Pediatrics, General Medicine, Food And technology etc. to make readers aware of the risk of developing health problems due to food additives and preservatives.

**Key words:** *Preservatives, additive, toxins, carcinogenic.*

#### Introduction

What toxicology testing cannot accurately predict, is the long-term combined effect of various additives and environmental toxins on children, the elderly, newborn, the fetus, and people with cancer<sup>2</sup>. We eat, drink and breathe are loaded with poisons. Your body has become a chemical depository. These slow poisons have been accumulating in our body since birth and are embedded in every cell structure and organ and disrupt the natural chemistry of your body.

In the previous century, it was common to add embalming fluid to milk to stop curdling. Once Dr Wiley of FDA said he found was that eating borax "will create disturbances of appetite, digestion and health"<sup>3</sup>. Of embalming fluid, he said: "The addition of formaldehyde to food tends to derange metabolism."<sup>4</sup>

The FDA's Web site provides a list of

approved additives, which companies can legally include in food products. The length of this list is enormous - there are over a thousand different additives. Unfortunately, the list does not include a description of the possible side effects associated with these additives.

According to Dr. William Rice, a licensed Nutritional Consultant, many common additives have been linked to cancer, allergies, migraines, liver and kidney damage, birth defects, brain damage, and the list goes on. To make things worse, many additives do not appear on labels.<sup>5</sup> The last century, the Scientists discovered if they pumped the apple full of embalming fluid, as they did with dead bodies, the decomposition would be halted and the fruit would be preserved. They applied this "technology" to agriculture, but avoided the term "embalming fluid," referring to it instead as a "preservative." While most preservatives are not literally embalming fluid.<sup>6</sup>

#### Need of using Preservatives

When the food is to be stored for a prolonged period, use of additives and preservatives is essential in order to maintain its quality and flavour. Their use prevents spoiling of the foods due to the growth of bacteria and fungi. They also maintain the quality and consistency of the foods. Along with its palatability and wholesomeness they also maintain its nutritional

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value, control appropriate pH and enhance its flavour.

Although they are essential for food storage, they can give rise to certain health problems. They can cause different allergies and conditions such as hyperactivity and Attention Deficit Disorder, asthma, hay fever and certain reactions such as rashes, vomiting, headache, tight chest, hives and worsening of eczema in the some people.

Since foods without preservatives are more likely to spoil, it's important to buy fresh produce and consume it relatively quickly.

### **Certain Foods loaded with preservatives are discussed as follows**

- a) Milk-Milk has preservatives in more than 50 per cent. Carboxyl Methyl, Hydro Ethyl, Caustic Soda, Hydrogen Peroxide and colour pigments are stored in these containers while some of these compounds cannot be broken by washing these chemicals with any soap or water, and the only way to clean them is to wash them by petrol, which itself is too deadly to be mixed with the food.
- b) Soft drinks: Sodium benzoate, an ingredient in many soft drinks and sauces, has the ability to deactivate parts of DNA and eventually cause diseases such as Parkinson's and cirrhosis of the liver.<sup>7</sup>
- c) Fruit juices: Sodium benzoate and ascorbic acid (vitamin C) are the main preservatives. The latest study was carried out on a range of such soft drinks. These two preservatives seem to produce carcinogenic benzene in the presence of heat and ultra-violet light!

Brominated oils are added to bottled fruit juice to maintain a look of freshness even after 6 months of storage. Unfortunately, they produce changes in heart tissue, enlargement of the thyroid, kidney damage, decrease in liver metabolism and cause withered testicles.

Stannous chloride (tin) is used as antioxidant and color-retention agent in canned and bottled foods, fruit juices. Acute poisoning has been reported from ingestion of fruit juices containing concentrations of tin greater than 250 mg per liter.

#### **d) Meat: Sodium nitrite**

It is the most dangerous preservative, used to preserve, colour, and flavour meat products. It is commonly added to bacon, ham, hot dogs, luncheon meats, smoked fish, and corned beef to stabilize the red color and add flavor. It prevents growth of bacteria, but studies have linked it to various types of cancer. Under certain high-temperature cooking conditions such as grilling, it transforms into a reactive compound that has been shown to promote cancer. JECFA (the joint FAO/WHO Expert Committee on Food Additives) says it is "highly probable" that nitrites are carcinogenic in humans.<sup>8</sup>

Benzoates can trigger the allergies such as skin rashes and asthma as well as believed to be causing brain damage. Two recent studies, released in 2004 and 2007 respectively, singled out food coloring as a potential problem in the ADHD diet. Children with ADHD and allergies were tested on a variety of food additives.<sup>7,9,10</sup>

Bromates destroy the nutrients in the foods. It can give rise to nausea and diarrhea.

Butylates are responsible for high blood cholesterol levels as well as impaired liver and kidney function.<sup>11</sup>

Sodium chloride put in more amount in meats and fish can lead to high blood pressure, kidney failure, stroke and heart attack.<sup>12</sup>

#### **e) Whiskey, Beer, Wine and Soya sauce: Colouring Matters.**

These are found in milk, cream, cheese, sauces, sugar, and, although often harmless, their presence is intended to deceive.

Aniline dyes are, almost without exception, alone used. None of these colouring matters is in any case necessary, and many of them, even in small quantities, are poisonous.

Copper sulphate to colour peas and other vegetables should be carefully considered. There is evidence pointing to the conclusion that the copper, when added to the vegetables, forms a compound which is not easily soluble in the human body.



Tartrazine is used as colourant for yellow food may cause allergic reactions and asthmatic attacks and has been implicated in bouts of hyperactivity disorder in children.

The colouring matter for the dairy trade in milk, butter, cheese, and such poisonous substances should be rigorously excluded.

Red Dye 40 is suspected to cause certain birth defects and possibly cancer.<sup>14</sup>

Caramel is a famous flavoring and coloring agent that can cause vitamin B6 deficiencies. It can cause certain genetic defects and even cancer.<sup>15</sup>

- f) Vegetables and Fruits: Sulfur is used to keep dried fruit fresh. Formaldehyde which is used to retard corpse decomposition is added to disinfect frozen vegetables.

Maleic hydrazine Potatoes are coated with this chemical inhibitor because of their bad habit of sprouting, which has resulted in cancer in laboratory animals.

- g) Ice-creams: Propylene glycol is used in making ice-cream, the same is used in antifreeze and paint remover.

Carboxymethylcellulose is a stabilizer, used in ice cream, salad dressing, cheese spreads and chocolate milk. It has produced tumors in 80% of rats injected.

Aspartame a Sweetener in snacks, sweets, alcohol, desserts, diet foods may affect people with PKU (phenylketonuria). Recent reports show possibility of headaches, blindness, and seizures with long-term high doses of aspartame.

- h) Fats and Oils: Butylated hydroxytoluene (BHT) and Butylated hydroxyanisole (BHA) are phenolic antioxidants which prevents rancidity of fats and oils in food by protecting against lipid oxidation. Although not toxic itself, BHT may interact with other substances. Other studies have shown that BHA protects against some chemical carcinogens. There is evidence that certain persons may have difficulty metabolizing BHA and BHT, resulting in health and behavior changes. BHA and BHT may have antiviral and antimicrobial activities.<sup>16</sup>

- i) Baby Foods: Monosodium glutamate is added in new high-tech foods. The enzymes which help to metabolize MSG in adults do not exist in infants. MSG is carried to the brain, causing a dangerous result. It crosses the placenta. MSG fed to growing rats, reduced their growth rate by 16%. The effect on the human fetus is still unknown! Has been known to cause pressure on the head, seizures, chest pains, headache, nausea, burning sensations, and tightness of face. Many baby food producers have stopped adding MSG to their products.<sup>17</sup>

### Summary and conclusions

Food Preservatives may have deleterious effects on health. This paper supports the continued safe and effective use of preservatives within these current constraints.<sup>18</sup>

While it's hard to avoid food additives completely, you can greatly reduce the amount that you do consume. Remove these harmful preservatives from your diet and replace them with wholesome, additive free foods. Select organic fruit and vegetables whenever possible. Wash or peel non-organic produce. Choose fruits and vegetables in season. This means that your exposure to the chemicals used to delay ripening, prolong shelf-life, preserve color and so on, will be limited. Supplement your diet with antioxidant nutrients-vitamins A, C, and E, and the minerals zinc and selenium-since the detoxification of many pesticides.

Now a days, new and emerging methods of food preservation i.e. radical approaches, such as the use of high hydrostatic pressures or voltage pulses to inactivate microorganisms in food, and the direct and synergistic application of ultrasonic radiation are being tried.<sup>19</sup>

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