Indian Academy of Forensic Medicine (IAFM)

(Registration No.349, 12th May, 1972, Panji, Goa)

Governing Council 2010-2013

President
Dr. D.S.Badkur

General Secretary
Dr.Adarsh Kumar

Treasurer
Dr. A.S. Thind

Vice Presidents
North Zone: Dr. Dalbir Singh
South Zone: Dr. P.Sampath Kumar
East Zone: Dr. Tulsi Mahto
West Zone: Dr. H.T. Katade
Central Zone: Dr. R.K. Singh

Joint Secretaries
North Zone: Dr. Dasari Harish
South Zone: Dr. Cyriac Job
East Zone: Dr. Shoban Das
West Zone: Dr. Hasumati Patel
Central Zone: Dr. P.S.Thakur

Editor
Dr. Mukesh Yadav

Joint Editor
Dr. Akash Deep Aggarwal

Executive Members

Dr.B.P. Dubey (Ex. President, IAFM)
Dr. Aditya Kumar Sharma
Dr.Sarvesh Tandon
Dr.C.P.Bhaisora
Dr.Pankaj Gupta
Dr.Luv Sharma
Dr. Sanjoy Das (Ex. Secretary, IAFM)
Dr.Amandeep Singh
Dr.Mukesh K.Goyal
Dr.C.B. Jani
Dr.Jaynti Yadav
Dr.P.K.Tiwari

Journal of Indian Academy of Forensic Medicine (JIAFM)

The official publication of Indian Academy of Forensic Medicine

Printed and published by **Dr. Mukesh Yadav, Editor, JIAFM** and **Dr. A. D. Aggarwal, Joint Editor, JIAFM** on behalf of Indian Academy of Forensic Medicine at name of the press [SHIVANI PRINTERS, NOIDA, U.P.]

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Journal of Indian Academy of Forensic Medicine

Volume: 33 • Number: 3 • July-September- 2011

Contents

Original Research Paper

Review Papers

Case Reports

 The Journal of Indian Academy of Forensic Medicine is indexed in **Scopus [Elsevier]**, **Index Copernicus** [Poland] & **IndMED** [India]. Print **ISSN: 0971-0973**. Electronic **ISSN: 0974-0848. IndMED** www.medind.nic.in/jal/jalm.shtml

Address request for reprint or further information relating to any article may please be made with author and in case of multi authored article, please communicate to Corresponding Author or the First Author

From the Editor's Desk

JIAFM
A Quarterly Publication
Volume 33, Number 3, July-September 2011

I feel immense pleasure to present before you the third issue of 2011. I assure you about the quality of research papers and quality of printing in future issues. Your valuable suggestions are always encouraging me and I heartily welcome for future suggestions. On behalf of Executive Committee of IAFM for the years 2010-2013, I took resolution to further improve the quality and status of our Journal. We always learn from mistakes and try to improve upon these. I am happy to inform you that the journal has been included in **Scopus**. SciVerse Scopus is the world's largest abstract and citation database of peer-reviewed literature and quality web sources.

Professor [Dr.] Mukesh Yadav
Editor, JIAFM

Subscription Information

- Members of IAFM will receive the free of cost.
- Non Members and Institutions (Annual Subscription rates)
- Personal: In India, Rs. 1000/ (Rest of the world: US$ 200/ or equivalent)
- Institutions: In India, Rs. 3000/ (Rest of the world: US$ 400/ or equivalent)
- We Accept: Bank Cheque / Demand Drafts (Add Rs. 50/- for outstation Cheques)
- The Scope of the Journal covers all aspects of Forensic Medicine and allied fields, research and applied.

Subscription orders and payments should be made in favour of
"Editor, JIAFM, payable at Greater Noida"

Claims for missing issue:

A copy will be sent free to the member / subscriber provided the claim is made within 2 months of publication of the issue & self addressed envelop of the size 9" x 12" is sent to the Editor. (Those who want the journals to be dispatched by Registered Post must affix Rs. 100/ worth postage stamps).

The journal is indexed with IndMed and made available online by following website:
www.medind.nic.in; http://indmed.nic.in
www.jiafm.com; www.forensicindia.com
www.indianjournals.com

Editorial

Child Sexual Abuse in India

Is Chemical Castration an alternative punishment?

Child sexual abuses are dark realities in Indian society like in any other nation. 53 percent of our children are sexually abused, according to a statistic from a survey done by the Government of India. A 1985 study by the Tata Institute of Social Sciences reveals that one out of three girls and one out of 10 boys had been sexually abused as a child. 50% of child sexual abuse happens at home. In 1996, Samvada, a Bangalore based NGO, conducted a study among 348 girls. 15% were used for masturbation mostly by male relatives when they were less than 10 years old. 75% of the abusers were adult family members.

A report from RAHI, (Recovering and Healing from Incest), a Delhi based NGO working with child sexual abuse titled Voices from the Silent Zone suggests that nearly three-quarters of upper and middle class Indian girls are abused by a family member, often by an uncle, a cousin or an elder brother. (Rel. on material from Internet)

Intra-familial child sexual abuse:

Rape is abominable and ghastly and worsens and becomes inhuman and barbaric when the victim is a small female child, close relative of the abuser over whom the family has repose faith as has happened in the present case where the minor has been subjected to unwanted physical contact by a perverted male adult.

Due to her tender age, neither the body of the child was fully developed nor, she was in a position to offer any resistance whenever violated. In most of the cases of child sexual abuse by close relatives the accused has taken advantage of a helpless and defenceless child who did not even understand the gravity of the offence or tried to escape and was an easy and vulnerable prey. Inspite of the tender age of the child, the accused went on to commit the ghastly, abominable, inhuman and barbaric act of rape, violating the person of the child and giving her a lifelong trauma.

Recent years have seen a spurt in molestation, rape and other sexual offences. Sexual predators moving around the city spare none. Be it a child of few months or a senior citizen in a twilight years. Young girls are not safe even in their own families where fathers and brothers turn predators. It is sickening indeed. Rape is a growing menace which the administration is finding hard to tackle. Even stringent punishments so prescribed under the law do not appear to be having any deterrence.

World over Rape has been considered most abominable and most developed societies provide for a stringent punishment for the same considering it as a grave offence but punishment in most of the countries is imprisonment.

In many developed countries Death Penalty applies in cases of aggravated rape indicating the severity with which this crime has been viewed. In fact many developed countries like USA, UK, Germany, and Israel have experimented with alternatives such as Surgical and Chemical Castration of rapists and molesters particularly serial offenders, child molesters and pedophiles.

What is chemical castration?

- Chemical Castration is the administration of medication designed to reduce libido and sexual activity, usually in the hope of preventing rapists, child molesters and other sex offenders from repeating their crimes, unlike Surgical Castration, where the testes or ovaries are removed through an incision in the body.
- Chemical Castration does not actually castrate the person, nor is it a form of sterilization and for this reason the term "Chemical Castration" has been called a misnomer.
- Castration has, from time to time, been used as an instrument of public and/or judicial policy despite concerns over human rights and possible side effects.

Global Scenario:

Surgical and Chemical Castration is a punishment prescribed for rape and, controversially, some U.S. jurisdictions allow shorter sentences for sex criminals who agree to Voluntary Chemical Castration. California was the first U.S. State to specify the use of Chemical Castration as a punishment for child molestation, following the passage of a modification to Section 645 of the California Penal Code in the year 1996. This law stipulates that anyone convicted of child molestation with a minor less than 13 years

of age may be treated with the drug Depo Provera if they are on parole, if it is their second offense and offenders may not reject the treatment.

The most common drug used for Chemical Castration is Cyproterone Acetate which is used through out in European countries as compared to MPA (Medroxy Progesterone Acetate) which is the preferred drug in America. The passage of this law led to similar laws in other states, such as Florida's Statute Section 794.0235 which was passed into law in 1997 and as in California, treatment is mandatory after a second offense. Besides California and Florida, at least seven other states, including Georgia, Iowa, Louisiana, Montana, Oregon, Texas and Wisconsin, have experimented with Chemical Castration. In Iowa, as in California and Florida, offenders may be sentenced to chemical castration in all cases involving serious sex offenses.

On June 25, 2008 Louisiana Governor Bobby Jindal signed Senate Bill 144, allowing Louisiana judges to sentence convicted rapists to chemical castration. Poland had passed a legislation for forcible Chemical Castration for child molesters coupled with psychic treatment during the term. Germany and Israel are other examples of developed countries where voluntarily chemical castration is a punishment for child rapists. Similarly Madoza a province in Argentina passed a law in March 2010 which rules the use of Chemical Castration for rapist but they must voluntarily go it.

Chemical Castration is a human alternative to life long imprisonment or surgical castration. Many developed countries use it as a condition for probation or for the purpose of imposing lesser punishment in case of Plea Bargaining. Although Chemical Castration is not the perfect solution to inhibit child molestation, it certainly discourages sexual assault better than incarceration.

How chemical castration works?

Injections of Depo-Provera, Cyproterone Acetate and MPA (Medroxy Progesterone Acetate) decrease the aggressive tendencies that lead to rape in males. Castration also discourages sexual fantasies and eradicates sexual obsessions. Pedophiles are reduced to apathetic pacifists. Regulated chemical castration should be encouraged as an alternative to prison for child molesters in order to stop recidivism and decrease instances of sexual assault.

Indian Scenario:

- Ironically, the Indian legislatures are yet to take notice of this alarming situation and address the issue with all seriousness by exploring the possibility of permitting the imposition of alternative sentences of Surgical Castration or Chemical Castration particularly in cases involving rape of minors, serial offenders and child molesters or as a condition for Probation, or as an alternative sentence in case of Plea Bargaining. I am not oblivious of the fact that arguments are bound to be raised against the above by some Rights Activists but that in my view would be sheer hypocrisy given the damage the rapist and sexual predators do to their victims. The jurist world over are undivided in their view that Chemical Castration is required to be mandated for incestuous offenders, repeated sex offenders, pedophiles and molesters.

Summary and conclusions:

- In a recent case a Trial Court opined that “In my view it is time that we as a Civil Society stand up and also think of a law similar to the one existing in many developed countries providing for Surgical and Chemical Castrations.”
- Trial Court further added that “Having said so, my hands are tied since I am bound by the law of the land which only provides for imprisonment not less than seven years but may be for life or for a term which may extend to ten years and also fine.”
- Court went on adding that “My conscious however tells me that this is a crime which is required to be addressed differently and a full public debate with regard to imposition of Castration (both Surgical and Chemical) as an alternative punishment for the offence of rape and molestation is the crying need of the hour.”

Public debate among social activist, women activist, social scientists and forensic medicine experts, legal experts, National and State Women Rights organizations and Child Rights activist all can play their role to deal with Child Sexual Abuse and protect their human rights to this social menace.

Mukesh Yadav
Editor, JIAFM

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Correlation of Stature of Adult with the Length of Clavicle

*Yashoda Rani, **Shrabana K Naik, ***Avnish K Singh, ****Atul Murari

Abstract

Forensic anthropology can play an important role in the identification process. Besides determination of race, sex and age of the unknown individual, estimation of stature enhances the reliability of identification. It is easier to get those data when the whole body or entire skeleton is available to the forensic anthropologist. However, in cases of deliberate mutilation and disposal in parts, interference by wild animals and bomb blast by terrorist attack, recovery of the whole body or complete skeleton may not be possible. In those cases, the forensic anthropologists have to give his opinion based upon the available supplied skeletal remains. Although approximate stature of the individual can be estimated from most of the long bones using either multiplication factors or regression formulae, studies on estimation of stature from clavicle are limited. In the present autopsy based study, an attempt has been made to correlate stature of individual with the length of clavicle.

Key Words: Stature, Long bones, Clavicle, Estimation, correlation

Introduction:

Estimation of stature is an essential part of identification process of unknown individuals, especially in case of situations where human bodies are found either as skeletal remains or in mutilated conditions. Approximate stature can be estimated if multiple long bones of limbs are available, but from any other single bone, it always remains a daunting task for any anthropological/forensic examiner, especially clavicle which lies horizontally in the body.In the past, Terry, Oliver, and Thieme have tried to estimate the stature of the individual from clavicle, outside India.[1- 3]

Similarly, in India, only few studies have been conducted so far by Singh & Sohal, Jit & Singh, Yadav and Khaka on estimation of stature from clavicles.[4-7] Considering the paucity of studies with conflicting results, the present authors have made an attempt to correlate stature of the individual from the maximum length of clavicle.

Aims & Objectives:

1.Correlate stature of individual with maximum length of clavicle.
2.Obtain the regression formulae, to estimate stature from adult clavicle, for both sexes.
3.To compare reliability of maximum length of clavicle with other parameters namely, mid clavicular circumference, vertical diameter of clavicle, saggital diameter of clavicle, calibre index of clavicle, cross sectional index of clavicle and weight of clavicle, for determination of stature.

Corresponding Author:

*Professor, Department of Forensic Medicine,
Lady Hardinge Medical College &
Smt. S.K. Hospital, New Delhi-110001 (India)
Email: fmtlhmc@gmail.com
**Assistant Professor, LHMC, New Delhi
***Ex-Senior Resident, LHMC, New Delhi
****Director Professor, LHMC, New Delhi

Materials & Methods:

In the present study, total 100 clavicles of both sides of 70 male and 30 female individuals were taken from the dead bodies that came for medico-legal autopsies at Lady Hardinge Medical College & Smt. S.K. Hospital, New Delhi from the period Jun'2004 to Apr'2006.

Instruments & Equipments used: Calibrated autopsy table, Foreceps, Scalpel with blade, Beakers, Sodium Bicarbonates, Box for keeping clavicles, Osteometric board, Vernier Caliper

Method used:

1. Identification of the sex of the individual
2. Measurement of stature of the individual
3. Removal of the clavicle from the dead body
4. Maceration of soft tissues attached to clavicle
5. Cleaning and drying of the clavicles
6. Measurement of various parameters including maximum length of clavicle, initially by osteometric board, and then rechecked by vernier calliper

Observation & Results:

Table-1 shows length of the clavicles of both sides in Male individuals where as Table-2 shows length of the clavicles of both sides in Female individuals. The mean length of left clavicle was found more than the mean length of right clavicle in both the male and female individuals. In case of male subjects, the standards of errors were 5.15 for left clavicle,

and 5.93 for right clavicle. Similarly, in case of female subjects, the standards of errors were 5.04 and 3.09 for left and right clavicles respectively.

Table-1: Length of the Clavicles of Both Sides in Males:

	Left Clavicle	Right Clavicle
Total No.	33	37
Range	138.74mm-161.29mm	137.98-164.73mm
Mean	149.74mm	146.18mm
Standard error	5.15	5.93

Table-2: Length of the Clavicles of Both Sides in Females:

	Left Clavicle	Right Clavicle
Total No.	17	13
Range	106mm-137.65mm	104.23-135.29mm
Mean	118.44mm	115.60mm
Standard error	5.04	3.09

When standards of errors of maximum length of clavicle were compared with standards of errors of mid clavicular circumference, vertical diameter of clavicle, saggital diameter of clavicle, calibre index of clavicle, cross sectional index of clavicle and weight of clavicle, it was observed that standards of errors of maximum length of clavicle is minimum for both male and female as well as for both left and right clavicles. (Table-3)

Basing on the maximum lengths of clavicles for both sexes of both sides, separate linear equations are derived. Linear regression equations thus obtained are:

For male individual:

46.259 + 0.790 X Maximum length of left clavicle
34.982 + 0.988 X Maximum length of right clavicle

For Female Individual:

54.714 + 0.808 X Maximum length of left clavicle
35.082 + 0.973 X Maximum length of right clavicle

Discussion:

Studies conducted by Terry, Oliver, Thieme outside India are not based on the materials from India; hence their formulae cannot be applied for Indian population. In India, few studies conducted by Singh & Sohal, Jit & Singh, Yadav and Khaka on estimation of stature from clavicles showed conflicting results. [4-7] Singh & Sohal have suggested multiplication factor for only male individuals. Thus, it cannot be applied for female individuals. Again, as there is variation in maximum length of clavicles of left and right side, same multiplication factor cannot be applied to both sides' clavicles. Yadav in Rothak derived multiplication factor for both sides in both sexes. But he also suggested that multiplication factor is of little use in stature estimation. Khakha analyzed various parameters of clavicle of both sides of both sexes separately and also derived linear regression equation for each parameter of the clavicle. He found that maximum length was the best parameter for stature estimation from clavicle because of minimal standards of errors.

In the present study, we have also analyzed various parameters of clavicle of both sides of both sexes separately and also derived linear regression equation for each parameter of the clavicle. We found that maximum length was the best parameter for stature estimation from clavicle because of minimum standards of errors and maximum correlation coefficient, as reported by Khakha.

Conclusion:

Thus, if only the clavicle is recovered, then anthropologist / forensic examiner can estimate the stature of the individual with a reasonable degree of accuracy. However, as our study is on Delhi based heterogeneous group of population, similar studies on homogenous group of population may yield better results.

Out of seven parameters, maximum length of clavicle was found the best parameter to estimate the stature of unknown individual. For estimation of stature from clavicle, sex and side of the clavicle must be considered for applying the regression formula.Regression formulae for estimating stature from the clavicle:

For Male Individual: 46.259 + 0.790 X Maximum length of left clavicle, 34.982 + 0.988 X Maximum length of right clavicle

For Female Individual: 54.714 + 0.808 X Maximum length of left clavicle, 35.082 + 0.973 X Maximum length of right clavicle

References:

1. **Terry J.** The clavicle of the American Negro. American journal of Physical Anthropology.1932; 16:351-381.
2. **Oliver G.** Anthropologic de le Clavicle III. La claviculae du Francais. Bull Social Anthropology. 1951; 2: 121-157.
3. **Thieme FP.** Sex in Negro skeletons. Journal of forensic Medicine.1957; 4: 72-81.
4. **Singh B, Sohal HS.** Estimation of stature from the length of clavicle in Punjabis, a preliminary report. Indian J Med Res. 1952; 40: 67-71.
5. **Jit I, Singh S.** Estimation of stature from clavicles. Indian J Med Res. 1956; 44:137-155.
6. **Yadav DR.** Study of adult clavicles for determination of sex and stature in Rohtak (Haryana)-Thesis for MD (Forensic Medicine), Maharishi Dayanand University, Rohtak, 1980.
7. **Khakha AF.** Status of adult clavicle for determination of sex and stature in Delhi- Thesis for MD (Forensic Medicine), UCMS, Delhi, 1989.

Table-3: Comparison with Standards of errors of other Parameters

Sl. No.	Parameters	Male		Female	
		Left Clavicle	Right Clavicle	Left Clavicle	Right Clavicle
1	Mid clavicular circumference	7.01	6.73	8.35	9.39
2	Vertical diameter of clavicle	6.67	6.22	8.33	9.07
3	Saggital diameter of clavicle	6.92	6.73	8.35	9.39
4	Caliber index of clavicle	7.19	6.65	8.42	8.36
5	Cross sectional index of clavicle	7.21	6.75	8.29	9.41
6	Weight of clavicle	6.92	6.65	8.12	7.26
7	Maximum length of clavicle	5.15	5.93	5.04	3.09

Obituary

Leading Forensic Persons Leaves us to settle in Heaven

Professor [Dr] Anand Menon

[May 9, 1956 – June 24, 2011]

He was Professor and Head, Forensic Medicine & Toxicology
Kasturba Medical College, Mangalore

He was a young and dynamic Forensic Expert of India, Besides publication of many National and International paper, PM Examination of Mangalore Air Crash victims on May 20, 2010, goes to his name.

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Trends of Fatal Poisoning In Saurashtra Region of Gujarat (A Prospective Study)

*Sanjeev Kumar, **Akhilesh Pathak, ***H. M. Mangal

Abstract

Everyday around the world almost 700 people die from the poisoning and several thousands more are affected by poisoning. Poisoning occurs in all regions and countries and affects people in all age and income group. Major occupation in Saurashtra region of Gujarat is farming with majority of population living in rural areas where the cases of accidental and suicidal poisoning are common and incidences are increasing day by day due to the use of pesticides for a wider variety of purposes. A detailed knowledge about the nature and magnitude of the poisoning cases in this particular area is not only important for early diagnosis and prompt treatment but also it may help to form policies to curb the access of the population to certain very toxic substances. The present study was undertaken in the department of Forensic Medicine at Rajkot (Gujarat) to know the pattern of fatal poisoning. Total 208 cases of death due to fatal poisoning were selected for this prospective study, which were brought to us for postmortem examination during the span of one year (From January 2007 to December 2007). Our study revealed that most of the victims of fatal poisoning were Hindus, married males of middle socio-economic status who died due to self ingestion of some poison.

Key Words: Poisoning, Autopsy & Suicide, Toxic Substances, Fatal

Introduction:

Poisoning both accidental and intentional is a significant contributor to mortality and morbidity throughout the world. According to WHO, three million acute poisoning cases with 2, 20,000 deaths occur annually. Of this 90% of fatal poisoning occurs in developing countries particularly among agricultural workers. Acute poisoning forms one of the commonest causes of emergency hospital admissions. Pattern of poisoning in a reason depends on variety of factors, such as availability of poisons, socioeconomic status of population, religious and cultural influence and availability of poisons. The exact incidence of poisoning in India is uncertain due to lack of data at central level as most cases are not reported, and as mortality data are a poor indicator of incidence of poisoning. It has been estimated that about 5-6 persons per lakh of population die due to poisoning every year. [1]

The commonest poisoning in India and other developing countries is due to pesticides, the reasons being agriculture based economy, poverty and easy availability of highly toxic pesticides.

Corresponding Author:

**Asso. Prof., FMT, Government Medical College, Vadodara (Gujarat)
E-mail: dr.akhilesh_pathak@yahoo.co.in
* Assis. Prof., FMT, G.M. C, Udaipur.
*** Professor & Head, Forensic Medicine, PDU Medical College, Rajkot

Occupational poisoning due to pesticides is also common in developing countries, due to unsafe practices, illiteracy, ignorance and lack of protective clothing.

Poisoning can be occupational, accidental or intentional exposure. It is a major public health problem in the developing world. Hazardous occupational practices & unsafe storage expose millions of people to toxic effects of pesticides. However, deliberate self-poisoning account for majority of fatal episodes and put tremendous stress on hospital services, particularly in Asia. [2, 3] In 1990, an estimated 2 million people deliberately self-poisoned themselves and 200,000 deaths resulted. [4] In contrast, accidental and occupational exposure was estimated to touch 1 million cases & 20,000 deaths. Many studies have shown that deliberate self-poisoning has a far higher mortality than accidental poisoning. [5, 6, 7] The act of self harm has been done to express anger, rebellion or revenge by causing distress to another person in some cultures. Many studies emphasize that not all people who die following acts of self-harm, actually wished to die. [8, 9] The role of intent in an attempted suicide is controversial. Determinants for a fatal event include poison's toxicity, time taken in receiving clinical attention and the efficacy of medical treatment. WHO class I hazardous pesticides are easily available in developing countries and the virtually non-existent medical

services in the developing world ensure that the mortality rate for deliberate self-poisoning is at least 20 times higher in these countries. [9] Pattern of poisoning in region of Rajkot has not been studied before this study. There is very little information available on the access of the population to different types of poisons. Major occupation in Rajkot region is farming with majority of population living in rural areas. Agricultural practice is monsoon dependent & farmers usually belong to lower socioeconomic strata. The rising incidences of fatal poisoning with prevalence of certain groups of poison in this particular geographical area has prompted us to undertake this study to know the epidemiological aspects, patterns & other significant features of deaths due fatal poisoning, & to compare it with the observations of various authors by scientific discussion.

Material & Methods:

Rajkot is a district with population of about 12 lakhs as per 2001 census in an area of 13,582 sq kms. The present prospective study was conducted in the Departments of Forensic Medicine Rajkot, which is a tertiary health care center and most of the cases are referred here from rural areas and about 80% of total medico-legal work done across the district is performed here.

Out of total 2039 autopsies, 208 cases (10.02%) of death due to poisoning were selected for the present study, which were referred to us for autopsy examination during the period of one year from 1st January 2007 to 31st December 2007. In all these cases detailed and complete post mortem examination was conducted and information regarding age, gender, religion, marital status and manner of death were duly recorded after analyzing the reports of chemical analysis.

Information from relatives and accompanying police records with autopsy details were used to conclude the manner of poisoning whether suicidal, accidental or homicidal. Finally the details were analyzed and the conclusions were drawn after comparing and discussing with similar type of the work carried out by foreign and Indian authors.

Observations:

Out of total 2039 autopsies, 208 cases (10.02%) of death due to poisoning were selected for the present study. Incidence of poisoning deaths was more in 2nd (24.51%) and 3rd decade (32.79%) of life as compared to both extremes of life. When age distribution of deaths are contrasted on the basis of gender then it become evident that male deaths are highest in the age group 21-30 years (20.09%) but for female age group 11-20 years (14.42%) reports the highest number of deaths. In the present study male poisoning deaths (57.69%) are observed 1.36 times more than the female deaths (42.31%) with a male to female ratio of 1:0.73. Incidence of fatal poisoning was more in Hindu people (89.90%) as compared to Muslim (10.10%) and most of the victims of poisoning death were married (67.31%). A significant difference was observed between rural and urban areas on the basis of socio-economic status. In the urban areas middle socio-economic status people have higher odds of fatal event (44.71%) whereas in rural areas lower socio-economic status people have higher odds of fatal event (23.56%). Incidence of suicidal cases was highest (92.8 %) in the present study followed by cases of poisoning in which manner of death cannot be decided (4.8%), followed by accidental cases (2.4%). No homicidal case of fatal poisoning was noticed in present study. This inference is based on history given by relatives and investigating police officer.

Discussion:

In the present study we tried to find out the association of episodes of fatal poisoning with various factors like age, gender, area of residence, religion, marital status, type of poison and manner of death. These factors have been dealt by other researchers in varying permutations and combinations. Despite the tremendous progress in all fields of life accidental insecticidal poisoning continues to be the major cause of morbidity and mortality in India, which is avoidable.

The incidence of poisoning of fatal poisoning in present study was 10.02%, which is comparable to other studies. [10, 11, 14] The incidences of poisoning were higher in third decade of life in Hindu Married Males, which is similar to most of the studies done by various authors. [10, 11, 12, 13, 14, 15, 16, 17, 18, 19]

Higher incidence of poisoning in the individuals of younger age group of 15-30 years can be explained by the fact that the persons of this age group are suffering from stress of the modern life style, failure or less percentage in the exams, scolding from parents or teachers, failure in love, family problems etc. Change over from the concept of joint family to nuclear family has forced modern youth to face the problem of day to day living, both at home and outside, on their own, without the much needed advice from the elders. When these problems and tensions become unbearable, ending one's life seems to

be the only solution of them. Though all studies were conducted in different parts of India, male predominance was a common and constant feature in all, which suggests that male are more active in various social activities and customs and hence they are vulnerable from stress and tension. The incidences of fatal poisoning were higher in people of middle socioeconomic class who belongs to urban area, which is showing contradiction from the study of others. [10, 11, 13, 16, 17, 18, 19] It might be because larger segment of our population comes from these groups of city area and referrals from periphery are less as compare to other areas. Most of the studies including this show that majority of cases were suicidal in nature followed by cases of accidental poisoning, while no case of homicidal poisoning was observed in present study. In rest 4.8% cases manner of death could not be detected by any means till the date of this study.

Conclusion:

Pattern of fatal poisoning in present study is more or less similar to the pattern observed in most of the other studies done by various authors. Our study revealed that most of the victims of fatal poisoning were Hindu married male of middle socio-economic status who died due to self ingestion of pesticide poison.

Reducing deaths from self-poisoning require prevention strategies include treating the problems leading to suicidal behaviors involving pesticides; changing attitudes, knowledge, and beliefs about pesticides; controlling access to dangerous pesticides, including developing secure storage practices and improving the medical treatment of poisonings.

More research is needed to better understand suicides involving pesticides in their cultural contexts and to evaluate the effectiveness of intervention programs, including assessment of possible substitution of methods.

References:

1. **Reddy KSN:** The Essentials of Forensic Medicine and Toxicology, 29th Edition. K.Saguna Devi, Hyderabad, 2010; 449.
2. **VanderHoek W, Konradsen F, Athukorala K & Wanigadewa T:** Pesticide poisoning- a major Health problem in Sri Lanka, Soc Sci Med, 1998; 46, 495–504.
3. **Eddleston M, Sheriff MHR & Hawton K:** Deliberate self-harm in Sri Lanka- An overlooked Tragedy in the developing world, Br Med J, 1998; 317, 133–35.
4. **Ingianna J, Herrero R & Albertazzi C:** Estudio comparativo de casos de intoxicaciones por insecticidas organofosforados en diferentes zonas de Costa Rica, Revista Biol Trop,1983; 31, 139–44.
5. **World Health Organization:** Environmental health criteria, Phosphine and selected metal Phosphides, Geneva: WHO, 1988.
6. **Sinitox: Revisao da estatistica de** 1997. Casos de intoxicacao e envenenamento. Brasil, 1997, Available on http://www.fiocruz.br
7. **De Silva P:** The logic of attempted suicide and its linkage with human emotions- Suicide in Sri Lanka, Kandy, Institute of Fundamental Studies, 1989; 1, 25–40.
8. **Williams H, Buchan T:** A preliminary investigation into parasuicide in Salisbury, Zimbabwe, Central Afr J of Med, 1981; 27, 129–35.
9. **Jacobsen D, Frederichsen PS, Knutsen KM, Sorum Y, Talseth T, Odegaard OR**: Clinical Course in acute self-poisoning: a prospective study of 1125 consecutively hospitalised adults,Hum Exp, Toxicol, 1984; 3, 107–16.
10. **Gupta BD & Vaghela PC:** Profile of fatal poisoning in & around Jamnagar, JIAFM, 2005; 27(3), 145-48.
11. **Das RK:** Epidemiology of insecticide poisoning at AIIMS emergency services and role of its Detection by Gas liquid chromatography in diagnosis, 2007; 7 (2), 7-12.
12. **Aggarwal NK & Aggarwal BBL:** Trends of poisoning in Delhi, JIAFM, 1998; 20 (2), 32-36.
13. **Dalal JS, Goria RK, Aggarwal AK, Thind AS & Sandhu SS:** Poisoning Trends- A post mortem study, JIAFM, 1998; 20 (2), 27-31.
14. 14**. Dhattarwal SK & Dalal** SS: Profile of Deaths Due to Poisoning in Rohtak, Haryana, JFMT, 1995; 14(1), 51.
15. **Gargi J, Rai H, Chanana A, Raj G, Sharma G & Bagga IJS:** Current Trends of Poisoning -A Hospital Profile, JPAFMT, 2003; 3, 41-45.
16. **Shingh K, Oberoi SS & Bhullar DS:** Poisoning Trends in the Malwa Region of Punjab, JPAFMT, 2003; 3(26), 29.
17. **Sharma BR, Dasari H, Sharma V & Vij K:** The epidemiology of poisoning - An Indian view point, JFMT, 2000; 19(2), 5-11.
18. **Shingh VP, Sharma BR, Dasari H & Krishan V:** A ten year study of poisoning cases in a tertiary care hospital, Ind Internet J of For Med & Toxicolo, 2004; 1(2). Page no.
19. 19. **Dhattarwal SK & Singh H:** Profile of death due to poisoning in Rohtak, Haryana, JFMT, 2001, 18(2), 28-29.

Table-1: Age & Gender Wise Distribution

Age Group	Number of Male (%)	Number of Female (%)	Total
< 10 Yr	1 (0.48%)	1 (0.48%)	02 (0.96%)
11-20 Yr	21 (10.09%)	30 (14.42%)	51 (24.5%)
21-30 Yr	42 (20.19%)	26 (12.6%)	**68 (32.7%)**
31-40 Yr	23 (11.07%)	12 (5.77%)	35 (16.8%)
41-50 Yr	23 (11.07%)	12 (5.77%)	35 (16.8%)
51-60 Yr	6 (2.89%)	5 (2.40%)	11 (5.2%)
>61 Yr	4 (1.9%)	2 (0.48%)	06 (2.7%)
Total	**120 (57.69%)**	**88 (42.31%)**	**208 (100%)**

Table-2: RELIGION AND MARITAL STATUS WISE DISTRIBUTION OF POISONING

Marital status	Hindu	Muslim	Sikh	Total
Unmarried	66 (31.73%)	02 (0.96%)	0	68 (32.69%)
Married	121 (58.17%)	19 (9.13%)	0	140 (67.31%)
Total	**187 (89.90%)**	**21 (10.10%)**	**0**	**208 (100%)**

Table-3: Socio-Economic Status & Area Wise Distribution

Socio economic Status	Rural Area	Urban Area	Total
Lower	49 (23.56%)	42 (20.19%)	91 (43.75%)
Middle	24 (11.54%)	93 (44.71%)	117 (56.25%)
Total	**73 (35.10%)**	**135 (64.9%)**	**208 (100%)**

Table-4: DISTRIBUTION OF CASES ACCORDING TO MANNER OF DEATH

Manner of death	Suicidal	Accidental	Homicidal	Not known	Total
Cases (%)	**193 (92.8%)**	5 (2.4%)	0 (0%)	10 (4.8%)	208 (100%)

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

A Study of Efficacy of Lip Prints as an Identification Tool among the People of Karnataka in India

*Annie Joseph Verghese, **Shashidhar C. Mestri

Abstract

This is a study of cheiloscopy done on the subjects from south Karnataka districts in India. Lip prints from 100 male and 100 female subjects were studied to determine the predominant lip print type and to look for any correlation between lip print types and blood groups. Tsuchihashi's classification of type I (complete vertical grooves), type I' (incomplete vertical grooves), type II (forking grooves), type III (intersecting grooves), type IV (reticular grooves) and type V (indeterminate grooves) was used. Only the middle 10 mm of the lower lip was studied as this is the area most often found at a crime scene. The prints were obtained using lipstick and cellophane tape. It was observed that type IV (reticular) was predominant in the subjects chosen for the study and that there was no correlation between blood groups and lip print types.

Key words: Cheiloscopy, Blood groups, India, Lip prints, South Karnataka

Introduction:

Identification of a person is of paramount importance in a medico-legal investigation. A wide range of methods is available for this purpose out of which one of the best and most often used is fingerprints. Perhaps for this very reason, the awareness of fingerprints is very high in the general public and a significant proportion of offences are committed with deliberate attempts not to leave behind fingerprints at a crime scene.

An alternative mode of identification is cheiloscopy, which is the study of the grooves and furrows present on the red part of the human lips. These grooves occur as distinct patterns or types and are unique to each individual and thus can be used to fix the identity of a person. One of the earliest workers was Dr.Martinez Santos from Brazil who classified the furrows on the lips and showed that they can be used for identification.

Specialists in anthropology, stomatology and forensic medicine from different parts of the globe such as France, Italy, West Germany, Great Britain, Iran and Czechoslovakia have also carried out cheiloscopic research. [1]

Corresponding Author:

* Associate Prof., Forensic Medicine & Toxicology
MVJ Medical College and Research Hospital
Hoskote – 562 114, Karnataka, India
Email: annieverghese@hotmail.com
** Professor and Head,
Karpaga Institute of Medical Sciences
Palayanoor-503308, Tamil Nadu, India

In 1976 in Milanowek in Poland during a burglary investigation, a technician looking for fingerprints found a trace of the lips. It turned out to belong to the daughter of the owners. In this case, the cheiloscopic evidence had an eliminatory character. [1] In the following years more instances of cheiloscopic identification took place. One of these concerned a burglary where a piece of cake was found with a trace of teeth. On examination it revealed a lip print as well and a categorical result as to the burglar could be obtained. It brought to attention that lip prints are often found along with teeth marks. Another notable point is that the lip print remained on the cake for three months. [1]

The following years showed a rise in the acceptance of cheiloscopy in the legal community. Cheiloscopy workshops are conducted by the Federal Bureau of Investigation in the United States of America and in 1999, a U.S. court accepted the testimony of two state police experts that lip print identification is generally accepted within the forensic science community as a method of positive identification. [2] The use of lip prints is not limited to visible traces left at a scene of crime. Latent or invisible prints can be developed or made visible in a manner similar to that used for fingerprints. In 1982 the Forensic Institute of Warsaw University studied the latent lip prints of 1500 persons. The prints were visualized with ferromagnetic powder and then fixed on transparent foil. It resulted in a catalogue of 23 types of individual features. [3] Segui MA, Feucht MM, Ponce AC and Pascual

FAV studied latent lip prints left behind by permanent or 'persistent' type of lipsticks. Contrary to conventional lipsticks, these do not leave visible prints when they come in contact with a surface. They used three developers – aluminum powder, cobalt oxide powder and magnetic powder. They found that aluminum and magnetic powders gave better results than the cobalt oxide powder. [4] Apart from its use in the positive identification of the individual, cheiloscopy may also be able to provide additional information about the person. Studies have been carried out in an attempt to determine the sex from the lip print. [5]

Other workers have attempted to discover possible ethnic variations in the lip print. Yasuo Tsuchihashi studied the lip prints of 757 males and 607 females of Japanese origin. He classified the lip prints into six types according to the shape and course of the grooves. These were:

- **Type I:** clear-cut grooves running vertically across the lip.
- **Type I':** the grooves are straight but disappear halfway.
- **Type II:** the grooves fork in their course.
- **Type III:** the grooves intersect.
- **Type IV:** the grooves are reticular
- **Type V:** the grooves do not fall into any of the types I to IV.

Tsuchihashi found that Type III was predominant among the Japanese subjects. [6] In India, Vahanwalla and Parekh studied lip prints from 50 male and 50 female subjects from Mumbai. They found that type I was predominant in the lower lip among the females and that the male subjects tended to have different types in all quadrants of the lips. [5]

Sivapathasundharam, Prakash and Sivakumar studied the lip prints of 200 Indo-Dravidian persons and they followed Tsuchihashi's classification of types I to V. They also found that type III was predominant. [7]

Manipady did a study on lip prints in which he compared Indian and Chinese subjects. His findings were different from the previous two studies for he discovered that type II was predominant among both the Indian and Chinese persons. In our study we have searched for the predominant lip print type among the persons from south Karnataka districts in India and we have also looked into a possible correlation between lip print types and blood groups. We have used the lipstick-cellophane method to record the prints. A variety of methods are available in literature, such as photographing the lips, taking the prints directly on to paper (without using cellophane tape) and obtaining three-dimensional casts of the lips. The last method utilizes dental impression materials and gives good quality casts in which the groves on the lips can be seen clearly. The time consumption, high level of technical skill required and cost considerations were however prohibitive for our study. From among the other methods, considering the time factor, ease of taking the prints and the clarity of the grooves; we preferred the lipstick-cellophane method.

Materials and Methods:

1. Lipstick of a bright red color and non-glossy, commercially available.
2. Cellophane tape that was transparent and glued on one side. The width was 0.9 cm.
3. White bond paper, unglazed
4. Magnifying lens
5. Tissue paper

Subjects were 100 males and 100 females of south Karnataka origin between the ages of 18 and 25 years. All were 1st and 2nd year students of the J.S.S. Medical, Dental and Ayurveda Colleges in Mysore, Karnataka and the subjects were aware of their blood groups. The cases with any evidence of disease or injury of the lips were not included. Subjects were informed about the study and written consent was obtained prior to recording the prints.

Procedure:

The upper surface of the lipstick was wiped clean on tissue paper prior to each use for hygienic purposes. The subject was asked to open the mouth and lipstick was applied in a single motion evenly on the upper lip, then on the lower lip. The subject was asked to rub the upper and lower lips together in a horizontal direction, to spread the lipstick evenly on all parts of the lips. A strip of cellophane tape about 10 cm long was cut. The subject was asked to open the mouth slightly and to keep the mouth stationary during the procedure. The glued portion of the tape was applied on the lower lip. It was held in place, applying gentle and even pressure for a few seconds to allow the print to form on the tape.

The tape was then lifted carefully from the lip from one end to the other, avoiding any smudging of the print. The strip of cellophane tape was then stuck on to a piece of white bond paper. The above steps were repeated for the upper lip. The excess tape was folded on to the reverse side of the paper and the subject's serial number was written on the paper to serve as a record. The subject was provided with tissue paper to clean the lips. A vertical line was drawn with a pencil at the centre of the print. At a

distance of 5 mm on either side of this line, parallel lines were drawn to the first line. These lines demarcated the middle 10 mm of the lower lip, which was the area to be studied. This was chosen because the centre portion of the lower lip is the area that is most frequently found at a crime scene.

Quadrants were drawn on paper, which were similar to the Zsigmondy-Palmer system of dental charting. The lip print was studied under a magnifying lens. The grooves were classified according to Tsuchihashi's classification of types I to V. These types were written on the chart as grooves present on the lower left or the lower right quadrants. The predominant type in each quadrant was noted.

Statistical Methodology:

This study was done using Software Package for Social Service (SPSS).

The frequency of each lip print type was tabulated and the percentage of each type was calculated. The chi square (χ^2) test was applied to see whether there was any association between the lip print types and blood groups. It is calculated as:

$\chi^2 = \Sigma \frac{(\text{Observed frequencies} - \text{Expected frequencies})^2}{\text{Expected frequencies}}$

Where, Σ denotes summation

"p" value is probability role at 0.05 level of significance for corresponding degree of freedom. $p<0.05$ is significant, $p>0.05$ is not significant

Results:

The most frequent is type IV, which is the reticular type of lip print. (Table 1) The contingency coefficient was 0.251. The p value was more than 0.05 showing that there was no correlation between the lip print type and the blood group of the subject. (Table 2)

Discussion:

Our study on persons from the state of Karnataka, in India found that type IV (reticular grooves) was the predominant type. This is in contrast to the study done by Vahanwalla and Parekh in Mumbai, (which is in the state of Maharashtra), in which they found that type I was predominant in the lower lip among the female subjects. This variance can be explained by the ethnic difference in the subjects studied. The study done by Sivapathasundharam et al was on Indo-Dravidian subjects, who are not quite the same as subjects from the state of Karnataka. They found that the predominant lip print type was type III (intersecting grooves). Manipady's subjects were not from any one particular part of India, and he found type II to be predominant among them as well among his subjects of Chinese origin. These studies suggest that there is ethnic and racial variation in the lip print.

This particular aspect of cheiloscopy is currently in its nascent stage of investigation; therefore with the information available at present, it may not be possible to categorically state the ethnic origins of a person by studying the lip print. However further work on the subject may elucidate this data from the lip print. As far as the relationship goes between lip print types and blood groups, our study showed that no correlation exists. Lip prints can be a useful adjunct to fingerprints in the identification process. In most of the countries across the globe, efficient machinery is already in place for the detection, recording and matching of fingerprints of a suspect. Similar equipment can be employed for lip prints and fingerprint experts can be trained to perform cheiloscopic identification exercises. This can greatly enhance the apprehension of suspects and their conviction in the courts of law.

Table 1: Frequency & %age of lip print types

Lip print type	Frequency			Percent
	LL	LR	Total	
Type I	6	6	12	3.0
Type I'	28	20	48	12.0
Type II	49	47	96	24.0
Type III	47	53	100	25.0
Type IV	63	69	132	33.0
Type V	7	5	12	3.0

LL- left quadrant of the lower lip

LR- right quadrant of the lower lip

Table 2: Correlation of lipprint type & Bld Gp

Lip print type	Blood groups					
	A +	A -	B +	O +	O -	AB +
Type I	2	0	2	8	0	0
Type I'	11	0	16	18	2	1
Type II	23	2	26	39	2	4
Type III	20	1	35	36	3	5
Type IV	37	0	31	53	1	10
Type V	5	1	2	4	0	0

Note: there were no subjects with the blood groups B- and AB-

References:

1. **Kasprzak J.** Possibilities of cheiloscopy. Forensic Sci Int. 1990; 46: 145-151.
2. **Ball J.** The current status of lip prints and their use for identification. J Forensic Odontostomatol. 2002; 20: 43-46.
3. **Kasprzak J.** Cheiloscopy. In: Siegel JA, Pekka SJ, Geodfrey CK (ed) Encyclopedia of Forensic Sciences. 1st edition. Warsaw: Academic Press; 2000. p. 358-361.
4. **Segui MA, Feucht MM, Ponce AC.** Persistent lipsticks and their lip prints: new evidence at the crime scene. Forensic Sci Int. 2000; 112: 41-47.
5. **Vahanwalla SP, Parekh BK.** Study on lip prints as an aid to forensic methodology. J Indian Dent Assoc. 2000; 71: 268-271.
6. **Tsuchihashi Y.** Studies on personal identification by means of lip prints. Forensic Sci. 1974; 3: 233-248.
7. **Sivapathasundharam B, Prakash PA, Sivakumar G.** Lip prints (cheiloscopy). Indian J. Dent Res. 2001; 12(4): 234-237.

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Comparative Study of Hepatic Injury and its Different aspects in Medicolegal Autopsies

*Prabir Chakraborty, **Somnath Das, ***Surendra Kumar Pandey

Abstract

Liver being an important and highly vascular organ, hepatic injury causes huge blood loss from the body for which the condition of victims becomes grave. So it is important to know which type if force or trauma causes which type of injury and also its extent to the liver. This paper deals with different types of injuries to the liver following trauma of different origin. In case of unnatural death resulting from trauma there are many authors who worked with injuries over different part of the body but a few of them has highlighted over hepatic injuries. That is why we liked to give our attention over hepatic injury. In present study we have dealt with 100 dead bodies with mechanical injuries in Calcutta Police Morgue under Medical College Calcutta during June 2008 to December 2009. This paper can also assist the care givers of the victim with the knowledge of the golden hour of management and also to find out the site of primary injury over liver.

Key Words: Hepatic injury, Autopsy, Calcutta Medical College

Introduction:

Though liver is protected to a great extent by the lower half of the costal arch specially the right lobe, studies have shown that blunt force injuries to the liver by non-penetrating mechanical trauma also have shown phenomenal rise. A review of news in the television and other media reflects that the death of human being resulting from road traffic injuries is very common. The post mortem examination on such death also reveals that in most cases hepatic injury was mainly responsible for precipitation death of the victim by vascular shock.

Studies have revealed that early diagnosis of hepatic injury and immediate surgical interventions have led to saving lives which were at great risk due to hepatic injuries. Thorough knowledge of hepatic injuries and epidemiological study on them are essential for proper administration of justice in criminal cases and assessment of compensation in civil cases, such studies are also necessary to decide whether medical negligence was responsible behind the death resulting from hepatic injuries.

Corresponding Author:

**Deptt. of Forensic Medicine. Midnapore Medical College, Paschim, Medinipur, West Bengal [WB]
E-mail somnath1976@rediffmail.com
* Assist.Prof. Deptt of Forensic & State Medicine
Bankura Sammilani Medical College, Bankura, WB
***Assistant Professor, FMT, IMS, BHU. Varanasi

Aims and Objectives:

Following points is studied in this regard:

1. To study the pattern of hepatic injuries
2. To know manner of hepatic injuries in certain periods
3. To find causative factors of hepatic injuries
4. To study the relationship between Severity of injuries and Survival period
5. To obtain solution to reduce mortality

Materials and Methods:

The present study has been carried out over a period of June 2008 to December 2009. Subjects were chosen from cases sent for post-mortem examination to Calcutta Police Morgue under the Upgraded Department of Forensic & State Medicine, Medical College, Calcutta, to analyze the different aspects of Hepatic injury.

The selection of cases of this study has been as per following criteria:

a. All cases of non-penetrating and penetrating injuries over abdomen with evidence of hepatic injuries.
b. All other cases of injuries without definite evidence of injury to the abdomen but accompanied with hepatic injuries.
c. Injury cases have been included road traffic injuries suicidal cases and homicidal injuries and accidental injuries.
d. Highly decomposed dead bodies with extensive putrefactive changes in the injured liver have been excluded from the study.

Statistics:

Table 1: Sex wise distribution

Male	Female	Total
84	16	100
84%	16%	100%

Table 2: Pattern of age group involved incase of Hepatic Injury

Hepatic Injuries	Hepatic injuries accompanied with other organ injuries	Total
7	93	100
7%	93%	100%

Table 3: Distribution of Survival period

Age Group	Number	%
1-10 yrs	5	5%
11-20 yrs	11	11%
21-30 yrs	29	29%
31-40 yrs	22	22%
41-50 yrs	14	14%
51-60 yrs	12	12%
61-70 yrs	6	6%
71-80 yrs	1	1%
Total	100	100%

Table 4: Distribution of death

< 1 hr	11	11%
1 – 6 hrs	13	13%
6 – 12 hrs	2	2%
12 – 24 hrs	3	3%
1 – 2 days	3	3%
2 – 3 days	1	1%
3 – 4 days	2	2%
4 days >	1	1%

Table 5: Pattern of incident in a case of death of Hepatic injury

Run over by Vehicle	58	58%
Fall from Height	12	12%
Fire arm injuries	8	8%
Stab injuries	4	4%
Collision between two cars	4	4%
Metro Rail injuries	4	4%
Burn	1	1%
Other	9	9%
Total	100	100%

Table 6: Pattern of persons involved

Pedestrian	52	52%
Fall from height	12	12%
Fire arm injuries	8	8%
Stab injuries	4	4%
Bicyclist	3	3%
Driver	2	2%
Occupant	6	6%
Metro rail (in front)	4	4%
Fall of heavy weight	2	2%
Burn	1	1%
Others	6	6%
Total	100	100%

Table 7: Distribution of site of injuries in liver

RT. Lobe	92
LT. lobe	20
Anterior surface	56
Posterior surface	9
Outer surface	5
Superior surface	26
Inferior surface	22

Death in case of Hepatic injury during June, 2008 – Dec. 2009, occurred were 100; among them male were 84 and Female were 16 on percentage 84% &16% respectively. (Table 1)

Major portion of casualties of hepatic injuries occurs 29 (29%) & 22 (22%) out of cases 100 in age groupp 21-30 yrs & 31-40 yrs respectively followed by 14 casualties in 41-50 yrs age gp, 12 casualties in 51-60 age group & 11 casualties in 11-12 yrs age group. On either side of extreme age groupp that is number of 5, 6, 1 casualties occur in 0-10 yrs age group. 61-70 yrs age group and 71-80 yrs age group, respectively which signifies diminishing tendency. (Table 2)

Table 3 showing victims, brought dead or spot dead are not taken. Survival period of 36 victims of hepatic injuries which are out of 100 victims, rest 64 victims died either at spot or became brought dead at hospital or time of incident was not known, so survival period of them were beyond of knowledge. Among 36%, major portion died within 1 hour and between 1-6 hours i.e. 11% and 13% respectively, between 12-24 hours and between 1-2 days victims died 3% each, again between 6-12 hours and between 3-4 days occurrence of death were 2% each, and between 2-3 days and after 4 days i.e., after 9 days victims died 1% each.

Explain death only due to Hepatic injury was on 7 (7%) cases and major portion (93%) death occurred due to Hepatic injury accompanied with other organ injury. This finding is consistent with the findings of other studies also. (Table 4) [1]

Explain out of 100 cases of hepatic injuries 58 (58%) occurred due to run over by vehicle, 12 (12%), 8 (8%), in case of fall from height and fire arm injury respectively, hepatic injuries also occurred 4 (4%), each in stab injuries, collision between two cars,& metro-rail injuries, & burn injury occurred in 1 (1%) case. (Table 5)

Discuss out of 100 cases of Hepatic injuries 52 (52%) were pedestrian 12 (12%) were of fall from height following 8 (8%), 4 (4%) from firearm injuries and stab injuries respectively. Again Bicyclist, driver and vehicle occupant were victim of Hepatic injuries 3 (3%), 2 (2%), 6 (6%) respectively. More over Metro rail injury, fall of heavy weight on body and burn share Hepatic injury 4 (4%), 2 (2%), 1 (1%) respectively. (Table 6)

Table 7 showing common injury to the liver has occurred in RT lobe (92%) following involvement sites are Anterior surface (56%), Superior Surface (26%), Inferior surface (22%), and Lt Lobe (20%), less commonly occurrence

of sites of injuries are poster surface (9%) and outer surface (5%).

Discussion:

In the present study, 100 cases were taken for consideration. These cases came from various parts of kolkata and some districts of west Bengal. The results shown above give us a clear picture that hepatic injury is more common in male than females, which is quite consistent with other studies [2] and also with the fact that males are usual out door workers.

Table 2 explains that major portion of casualties of hepatic injuries occurs between the age groups of 21 to 40 years, the most active part of the life. This observation is similar to the observation made in the "Pattern of injuries in various road users involved with different vehicles in fatal accidents" Journal of Police Research and Development. [2], [3]

Major survival period among the non fatal hepatic injury cases were 6 hrs from the time of incidence which may be considered to be the golden period for intervention of these cases. This information in turn may help the care givers to be more vigilant while dealing with these cases for early transport to the hospitals.

If we look into the pattern of injuries, run over by vehicles [6] and fall from height constitute the major part. This means direct impact at the site result for the major fatality among the cases. Similar information may also be obtained from the Gooneteleke U.K.D.A's Intra-abdominal injuries due to fall from height; Medical Science Law. [4]

Victim pattern shows pedestrian comprises the majority, while co occurrence with other modes of death is minimum. Metro railways accidents are accounting for such injuries nowadays and are in a rise. Among the hepatic injuries arising from fall from height, it is mostly indirect transmission of forces along the axis of liver, rather than direct impact. Injuries to stomach and duodenum usually co exists with hepatic injury. [5]

Out of the 100 cases, 92 cases showed right lobe involvement and 56 showed anterior surface involvement. Anatomically the right lobe of liver is more prone to injury as it is not supported. The results in this paper also bring up the above facts in more precise way. [7]

Summary and Conclusion:

In the present study total 100 cases of hepatic injuries have been studied at Calcutta Police Morgue attached to Upgraded Dept. of Forensic and State Medicine, Medical College, Calcutta.This study has been done on the basis of epidemiological, prognostic and medico legal aspects.The results of the above studies are summarized as below:

- Most of the cases are male that is 84%.
- Majority of cases that is 29% have been occurred in age group between 31 – 40 years.
- 13% of victims died within 1-6 hrs following incidents, and in 11% cases victims died within 1 hour following incident.
- In most of the cases victims (58%) suffered from rum over by vehicle.
- In most of the cases victims were pedestrian that is 52%.
- Right lobe of liver was injured 92% cases; regarding surface anterior involvement surface was involved in 56% cases.
- Most of the cases that is 84% occurred accidentally.

The authors felt that special emphasis should be given for early diagnosis and management of hepatic injuries with due consideration to the epidemiological factors. Like proper management of urban areas upgrading of the economic status of the individual for preventing the incidences of hepatic injuries and minimizing loss of human life by early hospitalization of victims.

Proper identification of hepatic injuries with timely response to victims of such trauma and improvement of emergency services in the hospital may provide saving of human lives in a better manner. To conclude the author felt that, the hepatic injuries should be considered in a more prudent manner to provide effective solution to the ever increasing problem of loss and sufferings of human lives precipitated hepatic injuries.

Refrences:

1. **Boulanger B.R., Milzman D.P., Rosati Carl and Rodriguez Aurelio**; A comparison of right and left blunt traumatic diaphragmatic rupture; J-Trauma. **1993** August; Vol.35, No. 2: 255-260.
2. **Chandra J. and Dogra T.D.**; Pattern of injuries in various road users involved with different vehicles in fatal accidents; J. Police Research and Development. **1978** April-June; 26-28.
3. **Chandra J., Dogra T.D. and Dikshit P.C.**; Pattern of Cranio-intracranial injuries in fatal vehicular accidents in Delhi (1966-76); Med-Sci-Law. **1979**; Vol.19, No.3: 186-194.
4. **Gooneteleke U.K.D.A.**; Intra-abdominal injuries due to fall from height; Medical Science Law. **1980**; Vol.20, 262-275.
5. **Harrison R.C., and Debas H.T.**; Injuries of the stomach and duodenum; Surg-Clin-North-Am. **1972**; Vol.52: 635.
6. **Sharma A.K.**; Postmortem evaluation of abdominal and pelvic trauma in Delhi; Thesis for the Degree of Doctor of Medicine (Forensic Medicine). **1986.**
7. **Christmas AB et al:** Selective management of blunt hepatic injuries including nonoperative management is a safe and effective strategy. ***Surgery*** 138:606, 200.

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Role of Sacrum in Sexual Dimorphism-A Morphometric Study

* Kanika Sachdeva, ** Rajan Kumar Singla, ***Gurdeep Kalsey, ****Gaurav Sharma

Abstract

The sacrum has always attracted the attention of the medico-legal experts for establishing the sex, because of its contribution to pelvic girdle and associated functional sex differences. The present study was performed to evaluate the reliability of the various parameters of sacrum in this regard. The material for the study comprised of 50 adult sacra (M: F= 40:10), obtained from the Department of Anatomy, Govt. Medical College, Amritsar. Different parameters viz. Midventral straight length, Midventral curved length, Ventral straight breadth, Transverse diameter of base, Transverse diameter of body of S_1, Antero-posterior diameter of body of S_1, Breadth of alae were measured and indices viz. Sacral index, Longitudinal curvature index and Corporobasal index were calculated and statistically analyzed .

Out of these Midventral straight length, Midventral curved length, Transverse diameter of base, Antero-posterior diameter of body of S_1 and Breadth of alae were found to be significantly more in males while Sacral index was significantly more in females. Corporobasal index was found to be more in females though statistically insignificant.

Key Words: Sacrum, Sexual Dimorphism, Sacral Parameters, Sacral Index, Corporobasal Index

Introduction:

Sex determination of a skeleton is a problem of concern to paleoanthropologists, paleodemographers & forensic scientists. Pelvic bones are most important for sex determination, followed by skull & the long bones. Forensic expert is often faced with a single specimen on whom he is asked to pronounce an opinion about its origin in general terms; or it may be necessary to establish as probably belonging to a given person when the identity is already suspected on circumstantial evidence. [1]

The sex classification of a bone is possible with a degree of certainty only when it can be compared to a series of bones of known sexual dimorphism. Otherwise, a female bone could be classified as a male when the series to which it belonged was particularly robust.

Stewart (1952) [2] aptly highlighted the fact of the overlap of ranges of variation of male and female bones on the basis of development of sexual features. In a series of whole skeletons or any bony parts, the overlapping portion would cause difficulty or even impossibility of definite sex determination. [3]

Corresponding Author:

*Asst. Prof, Deptt of Anatomy,
Chintpurni Medical College,
Pathankot-Dalhousie Road, Bungal, Pathankot, Punjab, India E-mail: kanikadr.sarang@yahoo.com
**Asso. Prof. Government Medical College,Amritsar
***Prof.& Head, Anatomy Deptt, G.I.D.S., Ferozepur
**** Assoc. Prof. FMT, KNMC, Guntur

So vast is the overlap between sexual characters of male and female skeletons belonging to different races that Hooton (1930) [4] is compelled to comment, “Every anthropologist unless he deceives himself must recognize that many of his decisions as to sex are questionable.” Sexual dimorphic characters can be studied both morphologically and metrically. Morphometric studies pose several problems such as difficulties with quantification and interobserver bias. Geometric morphometrics is relatively a more reliable method.

Traditional methods for the assessment of sex on the pattern of skeletal morphology do not have an explicit basis. Visual impressions of the bones can seldom be as accurate because of the many pitfalls associated with subjective assessments of the observer. Lately sexual divergence has been based upon the actual measurements in different bones.

Speaking in connection with the sex differences of the skeleton, Davivongs (1963) [3] pointed out that as a general rule male bones are more massive and heavier than female bones. In case of pelvic girdle additional sex differences are added due to different reproductive functions mainly influenced by sex hormones.

The sacrum has always attracted the attention of the medico-legal experts for establishing its sex, because of its contribution to pelvic girdle and associated functional sex differences .Thus sacrum assumes an applied

importance in determining sex with the help of measurements carried upon it. [5]

Though sacrum is often considered to be an important bone while dealing with sex differences in skeletal material, yet there is a paucity of metrical data available for this bone. [6] The present study was undertaken to study the morphometric sex differences in the North Indian sacra and to provide a baseline data for the same.

Material & Methods:

The material for the present study comprised of 50 adult sacra (M: F:: 40: 10) of known sex but of unknown age, obtained from the Department of Anatomy, Government Medical College, Amritsar. The bones were boiled and cleaned and were selected keeping in view that they were not fractured and showed no signs of pathology or wear and tear. The linear measurements were taken with the help of sliding vernier calipers (Photograph 1) and the curved distance was recorded with the help of Doctor's tape (Micropore) (Photograph 2). The parameters pertaining to sacrum measured in the present study are given in Table I. By using these measurements, three indices were calculated for the sacra which are given in the Table II.

The total sample was subdivided into two subsamples, from the 40 males and 10 females respectively. The entire data thus obtained was scrutinized, tabulated and statistically analyzed using maximum and minimum values, range, mean, standard deviation and 95% confidence intervals of mean. The existence of significant differences between the means for the two subsamples was analyzed by using Independent Student's t-test.

Results:

For all the studied parameters, the mean, standard deviation, range and 95% confidence intervals of mean in both the sexes are depicted in Table III. To this independent Student's t-test for equality of means was applied and't' and 'p-values' were calculated to find out the significant differences between the means for the two sexes.

Discussion:

The results of the present study have been compared in Table IV, with the earlier other authors who conducted their studies on Australian Aborigine [3], Varanasi [6] & Agra [9] populations.

It was seen that both straight and curved lengths of the sacrum were more in males in all the population groups. These are comparable to those in Varanasi [6] & Agra [9] populations but more than Australian Aborigines. [3]

A longer sacrum in males as compared with the females is explained by Davivings (1963) [3] by the fact that 6 piece sacra are more in males. But in the present study no 6 piece sacrum was found in the male sample.

Thus this explanation doesn't stand a good stead as far as the present study is concerned. On statistical evaluation the mean sex difference in both the straight and curved midventral lengths were significant (p-value= 0.005 and 0.013 respectively), which is in line with longer bones in males, and the fact that length of the sacrum makes no contribution to the perimeter, neither pelvic inlet nor the outlet.

Ventral straight breadth of male sacra was found to be more as compared with females though the mean difference was statistically insignificant (p-value = 0.612). This was in contrast to the earlier studies done where it was found to be wider in females. While Davivings (1963) [3] found it to be more in females by 0.13 cm, Mishra et al (2003) [9] found so by 0.05 cm. However in the present study, male sacra were wider as compared with females by a mean of 0.14 cm.

Transverse diameter of base of sacrum was more in males both in Varanasi [6] and in North Indian population (present study) the mean sex difference in the present study being statistically significant (p-value = 0.015).

However when the mean difference between the two sexes was compared, it was 0.18 cm in Varanasi population as compared to 0.74 cm of the present study (See Table IV). This again showed that in the present study the difference in transverse diameter of base of male and female sacra was comparatively more than the previous study on Varanasi population. [6]

Now if we observe transverse diameter of the body of S1 vertebra, Table IV depicts that this parameter was more in males in all population groups, though the difference was statistically insignificant in the present study (p-value = 0.380). If we observe the difference in male and female values, while in the present study it was just 0.21 cm, it ranged between 0.33 to 0.63 cm in earlier studies. Thus difference was 1.5 – 3 times in earlier studies than ours. In other words, in North Indian sacra, though male sacra were wider than females, the difference in breadth was less marked in the body of S1 vertebra or in other words it was more marked in alae.

A larger transverse diameter of body of S1 in males is attributed by Francis (1952) [10]

to a larger articular facet for centrum of L5 in them occupying almost half of transverse width of base of sacrum. In females the facet is relatively small occupying only a little more than one-third of the entire base.

As far as the antero-posterior diameter of body of S1 Vertebra in the present study is concerned, it was more in males as compared with females and it was in consonance with previous workers. Also the mean difference between the sexes was statistically significant (p-value = 0.033).

The last parameter measured was the mean width of alae which was more in males in the present study, the difference being statistically highly significant (Table III). Earlier study had measured it in Agra population and found it more in females by 0.28 cm. (Mishra et al (2003). [9] In contrast to that, in the present study, it was more in males by 0.35 cm. Thus the ala of our male sacra is much wider than those of our female sacra and the difference is more pronounced than other studies. This has been shown above as well that our male sacra show more width in alar part than in the body of S1. In other words it may be said that the transverse diameter of body of S1 is more in females of the present study as compared to the other races. Thus it is contributing more to the transverse diameter of the base and hence the contribution by the alae is reduced, causing comparatively narrower alae in the females of the present study.

Toeing in line with the earlier studies [3, 6 & 9] the sacral index was more in the females of the present study as well, the difference being statistically significant.

Similarly the longitudinal curvature index was more in males as compared to females in all the population groups, thus supporting Davivongs (1963) [3] view that the higher values of this index in males is indicative of a more pronounced anterior surface of female sacrum. The mean difference in the present study was statistically insignificant (Table III).

The third index calculated in the present study i.e. corporobasal index was more in females as compared to the males, which is contrast to the previous studies. To explain this, a closer look at the transverse diameter of body of S1 is needed. It can be seen that difference between male and female values in the present study was 0.21 cm while in the previous studies it ranged between 0.4-0.63 cm i.e. approximately 2-3 times thereby meaning that transverse diameter of body of S1 is comparatively more in the present female sample. Furthermore, the transverse diameter of base of sacrum is much wider in males as compared with females in the present study, approximately 4 times as compared with the sex differences in Varanasi population. Now corporobasal index is directly proportional to transverse diameter of body of S1, and inversely proportional to the transverse diameter of base of sacrum, thus mounting to higher values for the index in females of the present study.

Summary & Conclusions:

Since sacrum is a component of pelvic girdle with functional differences between the two sexes, it itself becomes important for identification of sex in the human skeletal system. In the present study, out of the seven parameters of the sacrum, five parameters yielded significant mean differences between the two sexes. These were Midventral straight length, Midventral curved length, Transverse diameter of base, Antero-posterior diameter of body of S_1 and Breadth of alae ; all being more in the males as compared with females. Amongst the indices the Sacral index yielded significant results, but was more in the females. Thus sex differences in the present study were more in line with the robusticity of the male skeleton. While most of the results were in line with the previous workers, the Breadth of Alae & Corporobasal Index gave contrasting results. The alae were wider in males and the corporobasal index was more in females.

References:

1. **Singh S, Singh SP**. Identification of sex from the humerus. *Ind J Med Res.* 1972; 60: 1061-1066.
2. **Stewart TD**. Hrdlicka's Practical Anthropolometry. 4th Edition. Philadelphia, Wistar Institute of Anatomy and Biology; 1952.p. 127-132.
3. **Davivongs V**. The pelvic girdle of the Australian Aborigine; sex differences and sex determination. *Am J Phys Anthropol.* 1963; 21: 443-56.
4. **Hooton EA**. The Indians of Pecor Pueblo. Yale University Press, New Haven; 1930, Cited by Heyns OS. Sexual Differences in the Pelvis. *S Afr J of Med Sci.* 1947; 12: 17-20.
5. **Patel MM, Gupta BD and Singel TC**. Sexing of Sacrum by Sacral Inex and Kumra's Base-Wing Index. *J Ind Acad Foren Med.* 2005; 27(1): 5-9.
6. **Raju PB, Singh S, Padmanabhan R**. Sex determination and sacrum. *J Anat Soc Ind.* 1980; 30(1): 13-15.
7. **Wilder HH**. A laboratory Manual of Anthropometry. Philadelphia P, Blakistan 1920. Cited by Davivongs V. The pelvic girdle of the Australian Aborigine; sex differences and sex determination. *Am J Phys Anthropol.* 1963; 21: 443-56.
8. **Fawcett E.** The sexing of human sacrum. *J Anat.* 1938; 72: 633.
9. **Mishra SR, Singh PJ, Agrawal AK, Gupta RN**. Identification of sex of sacrum of Agra region. *J Anat Soc Ind.* 2003; 52(2): 132-136.
10. **Francis CC**. Bones of the pelvis: Hipbone. In: The human pelvis. ST Louis: The CV Mosby Company; 1952.p. 13-21.

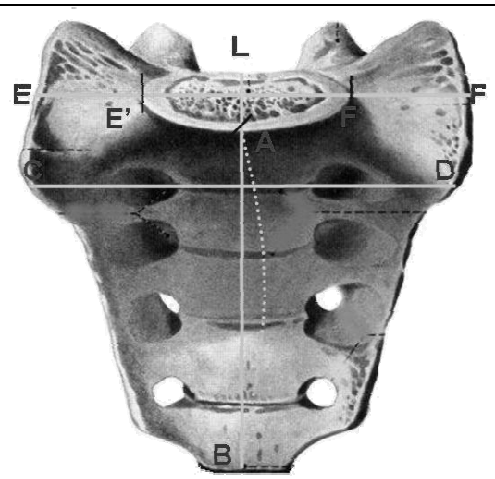


Fig.1

Photograph 1

Table I: Defining Various Sacral Parameters Studied in the Present Study:

Sr. No.	Parameter (cm)	Method	Shown in Fig.1
1.	Midventral Straight Length [2]	The midpoint of the sacral promontory to the middle of anteroinferior border of the fifth sacral vertebra	AB
2.	Midventral Curved Length	Length of the curved median line drawn along ventral surface from the middle of sacral promontory to midpoint of anteroinferior border of 5th sacral vertebra	AB dotted
3.	Ventral Straight breadth [**7**]	Straight distance across the ventral surface of the first sacral vertebra between the widest margins of lateral wings	CD thick line
4.	Transverse Diameter Base	Maximum transverse width of the superior surface of sacrum, comprising the two alae	EF
5.	Transverse Diameter Body S1 [**8**]	Maximum transverse diameter of the articular surface of the body of first sacral vertebra	E'F'
6.	AP Diameter Body S1 [3]	Anteroposterior distance from the midpoint of sacral promontory up to the mid-point on the posterior border of body of S_1	AL
7.	Breadth of Alae	Straight distance of the ala of the sacrum from the transverse diameter of the body of first sacral vertebra	EE' & FF'

Table II: Defining Various Indices of Sacrum Studied in the Present Study

Sr. No.	Index	Calculated As
1.	Sacral Index	$= \frac{\text{Anterior straight breadth of sacrum (Sr. No. 3)}}{\text{Midventral straight length of sacrum (Sr. No. 1)}} \times 100$
2.	Longitudinal curvature index	$= \frac{\text{Midventral straight length of sacrum (Sr. No. 1)}}{\text{Midventral curved length of sacrum (Sr. No. 2)}} \times 100$
3.	Corporobasal index	$= \frac{\text{Corpus width of } S_1 \text{ (Sr. No. 5)}}{\text{Breadth of base of sacrum (upper surface) (Sr. No. 4)}} \times 100$

Table III: Results of Sacral parameters in the present study and their statistical evaluation

Sr. No.	Parameter	Sex	Mean ± S.D.	Range	95% CI	P-value
1.	Midventral Straight Length (cm)	M	10.41+1.26	6.82-13.12	10.01-10.80	0.005*
		F	9.18+0.71	8.31-10.70	8.73-9.62	
2.	Midventral Curved Length(cm)	M	11.35+1.06	9.60-14.10	11.02-11.68	0.013*
		F	10.45+0.62	9.80-11.60	10.07-10.83	
3.	Ventral Straight breadth(cm)	M	10.31+0.78	8.70-11.90	10.07-10.55	0.612
		F	10.17+0.70	9.50-11.80	9.73-10.61	
4.	Transverse Diameter Base(cm)	M	11.18+0.84	9.70-13.60	10.92-11.44	0.015*
		F	10.44+0.78	9.50-11.90	9.95-10.92	
5.	Transverse Diameter Body S1(cm)	M	4.76+0.71	1.40-6.50	4.54-4.99	0.380
		F	4.55+0.48	3.90-5.50	4.26-4.85	
6.	AP Diameter Body S1(cm)	M	3.15+0.41	2.40-4.41	3.02-3.28	0.033*
		F	2.85+0.23	2.60-3.28	2.71-2.99	
7.	Breadth of Alae (cm)	M	3.35+0.37	2.57-4.20	3.24-3.46	<0.001**
		F	3.00+0.43	2.58-4.00	2.74-3.27	
8.	Sacral Index (%)	M	100.24+12.54	78.04-149.56	96.36-104.1	0.016*
		F	111.74+14.6	88.79-140.48	102.65-120.84	
9.	Longitudinal Curvature Index (%)	M	91.59+6.43	71.04-112.26	89.59-93.58	0.101
		F	87.87+5.67	80.43-98.12	84.36-91.38	
10.	Corporobasal Index (%)	M	43.22+4.28	32.87-54.81	41.89-44. 55	0.598
		F	43.84+5.44	32.77-52.38	40.47-47.21	

Abbreviations: CI- Confidence Interval, S.D.-Standard Deviation, St.- Straight,S1- First Sacral Vertebra, p-value- Significance by Students T-Test,*- Significant, **- Highly significant

Table IV: Comparison of Sacral parameters amongst different population groups

Author (Year) *Population*	Davivongs (1963) *Australian Aborigines*		Raju et al (1980) *Varanasi*		Mishra et al (2003) *Agra*		Present Study (2007-09) *North Indians*	
Sex (N)	**M (50)**	**F (50)**	**M (33)**	**F (11)**	**M (74)**	**F (42)**	**M(40)**	**F(10)**
1.Midventral Straight Length (cm)	9.65	8.81	10.50	9.27	10.75	9.06	10.41	9.18
2.Midventral Curved Length(cm)	10.43	9.71	11.28	10.48	11.96	10.95	11.35	10.45
3.Ventral Straight breadth(cm)	9.99	10.12	-	-	10.53	10.58	10.31	10.17
4.Transverse Diameter Base(cm)	-	-	10.53	10.35	-	-	11.18	10.44
5.Transverse Diameter Body S1(cm)	4.74	4.41	4.73	4.21	4.91	4.28	4.76	4.55
6.AP Diameter Body S1(cm)	2.98	2.76	3.03	2.76	3.00	2.93	3.15	2.85
7. Breadth of Alae (cm)	-	-	-	-	2.89	3.17	3.35	3.00
8.Sacral Index (%)	104.16	115.49	100.85	111.39	98.21	117.84	100.24	111.74
9.Longitudinal Curvature Index (%)	92.46	90.80	92.77	88.51	95.72	90.72	91.59	87.87
10.Corporobasal Index (%)	47.42	43.62	44.94	40.96	46.54	40.47	43.42	43.84

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Study of Unnatural Deaths in Females

A Medicolegal Study at Rural Medical College, Loni

*Rajesh C. Dere, **Col. K.M. Rajoo

Abstract

The present study was undertaken in the Department of Forensic Medicine & Toxicology, Rural Medical College, Loni, Ahmednagar, Maharashtra. Aims and objectives to study the incidences of unnatural deaths in females with special reference to "DOWRY DEATHS" in which cases medico legal autopsies was conducted. Data of total 310 cases were collected for this study purpose from police panchnama, post mortem reports and through interrogation of the parents, relatives, friends, neighbors accompanying dead body. Majority of the female deaths were in the age group 26 to 30 years (24.56%) followed by age group 21 to 25 years (21.93%). In majority of the victims burns (50%) was the common cause of death followed by poisoning (17.1%) and vehicular accidents (16.45%). Majority of the married female victims (44.19%) died within seven years of marriage.

Key words: Dowry deaths, Bride burning, Unnatural deaths, Manner of death, Burns, Poisoning, Vehicular accidents

Introduction:

From time immemorial crime against women existed, only pattern varied with time and place. Women always have been at receiving end of male dominated society. Types and trends of crime however, kept changing with change in mind set and techniques. Besides, there also developed situational and institutional violence against women along with the new changing trends of time, where they have to step out of the confines of their homes to earn a living.

Thus, crime against women is an outcome of their long history of deprivation of socioeconomic rights. In recent times there has been a phenomenal spurt in violence and crime against females and this has not only been the concern of the contemporary society but also is present since time immemorial.

Working women were most commonly affected and they have to go through various vital events such as marriage, change of social environment, job responsibility, bearing and rearing children, for which she has to face mental, physical psychological and social stress.

Corresponding Author:

*Associate Professor,
Department of Forensic Medicine & Toxicology,
Lokmanya Tilak Municipal Medical College and General Hospital, Sion Mumbai-400022
**Ex Principal, Professor & Head,
Rural Medical College, Loni Ahmednagar

Among all these evils **"Bride burning"** commonly known as dowry deaths assumes much importance. Constitutionally women were provided special protection under Article 21 and Article 14. Time and again Supreme Court of India extended the ambit of Article 21 and held that mere existence is not the right to live, it is the right to live with dignity. In the present study an attempt was made to find out various causes of unnatural deaths in women with special reference to death within 7 years of marriage.

Material and Methods:

The present study was carried out in the Department of Forensic Medicine & Toxicology, Rural Medical College, Loni Ahmednagar. The retrospective data from Jan 1997 to June 1999 and prospective data from July 1999 to Dec 2001 were collected for this study purpose. This study includes all cases of unnatural deaths in female brought for post mortem at the mortuary of Rural Medical College, Loni. There were total 859 post mortems were conducted during this period out of which 310 cases were of female deaths which constitute about 36% of total deaths.

This study included all dead bodies brought by police stations i.e. Loni, Rahuri, Sangamner, Shirdi, Kopargaon etc. The various epidemiological features and medico legal aspects of cases were collected from police panchnama, post mortem reports and through interrogation of the parents, relatives, friends, neighbors accompanying dead body. In selected cases histopathological, chemical analysis of viscera and skiagrams were taken and

analysed. This study has been evaluated according to age, marriage, literacy, employment, family patterns, manner of deaths, cause of death and socio-economic status.

Observations and Results:

Table No.1: **Distribution of Incidence of unnatural deaths in females**

Year	Total Post Mortems	Total Unnatural deaths in females	Percentage of total deaths (%)
1997	163	71	43.50
1998	208	78	37.50
1999	219	73	33.33
2000	170	53	31.17
2001	99	35	35.35
Total	859	310	36.08

Table No.2: Age and year wise distribution of unnatural deaths in females

Age in years	Year					Total
	1997	1998	1999	2000	2001	
<10	04	05	06	01	03	19 (6.13%)
11-15	05	04	04	04	02	19 (6.13%)
16-20	09	11	11	07	04	42 (13.55%)
21-25	17	16	09	19	07	68 (21.93%)
26-30	17	20	17	10	12	76 (24.53%)
31-35	08	10	10	06	03	37 (11.93%)
36-40	02	02	02	02	01	09 (2.9%)
>40	09	10	14	04	03	40 (12.9%)
Total	71	78	73	53	35	310 (100%)

Table No.3: Age of Marriage distribution

Years since marriage	Year					Total
	1997	1998	1999	2000	2001	
<1	07	10	01	05	07	30 (9.67%)
1-2	09	09	08	04	05	35(11.29%)
2-3	03	02	03	01	02	11 (3.55%)
3-4	01	01	02	00	00	04(1.29%)
4-5	00	01	00	00	01	02 (0.64%)
5-6	02	01	02	02	00	07(2.25%)
6-7	11	12	07	11	07	48(15.48%)
>7	27	27	37	22	08	121(39.03%)
Total	60	63	60	45	30	258 (83.22%)

(In the present study, 52 victims were unmarried)

Table No.4: Year wise distribution of cases according to manner of death

Manner of death	Year					Total
	1997	1998	1999	2000	2001	
Homicide	02	03	01	03	03	12 (3.88%)
Suicide	18	19	17	13	10	77 (24.83%)
Accident	45	50	51	33	17	196 (63.22%)
Undetermined	06	06	04	04	05	25 (8.06%)
Total	71	78	73	53	35	310 (100%)

Discussion:

In the present study total unnatural deaths in female all autopsies conducted during the five years was 36.08% where as in D.S.Bullar et al [1] it was 58.91%. The commonest age group affected was 26-30 years (24.56%) followed by age group 21-25 years (21.93%). In D.S.Bullar et al [1] study majority of victims were from 23-26 years. Average age of incidence was 24.8 years, which was consistent with this study. In the present study majority of females were married 258 (83.22%) as compared to unmarried females 52 (16.78%). In D.S.Bullar [1] et al study married females constitutes 65 (92.86%) and unmarried females constitutes 5 (7.14%). Married young females were the most common victims in most of the studies. Majority of married females died within 7 years of marriage were 137 (44.19%).

In D.S.Bullar et al [1] study it constitutes 52 (74.29%) while in T.D. Dogra [7] study it was 60%. The most common manner of death in the present study was accidental deaths 193 (63.22%) followed by suicidal deaths 77 (24.83%) while homicidal deaths constitute only 12 (3.88%) and undetermined in 25 (8.06%) deaths. Sanjeev Lalwani[5] et al in his study observed vehicular accidents 395(32.6%) followed by hanging 209(17.3%), poisoning 152(12.6%) and burns 123(10.2%).

In Sinha U.S. et al [6] in his study observed majority of dowry deaths in the age group of 23-30 years and most common cause of dowry death was burns followed by poisoning. Nageshkumar S. Rao et al [3] observed in his study fatal burns in females most of the victims belongs to 19 to 25 years of age and most victims died within seven years of their marriage. V.C.S. Verma and Prafulkumar Das [8] in their study observed 130 (80.2%) females death due to burns and most of the victims 118(90.7%) belongs to age group of 16 to 25 years. V.C.S. Verma and Prafulkumar Das [8] also observed in their study that homicidal motives in 45% of cases and suicidal motives in 25% cases and in 30% of cases motives remained undetermined.

K. D. Chavan and R. V. Kachare [2] in their study observed suicidal deaths 164 (88.6%) were most common in married females as compared to 21 (11.4%) unmarried females, the most commonly affected age of females was 19 to 25 years and burns was most common cause suicide 58(31.3%) followed by poisoning 23(12.4%). Virendrakumar [9] in his study observed 70 deaths (46.05%) were accidental in nature followed by homicidal burns 47 (30.92%) and suicidal burns 32 (21.05%), remaining 3 cases (1.97%) nature of death cannot be determined.

P. C. Sahoo [4] in his study noted that most vulnerable group for female suicide is 20 to 29 years and hanging was most common method adopted by married females for committing suicide followed by poisoning. In D.S.Bullar et a l1] study accidental deaths 44 (62.86%), followed by 17 (24.29%) suicidal cases and 9 (12.85%) homicidal cases.

T.D. Dogra [7] in his study observed that suicide was most frequent in about 54% of cases, followed by accidental deaths 40% and homicidal deaths 6%. The highest incidence of accidental death were observed in the age group 21-30 years 92 (46.93%) followed by 11-20 years 36 (18.36%) and 31-40 years 28 (14.28%).

Suggestions and Recommendations:

A) Social and economic measures:

1) Public opinion against this grave malady in the society through various agencies should be mobilized through various agencies like media coverage and NGO's.
2) An effective coordination should be sought between the non-government, voluntary and law enforcing agencies to prevent and contour crime against women.
3) Costly and ostentatious marriage rituals should be discouraged with an economical ban on such marriages.
4) Safety precautions to be adopted to prevent domestic accidents should be given to the families through government and non government agencies.
5) Promoting literacy among the women to make them economically independent and free by providing job opportunities.

B) Legal measures:

1. Enact more stringent laws taking care of the torture of housewives by their husbands and In-laws.
2. Inquest by a magistrate or a senior police officer should be made in all cases of females deaths especially of burns cases and the existing laws to be strictly adhere to.
3. Doctor should arrange/record dying declaration in dowry deaths cases particularly when he is of the opinion that the life was fast ebbing out of dying women and there was no time to call the magistrate, enacted in section 32 (1) of Evidence Act.
4. Visit to the crime scene should be made compulsory to the autopsy surgeon along with the expert in Forensic Science with a well-equipped team.
5. Strengthening of Mahila Courts.
6. Women protection cell working in the State should be given to deal with deaths resulting from burns with adequate and sufficient facilities.
7. There should be transparency and accountability in the Judicial system.
8. Early marriage should be discouraged and punitive measures to be strictly implemented in case of default.

References:

1. **D.S. Bhullar**: Profile of unnatural female deaths between 18-30 years of age, JFMT, Vol. XIII, No-3 & 4 1997, 5-8.
2. **K D Chavan and R V Kachare:** Study of suicidal deaths, International Journal of Medical Toxicology and Legal Medicne, Vol.1 No.2, Jan –June 1999, 29-31.
3. **Nageshkumar Rao**: Study of fatal female burns in Manipal, JFMT, Vol. XIV No.2, Dec 1997, 57-59.
4. **P C Sahoo:** Trends in suicide-A study in M.K.C.G. Medical College PM center, JFMT, Vol.16 No.1, Jan-June 1999, 34-35.
5. **Sanjeev Lalwani**: Profile of unnatural deaths of females at AIIMS- A retrospective review, FORENSICON 2001, 49.
6. **Sinha U. S.**: Crime against women with special reference to dowry deaths, FORENSICON 1999, 10.
7. **T.D. Dogra:** Suicide in south Delhi 1974-1993- The choice of method, Indian Medical Gazette, November 1996, 364-368.
8. **V C S Verma and Prafulkumar Das**: Burns and its medico-legal aspect, IAFM, Jan 1990, 7-9.
9. **Virendrakumar**: Burnt wives- a sociology study, International Journal of Medical Toxicology and Legal Medicine, Vol.2 No.1, July-Dec 1999, 27-33.

Table No-5: Age wise distribution of unnatural deaths in female in relation to the causative agents

Causative agents	Age in years								Total
	<10	11-15	16-20	21-25	26-30	31-35	36-40	>40	
Burns	08 (5.16%)	08 (5.16%)	25 (16.13%)	43 (27.75%)	42 (27.09%)	14 (9.03%)	07 (4.51%)	09 (5.80%)	155 (50%)
Poison	02 (3.79%)	07 (13.22%)	11 (20.75%)	10 (18.87%)	12 (22.65%)	06 (11.38%)	00	05 (9.44%)	53 (17.1%)
Vehicular accident	07 (13.74%)	02 (3.94%)	00	06 (11.76%)	06 (11.78%)	09 (17.65%)	00	21 (41.40%)	51 (16.45%)
Drowning	00	02 (16.66%)	02 (16.66%)	04 (33.34%)	03 (25.0%)	01 (8.33%)	00	00	12 (3.87%)
Hanging	00	00	02 (100%)	00	00	00	00	00	02 (0.65%)
Homicidal injuries	00	00	02 (16.66%)	04 (33.34%)	02 (16.66%)	02 (16.66%)	02 (16.66%)	00	12 (3.87%)
Others	02 (8.0%)	00	00	02 (8.0%)	11 (44.0%)	05 (20.0%)	00	05 (20.0%)	25 (8.06%)
Total	19 (6.13%)	19 (6.13%)	42 (13.5%)	68 (21.9%)	76 (24.5%)	37 (11.9%)	09 (2.9%)	40 (12.9%)	310 (100%)

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

A Descriptive One Year Study on the Alleged Male and Female Victims and Accused of Sex Crimes

*Kalpasree Bhowmik, **Rituraj Chaliha

Abstract

This study was based on the cases of alleged male and female victims and accused of sex crimes reporting to Gauhati Medical College mainly from the Kamrup districts and other nearby areas. The city of Guwahati is facing rise in crime incidences and the sex crime cases. The cases reported varied: abduction and kidnapping, rape, immoral trafficking, prostitution, unnatural sexual offences, child molestation, outraging the modesty of a woman, allegation of a man masturbating on a victim girl etc. The burden of such crimes on the society is huge. Many victims suffer from psychiatric problems as a result of sexual assault. The venereal diseases are another horrible consequence along with unwanted pregnancies.

Moreover, many of these crimes are never reported. Sexual assaults on male are also under reported. The need for a new law on sexual assault is felt as the present law does not define and reflect the various kinds of sexual assault that women and children are subjected to in our country. This study tried to analyze the present scenario in relation to the age groups, occupation, relationship of the victims and accused and physical findings

Key words: Male Victims, Female Victims, Accused, Sex Crimes, Sexual Assaults

Introduction:

Ever since the ancient times, rape and other sexual offences were considered to be heinous crimes. Rape has been described as 'not an act of sex, but an act of violence with sex as the primary weapon'. [9]

The newspapers are flooded with the news of woman being raped and molested in the country. No woman is immune to this. Even males and the children are victims of the sexual offences. The incidence of woman and the minor being sold for prostitution are increasing in number in Assam. Cases are reported of minor girls from the teagardens and the remote areas of Assam are being 'sold off' and trafficked to other states for prostitution.

Girls are enticed to sex with the false assurance of marriage. Police even rescued little girls of Assam from the China border of Arunachal Pradesh, who were about to be smuggled beyond the borders.

Corresponding Author:

*Post Graduate Trainee,
Department of Forensic Medicine & Toxicology, Gauhati Medical College,
Narakasur hill top (College building, 5th floor),
Bhangagarh, Guwahati, Assam PIN- 781032
E mail: kalpasree@yahoo.com
**Prof and Head

Girls of Assam, being sold to Haryana for marriage, as the latter state is having low number of females, are not unheard of. This ancient city of Guwahati is developing fast and is rightly termed as the 'Gateway to North-east India'. Assam is hemmed by the neighbouring states of Meghalaya, Arunachal Pradesh, Mizoram, Sikkim, Tripura, Nagaland, Manipur and Bengal. Guwahati, being strategically located in this transit route, encounters floating population.

The discotheques and bars, from where girls are often brought by the Police with the allegation of captivation of females to work as prostitutes and 'call-girls', are increasing in number. Woman has always occupied a higher position in the north-eastern states, particularly amongst certain ethnic groups. The increasing crime scenario of sexual assaults has proved to be a hazard to woman's freedom and a menace for the law enforcement agencies.

Many victims suffer from psychiatric problems as a consequence of sexual assault. Rape is a trauma that gives rise to one of the highest rates of any traumatic event, approximately 70%. [5] Sexual assault is associated with an increased life time rate of attempted suicide. [5] The venereal diseases are another horrible consequence along with unwanted pregnancies. Men are also in the same time subjected to sexual assaults. Incident

reports and prevalent research conducted in the United States indicate that men may be at a greater risk from sexual victimization than previously realized. [9]

Aims and objectives:

1. To know the number, trend and distribution of sex crime cases (both male victims and accused and female victims) reporting to this institute.
2. To know the relationship of the victims and accused.
3. To know the age group commonly involved and some relevant physical findings.

Materials and Methods:

This study was conducted in the Department of Forensic Medicine of Gauhati Medical College, Guwahati of Assam.

It was based on the cases of alleged male and female victims and accused of sex crimes reporting to Gauhati Medical College mainly from the Kamrup districts and other nearby areas. Only living cases were included in the study group. It was conducted in the time period from 1st August, 2009 to 31st July, 2010.

The data was collected from the police forwarding letter, history revealed by the cases, physical examination findings, dental data and radiological investigations. Amongst the female victims, sixty two females refused examinations.

They were not included in the examination findings, investigations and relationship between the victims and accused. One female did not report back for physical examination and was not included in the physical examination findings.

- **Age estimation**: We estimated the age based on the following methods:

1. Radiological investigations included conventional radiographs for age estimation from the ossification of the epiphyses. In Assam Galstaun's chart for Bengalees is in use.
2. Physical development
3. Dental examination
4. The cases (20 female cases) which did not turn up for radiographs, the age estimation were based on dental and physical examination.
5. In case of refusal for examination, the age noted in the police forwarding was recorded. 304 female victims were considered here as 62 females refused examination and one female did not report back for examination.

- Ultrasound investigations of lower abdomen were advised for determination of pregnancy.
- Informed written consent was taken from the cases examined. In cases of victims being underage, consent was taken from the guardian. Female attendants were present in the examination of female victims and male attendant was present in the male cases and their signature was taken.

Observations:

The total number of cases reported was 378. The numbers of female victims were 367 (97.08%) and the male cases reported were 11 (2.91%) in number. The accused, all males, were 7 (1.85%) in number. The male victims were 4 (1.06%) in number.

Chart 1: Sex-wise distribution of cases

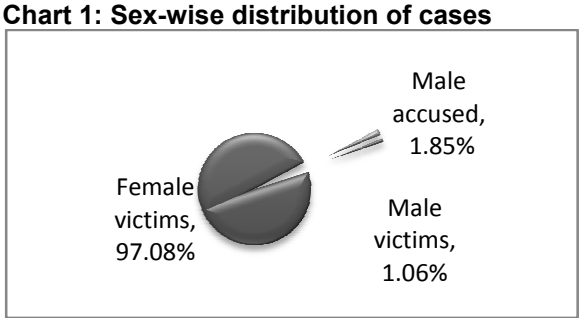
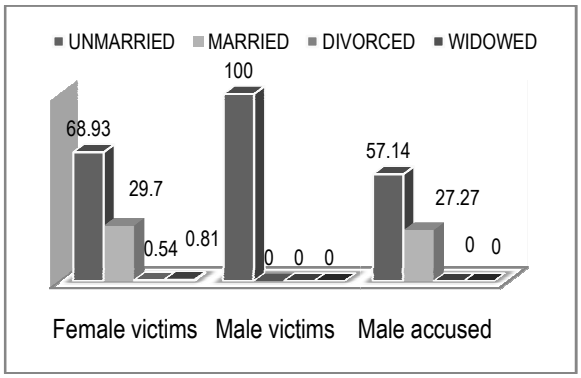
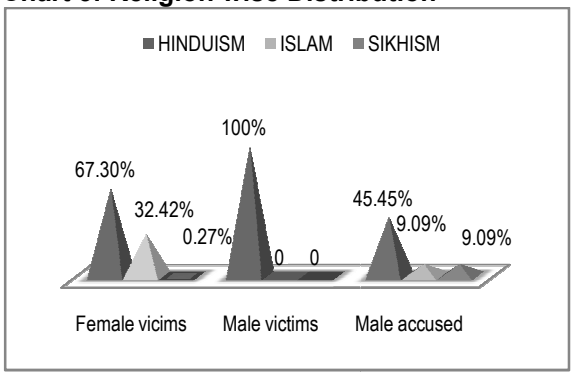


Chart 2: Marital status of the cases



Unmarried female victims cases outnumbered married (29.75%), divorced (0.54%) or widowed (0.81 %) female victims. All the male victims were unmarried (100%). Male accused were mostly unmarried (57.14%) and 27.27% were married.

Chart 3: Religion wise Distribution



Cases reported from Hindu, Muslim and Sikh community. Most of the female victims (67.3%) were Hindus followed closely by Muslims (32.42%) and Sikhs (0.27%) were lowest in number. All the male victims were Hindus. Male accused were 45.45% Hindus, Muslims and Sikhs each were 9.09%.

Table 1a: Age groups of the female victims

Age gps (yrs)	No. of cases	%age
0 - 12	27	7.35
12 -14	15	4.08
14 -16	88	23.9
16 -18	51	13.9
18 -20	95	25.88
>20	91	24.8
Total	367	100

Table 1b: Age groups of male victims & accused

Age groups (yrs)	**Number of cases**	
	Male accused **(%)**	Male victims **(%)**
0 -12	00 (0%)	**02** (50%)
12 -14	00 (0%)	**02**(50%)
14 – 16	00 (0%)	00 (0%)
16- 18	01 (14.29%)	00 (0%)
18 -20	00(0%)	00 (0%)
>20	**06** (85.71%)	00 (0%)
Total	07 (100%)	04 (100%)

The female victims who were below sixteen years of age were 130 (35.42%) All the male victims were below fourteen years of age. One male accused was below 18 years and other six were adults. The lowest age of the female victim was 1 year and that of male victim is of 8 years. The maximum age amongst the male accused was 65 years.

Table 2: Occupation of the female victims

Occupation	**cases (%)**
Students	193 (**52.6)**
Unemployed	64(17.43)
Domestic help / manual labour/ factory worker/ weaver /cook	56(15.25)
House wives	24(6.53)
Prostitutes	09(2.45)
Did not start school	02(**0.54)**
Others (beautician, teacher, sales executive, singer, shop keeper, self employed business woman, social worker, fortune teller)	19(5.17)
Total	367 (100%)

Table 3: Occupation of the male cases

Occupation	**Male victims (%)**	**Male accused (%)**
Student	**03 (75%)**	00(0%)
Tailor	01 (25%)	00(0%)
Factory worker	00 (0%)	01(14.29%)
Shopkeeper	00 (0%)	01(14.29%)
Unemployed	00(0%)	**03(42.85%)**
Assistant of a truck driver	00(0%)	01(14.29%)
Manual labour	00(0%)	01(14.29%)
Total	04(100%)	07(100%)

The majority of the victims (both male and female) were students and the accused were mostly unemployed.

Most of the cases (36.78%) were registered under S.366 (A) Indian Penal Code (IPC), followed by S.376 IPC .Total numbers of rape cases were 99 (26.97%). The cases were registered mostly under any of these along with other statutes of law–S.376 IPC, S. 376 2(f) IPC, S. 376B IPC, S. 364 (A) IPC, S.365IPC, S. 366 (A) IPC S.372 TPC, S.493 IPC, S.294 IPC, S. 490 IPC, S. 420 IPC, S. 387 IPC , S.354 IPC and Immoral Traffic (Prevention) Act,1956 (ITP). One female victim was registered under S. 302/201 IPC. One hundred and twenty four cases were registered under more than one statute of law. Forwarding letter (from the legal authority) of twenty nine cases did not mention any statutes of law and of these were General Diary Entry (G.DE.).

Two cases (a divorcee and a widow) were reported to have been sold to Haryana for the purpose of marriage. All the alleged male victims' cases were reported with the history of being forcefully subjected to act as a passive agent of anal intercourse. Three alleged male accused were each under S. 376 IPC, S. 377 IPC and S. 4/5 Immoral Traffic Prevention Act and two were under S. 366(A) IPC. Two male accused (one accused of committing rape and another with sodomy) were General Diary Entry. The cases were registered under more than 50 sections of the Indian law. (Table 4)

Table 5: Relationship of female victims & accused

Relationship	**cases**	**(%)**
Male friend	**169**	**55.4**
Strangers	49	16.06
Neighbours	26	8.52
Father / step- father	03	0.98
Family members and relatives	20	6.55
Employer / business partners	09	2.95
Servants	02	0.65
Others (security guard, tenants, casual acquaintance, teacher, newspaper agent, & shop keeper)	27	8.85
Total	305	100%

Table 6: Relationship of male victims and accused

Relationship	**cases**	**(%)**
Friend	01	9.09
Casual acquaintance	03	27.27
Employer	01	9.09
Neighbours	**05**	**45.45**
Not known	01	9.09
Total	11	100%

62 females refused examination and so history of relationship with the accused could not be elicited. It was observed that most of the female victims (55.4%) had their male friend as the alleged accused; whereas in cases of male, the alleged accused were neighbours (45.45%) of the victims. One male accused refused to give history.

Table 7: Injuries

Injuries	Female victims (%)	Male victims (%)	Male Accused (%)
Body	17 (5.6%)	**02(50%)**	01(14.28%)
Genitalia	16(5.26%)	00(0%)	00(0%)
Anal region	00(0%)	**02(50%)**	00(0%)
Both body & genitalia /anus	02(6.06%)	**02 (50%)**	01 (14.28%)

Injuries were present in thirty eight cases, either in genitalia or body or anus or in multiple parts of the body. The injuries were either abrasions or bruises and in some cases, bite marks were noted. Bleeding from hymen as well as abrasion or contusion of vagina was also noted in some female victims.

Anal injuries were not seen amongst the female victims. Of these 33 female victims with injuries, two female victims (6.06%) had injuries both on the body and genitalia.

Males did not have any injuries on the genitalia. All the male victims (100%) had injuries and 50% had injuries of anal margins. 50% of the male victims had injuries both on the body and anus. Other types of injuries were not found.

Table 8: Hymenal tears

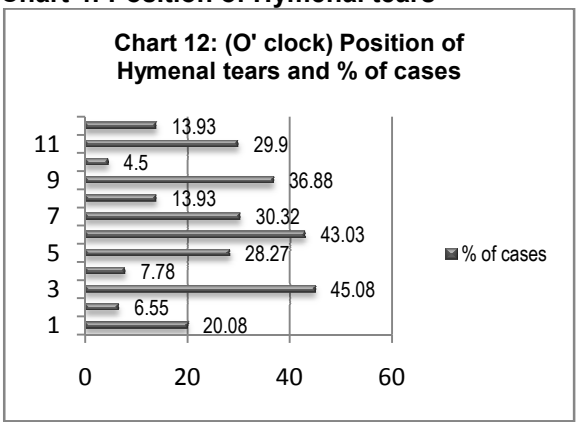
Hymen and its tears	**cases**	**(%)**
Intact	27	8.88
Recent	06	1.97
Old	**238**	**78.28**
Carunculae myrtiformes	33	10.85
Total	304	100%

Hymenal tears were found in 277 (91.18%) females. Recent tears were seen only in six cases. About 90% cases had old Hymenal tears, including carunculae myrtiformes.

The hymenal tears were studied amongst the 244 cases which had recent, old tears and carunculae myrtiformes. Cases with intact hymen and those cases (63) not examined were excluded. Hymenal tears were found maximum in 3 O'clock positions (45.08%) followed by 6 O'clock positions (43.03%).

Pregnancy was present in twenty cases and one case had signs of recent delivery.

Chart 4: Position of Hymenal tears



Discussion:

The cases of sex related crimes are increasing in number. In 2007, the ministry of Women and Child development published the 'Study on Child Abuse: India 2007' which sampled 15000 children and minors across 13 states.53% children reported having faced sexual abuse. Among them 53% were boys and 47% girls. Andhra Pradesh, Assam, Bihar and Delhi reported the highest percentage of sexual abuse among both boys and girls, as well as the highest incidence of sexual assaults. [1] In Assam, during the period from April 2009 to September 2009, the police have registered cases of rape stands at 979. [2]

The figures released by the National Crime Records Bureau (NCRB) of the Home Ministry on 20th January, 2011 showed Delhi to be the country's rape capital . Experts say that the highest numbers of rape cases in India are Incest rape cases although they are often not reported. As per the NCRB, Madhya Pradesh has earned the dubious distinction of 'Rape state', with 2,998 rape cases and Chattishgarh reported the highest number of incest rapes, 107 cases. [3]

Although pedophilic offenders are almost exclusively male, the victims of such offences may be of either sex. In general, more female than male children are involved in sexual offences, though the ratio of females to males varies markedly from study to study (Landis, 1956; Revitch and Weiss, 1962; Kozol *et al*., 1966; De Francis, 1969; Jaffe *et al*., 1975; Finkelhor, 1979). Offences against girls elicit more protective reactions (Howells 1980), possibly resulting in offences against girls being pursued more vigorously within the judicial system. Such biases may produce artifactual differences between heterosexual and homosexual offenders in research samples. This should be borne in mind when evaluating the heterosexual / homosexual differences reported. A substantial proportion of pedophilic incidents are not reported to the police or other authorities. [4]

In our study, male (victims and accused) cases accounted for approximately 3% of the cases. The vast majority of the cases were all alleged female victims. Female victims below 12 years of age, were 7.35% and male victims below 12 years of age, were 50%. All the accused were male.

In incest crimes the situation is usually a sexual act between father and daughter and the victim of the crime is usually a child or a minor. [4] James Klipatrick found that 38% of the rapes

were perpetrated by other relatives. [5] In our study, only 6.55% of the female victims held family members and relatives as the alleged accused. Father / step -fathers were accused in 0.98% cases.

The term 'Date rape / Acquaintance rape' is applied to the situations, in which rapist is known to the victim [5], or rape or nonconsensual sexual activity between people who know each other socially as friends, acquaintances, people on a date or even people in an existing romantic relationship. [13] If the accused is a loved one, many victims are reluctant to label rape. [5] In the study by Roy Chowdhury, Bose and Prasad, the 80 % accused were all known to the female victims [6]. James Klipatrick found that husbands and boyfriends were responsible for 19% cases and 22% of the rapes were perpetrated by strangers. [5] Gittelson *et al*. who interviewed female nurses, who had been victims of indecent exposure, found prior acquaintances only in 15% of such cases. [4]

In our study, we observed that the most of the alleged accused (55.4%) was male friend of the female victim. In our study strangers accounted for 16.06% of the accused in cases of female victims.

It has been proved that in pedophilic crimes the victim and the offender have in the majority of cases been acquainted with each other even before the crime (Brant ant Tisza, 1977). [4] In our study, we also observed that the accused in cases of male victims were all known to the victims even before the crime. Almost half of all the victims of violence are under 25 years of age. [5] In the study by Roy Chowdhury, Bose and Prasad, it was observed that 37.5% of the female victims belonged to the age group of 16-20 years. [6]

In a study by Tailor, Govekar, Patel and Silajiya, it was observed that majority (71.6%) female victims were in the age group of 14-17 years. [7] In a study done by Sharma, Aggarwal and Bhullar, it was observed that, the incidence of alleged rape is most amongst girls of 15-18 years. [8] Sukul, Chattopadhyay and Bose observed in their study of the victims of natural sexual offences that most of the victims (45.97%) were in the age group of 18-30 years. [15]

In our study about one quarter of the female victims (25.88%) were in the age group of 18-20 years but followed closely by twenty years and beyond age group (24.8%) and 14-16 years age group (23.9%).The male victims were 100% below 14 years of age. Tailor, Govekar, Patel and Silajiya in their study, observed that almost one quarter (23.4%) of victims were students. [7] In context to the Immoral Traffic (Prevention) Act, 1956, (ITP), the term "prostitution" means the sexual exploitation or abuse of persons for commercial purpose and the expression "prostitute" shall be construed accordingly. [14] Such persons, as per the S.15 (5A) of the ITP Act, 1956, shall be examined by a registered medical practitioner for the purposes of determination of the age, injuries as a result of sexual abuse or for the presence of any sexually transmitted diseases. [14] In our study, we observed that three quarter of the male (75%) and more than half of the female victims (52.6%) were students. In our study, 2.45% cases admitted to prostitution while others registered under ITP Act denied prostitution. Roy Chowdhury, Bose and Prasad in their study, observed that unmarried women were greatly involved [6]. In a study done by Sharma, Aggarwal and Bhullar, it was also observed that, the incidence of alleged rape is more amongst unmarried girls. [8] Sukul, Chattopadhyay and Bose observed that 77% victims were unmarried. [15] Similarly we also found in that the unmarried females accounted for most of the cases (66.93%) of the cases.

Roy Chowdhury, Bose and Prasad in their study, observed that Hindu victims outnumbered Muslims. This can be explained by the Hindu predominating areas which were under study. [6] We also observed 67.72% of the female victims were Hindus. This can be explained similarly.

In United States, the majority of rape laws are gender blind, allowing the inclusion of male victims. .The sexual assault of adult men outside the prison setting is rarely reported in the media and has surfaced only in the literature. Indian law does not recognize male rape. Therefore sexual assault of a boy is considered not as a rape but as an unnatural sexual act, by the Indian law. [9]

The most common act in 'male rape' is anal penetration of the victim, second is forcing the victim to perform fellatio. [5] In our study, 100% of the male victims reported with the history of alleged act of anal penetration. They were not habitual passive agents and reported the crime on first act. The male victims gave the history that they were lured away by the accused with a chocolate or money.

As a result of sexual intercourse, tears are present posteriorly usually at 5 and 7 'O' clock positions. At time this tears may be present in the middle line. [13] In this study, the alleged female victims had hymenal tears mostly in the position of 3 'O' clock positions (45.08 %)

followed closely by 6 'O' clock positions (43.03%).

In deflorated women, even without childbirth hymen is completely destroyed and complete penetration can occur without any evidence except semen. In young children, there are few signs of general violence, for the child usually has no idea and incapable of resistance. As such, hymen is usually intact as it is deeply situated. [10] Sukul, Chattopadhyay and Bose observed in their study that 86.20% of their cases had old tears of the hymen and 6.90% cases had recent tears and 6.90% had intact hymen. [15]

In our study, 8.88% cases had intact hymen. About 90% of the victims had old tears of the hymen, including carunculae myrtiformes. 1.97% cases had recent tears of the hymen. Approximately one third of the sexual assault victims suffer some form of injuries. The physicians treat the injuries symptomatically and fail to treat the injuries as abuse. [5] In women who are used to sexual intercourse, injuries from rape usually disappear or become obscured by 3 or 4 days. If there is much violence, the signs may persist. [10]

In relation to Section 366A IPC, and rape, in the case of *Satendra Kumar Singh Kushwaha Appelant v.The State of Bihar*, the Patna High Court opined that the non-appearance of the signs of rape on body of prosecutrix was immaterial since she was examined after considerable time of the incident. [16] In our study, we observed that the 50% of the male victims had injuries on their body and 50% had anal injuries. 5.26% of the female victims had genitalia injuries and 5.6% had injuries on the body. The victims often report late for medical examination, so injuries and other vital findings disappear in many cases.

The sex crimes may be related to other crimes. Menachem Amir (1971) in a study of 646 police reports of rape in Philadelphia estimated that 71% of these rapes were planned, 11% was partially planned and only 16% appeared to be "explosive" events. The *felony rapes* suggest an unplanned crime but one that is largely due to rational and opportunistic motives rather than irrational compulsions. [12] In our study 32.8% of the cases were under multiple statutes of law and cases were registered under more than 50 different sections of the Indian law.

Conclusion:

In our day to day duties we encounter a large number of cases with the allegation of the sex related crimes. Interestingly, a good number of female victims gave the history that they had voluntary sexual intercourse with their boyfriends and eloped with these males to get married. The cases were filed by their parents or guardians who did not approve to this relationship and subsequently filed lawsuits against these males. Tailor, Govekar, Patel and Silajiya in their study, observed that 83.7% cases had sexual intercourse with mutual consent. [7]

Simultaneously, the question arises how authentic are these allegations. These false cases are not only an un-necessary burden to the legal machinery but also cause defamation and false criminal charges against an innocent man. This is another part of this spectrum. Of course, there are also true rape cases and cases where girls are enticed to marriage by man under a false name and religion or are given false assurance of marriage. Sukul, Chattopadhyay and Bose observed in their study that most of the cases had consented act of intercourse over a period of time followed by refusal to marry and leading to lodging of complaint. [15]

The society needs to change. The children should be reared with strong moral values and it should be taught to these innocent minds that the dignity of a woman is to be respected. Sex education has become necessary at the school level, so that an inquisitive mind of a child does not grow with the wrong notions about the other gender and the process of procreation. All the educational institutions and work places should come up with counseling programme and help desk for such crimes in their premises. Multidisciplinary approach encompassing emotional, medical and forensic care is required in such cases. [5]

Moreover, many of these crimes are never reported. Sexual assault on male is an under reported crime. [5] The need for a new law on sexual assault is felt as the present law does not define and reflect the various kinds of sexual assault that women and children are subjected to in our country. Even men are not spared and women may not be always innocent. A new law is required which is broad spectrum in all its aspects.

References:

1. **Pillay V V.** Textbook of Forensic Medicine and Toxicology. 15th Edition. Hyderabad: Paras medical Publisher; 2010.p378.
2. **The Assam Tribune**, 14th January, 2010 (Editorial)
3. **The Times of India**, 21st January, 2011, p 3.
4. **Cook M**, **Howells K.** Adult Sexual Interest in Children. London: Academic Press Inc.; 1981.p83, 84, 87,127,128.
5. **Sadock B J and Sadock V A.** Kaplan and Sadock's Comprehensive Textbook of Psychiatry.7th edition. Philadelphia: Lippincott Williams and Wilkins; 2000.p2002-2008.
6. **Roy Chowdhury U B, Bose T K and Prasad R.** Rape: Its medico-legal and social aspect. J Indian Acad Forensic Med. 2008; 30(2); 69-71.

7. **Tailor C, Govekar G, Patel G and Silajiya D.** The Profile of Age in Cases of Victims of Sexual Offence. J Indian Acad Forensic Med .2010; 32(4); 303-307.
8. **Sharma D C, Aggarwal K K and Bhullar D S.** Analysis of vaginal swab examination vis-à-vis magnitude of rape in Punjab. J Indian Acad Forensic Med. 2008; 30(4); 186-192.
9. **Mathiharan K and Patnaik A K.** Modi's Medical Jurisprudence and Toxicology.23rd edition. New Delhi: Lexis Nexis; 2006.p894-964.
10. **Reddy K S N**. The Essentials of Forensic Medicine and Toxicology. Twenty Eighth Ed. Hyderabad: K. Suguna Devi; 2010.p 363-370.
11. **Maitra N.** Criminal Major Acts (Criminal manuals).Mumbai: Current Publications; 2010.p379-652.
12. **R Julia, Schwerdinger H.** Rape and Inequality. Vol 148.USA: Sage Publications; p46.
13. **Dikshit P C**. Textbook of Forensic Medicine and Toxicology. New Delhi: PEEPEE; 2007.p339, 384.
14. **Immoral Traffic (Prevention) Act, 1956. BARE ACT**. Delhi: Professional Book Publishers; 2009.
15. **Sukul B, Chattopadhyay S and Bose T K**. A Study of the Victims of Natural Sexual Offence in the Bankura District in West Bengal. J Indian Acad Forensic Med .2009; 31(1); 25-29.
16. **Cr L.J.**2003; Part 1; 392. Nagpur: All India Reporters.

Table 4: Statutes of law under which cases are registered

Statutes of law	Deals with: [11] [14]	cases	(%)
S. 376 IPC	Punishment for rape	84	22.88
S. 376 2(f) IPC	Whoever commits rape on a woman when she is under 12 years of age	14	3.81
S. 376B IPC	Intercourse by public servant with woman in his custody	01	0.26
S.361 IPC	Kidnapping from lawful guardianship	01	0.26
S.363 IPC	Punishment for kidnapping	01	0.26
S.364 (A) IPC	Kidnapping for ransom, etc.	01	0.26
S.365 IPC	Kidnapping or abducting with intent secretly and wrongfully to confine person	07	1.85
S.366 IPC	Kidnapping, abducting or inducing woman to compel her marriage, etc.	71	19.34
S.366 (A)IPC	Procuration of minor girl for the purpose of illicit sexual intercourse	**135**	**36.78**
S. 377 IPC	Unnatural sexual offences	05	1.32
S.493 IPC	Cohabitation caused by a man deceitfully inducing a belief of lawful marriage	28	7.40
S.294 IPC	Obscene acts and songs	04	1.05
Imm.3/4/5/7 (b) ITP	Punishment for keeping brothel or allowing premises to be used as a brothel / punishment for living on the earnings of prostitution / Procuring, inducing or taking [person]for the sake of prostitution/ prostitution in or vicinity of public places.	16	4.23
5/8 ITP	Procuring, inducing or taking [person]for the sake of prostitution / seducing or soliciting for the purpose of prostitution	02	0.52
S.14 ITP	Offences to be cognizable	01	0.26
S.34 IPC	Acts done by several persons in furtherance of common intention	42	
S. 372 IPC	Selling minor for purposes of prostitution	03	0.79
S.354 IPC	Assault or criminal force to woman with intent to outrage her modesty	04	1.05
S.323 IPC	Punishment for voluntarily causing hurt	05	1.32
S.468 IPC	Forgery for purpose of cheating	01	0.26
S.420 IPC	Cheating or dishonestly inducing delivery of property	13	3.49
S.511 IPC	Punishment for attempting to commit offences punishable with imprisonment for life or other imprisonment	07	1.85
S.387 IPC	Putting person in fear of death or of grievous hurt, in order to commit extortion	01	0.26
S.342 IPC	Punishment for wrongful confinement	05	1.32
S.120(B) IPC	Punishment of criminal conspiracy	05	1.32
S.325 IPC	Punishment for voluntarily causing grievous hurt	02	0.52
S.341 IPC	Punishment for wrongful restraint	01	0.26
S.307 IPC	Attempt to murder	03	0.79
S.406 IPC	Punishment for criminal breach of trust	04	1.05
S. 447IPC	Punishment for criminal trespass	05	1.32
S.419 IPC	Punishment for cheating by personation	04	1.05
S.353 IPC	Assault or criminal force to deter public servant from discharge of his duty	03	0.79
S. 317 IPC	Exposure and abandonment of child under twelve years, by parent or person having care of it	03	0.79
S.147 IPC	Punishment for rioting	02	0.52
S.143 IPC	Punishment for being member of unlawful assembly	01	0.26
S.417 IPC	Punishment for cheating	05	1.32
S.114 IPC	Abettor present when offence is committed	01	0.26
S.340 IPC	Wrongful confinement	01	0.26
S.302 IPC	Punishment for murder	01	0.26
S.201 IPC	Causing disappearance of evidence of offence, or giving false information to screen offender	02	0.52
S.379 IPC	Punishment for theft punishment for attempting to commit offences	05	1.32
S.511 IPC	Punishment for attempting to commit offences punishable with imprisonment for life or other imprisonment	01	0.26
S.134 IPC	Abetment of such assault, if such assault is committed	01	0.26
S.314 IPC	Death caused by act done with intent to cause miscarriage	01	0.26
S.312 IPC	Causing miscarriage	01	0.26
S.42 IPC	Local law	01	0.26
S.25 IPC	Fraudulently	01	0.26
S.148 IPC	Rioting, armed with deadly weapon	01	0.26
S.417 IPC	Punishment for cheating	02	0.52
S. 313 IPC	Causing miscarriage without woman's consent	02	0.52
S. 490 IPC	Counterfeiting currency-notes or bank notes	01	0.26
S.506 IPC	Punishment for criminal intimidation	27	7.14

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Age at menarche and affecting Bio-Social factors among the girls of Lucknow, Uttar Pradesh

*Tabassum Khatoon, **Anoop Kumar Verma, ***Reema Kumari, ****Raja Rupani *****Mousami Singh, ******Andleeb Rizvi

Abstract

The age at which first menstrual bleeding occurs in female, i.e menarche is viewed as an excellent physiological marker of adolescent maturation. The aim of this study is to determine the mean age at menarche among adolescent girls and to assess the influence of some Bio-social parameters affecting it.This study was conducted among 150 adolescent girls in the age group of 10 to 19 years, randomly selected from urban & rural government schools of Lucknow. 75 girls from each school were selected from November 2009 to March 2010. This was a cross sectional descriptive study. Girls were studied about their socioeconomic status, weight, height, place of residence. Out of 150 cases studied 108 cases were having menstruation, most frequent age of menarche being 13 years when 32 cases (29.63%) had its onset. The lowest age was 8 years and highest was 15 year. Mean age at menarche was found to be 12.43 ± 1.49. There seems to be definite association of various factors which modify the age at menarche like socio-economic status, body mass index, place of residence.

Key Words: Mean age at menarche, Body mass index, Menarche, Socio-economic status

Introduction:

Menarche is an important milestone in the development of female adolescent unlike other pubertal changes that are gradual & continuous, menarche is a distinct event with a sudden and dramatic onset. It is considered a distinct benchmark for sexual maturation. It is also considered as an indicator of quality of life of a population since a number of biological & socio-economic factors influence Prado et al (1995). [1]

Variation in the timing of puberty (onset/timing of menarche) are marked between well of and under privileged population with a marked delay in menarche reported in under privileged girls Thomas F et al (2001). [2] These data highlight the role of socioeconomic and nutritional condition in the timing of puberty .Similarly climate also has some influence on menarche, the onset of menstruation is earlier in hot climate and delayed in cold climate, Sushila Tiwari (1962). [3]

Corresponding Author:

*Junior Resident, Forensic Medicine & Toxicology CSMMU, Lucknow, U.P.
Email: drtabassum14@gmail.com
****Guest lecturer
*****Lecturer
**Associate Professor
***Associate Professor SPM
******Junior Resident, SPM

A world wide phenomenon of secular trend of advancing age at menarche is reported by Low et al (1982). [4] General improvements in Nutrition and health have been suggested to explain the downward trend Wyshak G (1982), [5] Chowdhury S (2000). [6] Association between nutritional status & onset of menarche has been well documental Chowdhury S (2000), [6] Osteria TS (1983). [7] In general adolescent who are taller and heavier with a greater body fat mass tend to reach menarche at younger age Chowdhury S (2000), [6] Osteria TS (1983). [7]

Frisch and Revelle (1970), [8] suggested that age at menarche might be related to attainment of appropriate weight for reproduction rather than appropriate skeletal status. The observations associated are that obesity advanced menarche, Simmons and Greulich (1943) [9] and under nourishment delayed menarche Frisch (1972). [10] The present study aims at reporting the mean age at menarche among the girls of Lucknow, Uttar Pradesh and to asses the influence of biological & socio-economic parameters like environmental condition, education, nutritional status, socio-economic status on age at menarche.

Material and Methods:

The present study was conducted among 150 adolescent girls in age group of 10 to 19 years, randomly selected from urban & rural government schools of Lucknow. 75 girls from urban & 75 from rural schools were

selected from November 2009 to March 2010, thus completing sample size of 150. The present study was undertaken to study the mean age at menarche among girls of Lucknow. An attempt has been made to collect the data from both types of girls that is urban and rural areas so that a correct measurement could be made. Every case was examined physically to exclude the presence of any disease. The girls were interviewed separately and privately. Their ages were recorded and their weight & height taken The menstrual history was inquired, the exact date of menarche was noted. Information regarding their socio-economic status was calculated in urban girls according to Modified Kuppuswamy Scale & in rural girls according to Pareek scale. This was cross sectional descriptive study.

Results:

Table No.1 shows age distribution of cases having menstruation, girls from 10 to 19 years were examined and out of total 150 cases, 108 cases, having menstruation iand 42 cases not having menstruation were reported. At 10 years of age only 4 cases (33.33%) were having menstruation like this at 13 years i.e 10 cases (55.56%) & 15 years, 11 cases (78.57%) having menstruation & finally from 16 year onward 100% cases were having menstruation.

Table No.2 shows frequency distribution and mean age at menarche. Girls in between 8-9 years and 9-10 years are considered as 8 years and 9 years respectively and so on.The most frequent age of menarche is 13 years when 32 cases (29.63%) had their onset the lowest age of menarche was found to be 8 years & the highest age was 15 years, Only one case had its onset at 8 years and & two cases had its onset at 9 years like this as age advances number of cases increases and it get maximum at 13 years (32 cases) and thereafter the onset get decreases and at 15 year only 9 cases and from 16 years onwad no case of onset was found. Mean age of menarche was found to be 12.43 ± 1.49.

Table No.3 shows mean age at menarche and some modifying Bio- social factors. Socio-economic status is assessed according to Modified KuppuSwamy Scale in urban girls & Pareek scale in rural girls, mean age at menarche among girls of class I, II, III,(IV & V) is 13.05 ± 1.09, 12.76 ± 1.24, 12.12 ± 1.48, 12.07 ± 1.77 respectively. Similarly body mass index is measured by taking the weight & height of girls, mean age at menarche in underweight, normal, overweight & obese girls is 12.72 ± 1.18, 12.67 ± 1.37, 12.43 ± 1.55, 11.97 ± 1.68 respectively. Mean age at menarche in urban and rural girls is 12.37 ± 1.46 and 12.51 ± 1.55 respectively.

Discussion:

The mean menarche age in the present study is 12.43 ± 1.49. This is in agreement with Purushathan (1978), [11] Amrita et al(2000) [12] and Banerjee I et al (2007) [13] they found the mean age at menarche as 12.78 years, 12.6 years and 12.3 years respectively. The finding is not agreement with Chakravartii & Renuka (1970) [14] who found mean age at menarche to be 14.76±0.6, with Kundalkar (1981) [15] reported to be 13 years and 2 months, with Rakshit (1962) [16] reported 14 years and 4 months, and Study undertaken by the Indian Council of Medical Research ICMR (1972) [17] reported the mean menarchal age for Maharastrian girls as 13 years and 2 months, therefore the finding may be attributed due to differences in socioeconomic status, environment condition and body mass index in different states of India. In present study findings are consistent between 8 to 15 years in which maximum incidence is seen between 13 to 14 years when 32 cases (29.63 %) had its menarche.

Factors affecting age at menarche:

1**.Socio-economic status:** The Age at menarche in different socio-economic groups were studied according to Modified Kuppuswamy Scale in urban & Pareek Scale in rural.Age at menarche in class I is (13.05 ± 1.09), class II is (12.76 ± 1.24), class III is (12.12 ±.1.48) & IV&V is (12.07 ±1.77) respectively. This figure is an agreement with ICMR (1972), [17] Bai and Vijaylaxmi (1973) [18] and Sidhu (2002) [19] who revealed that mean menarcheal age steadily increases with decrease in per capita income.

2. Body mass index: It has always been considered that weight & height is major influencing factor in pubertal growth period. In present study cases are divided into four groups according to their body mass index. It shows earlier mean age at menarche in obese (11.97 ± 1.68) and later in underweight i.e. (12.72 ± 1.18) and in normal is (12.67 ± 1.37) and overweight is (12.43 ± 1.55) therefore body mass index significantly influence the mean age at menarche.

3.Place of residence: It was observe that in the girls of urban area the mean age at menarche is (12.37 ± 1.46) as compare to rural area where it is (12.51± 1.55) few other studies conducted in India gave average age at menarche in urban girls to be 12 years Vaidya R.A Shringi MS

(1998). [20] In present study the figure of urban and rural areas are practically identical and therefore place of residence does not seem to affect the age at menarche

Conclusion:

In present study there were 150 cases, the menstruation had started in 108 cases and not started in 42 cases. The mean age at menarche is (12.43 ± 1.49) .The lowest age of menarche is 8 years and highest is 15 years.The effect of socio-economic status is studied, the mean age at menarche is earlier in class IV&V group and delayed in class I socio-economic group.This is in agreement with ICMR (1972), [17] Bai & Vijaylaxmi (1973) [18] and Sidhu (2002). [19]

Thus the trend of lowering of age at menarche is well marked as we moved from lower and middle to higher socioeconomic stratum. Body mass index is also said to effect the age at menarche. In cases of better nutrition and more weight (Obese) the mean age at menarche is earlier as compared to cases of undernutrition and less weight.The mean age at menarche in urban areas is (12.37 ± 1.46) and in rural areas is (12.51 ± 1.55) the figure is practically identically, therefore place of residence does not seem to affect the mean age at menarche. In the present study there seems to be a definite association between Bio-Social factors and mean age at menarche.

References:

1. **Prado, C., Martinez, R., Perez-de landozabal, E.:** Menarcheal age as an indicator of socio-economic level in emigrants. *J. Hum. Ecol.*, **4:** 157-171 (1995).
2. **Thomas F. Renaul I benefice E.De Meens T.Guegan JF** international variability of ages at menarche and menopause: patterns & main determinants Hum Biol 2001; 73: 271-290.
3. **Sushila Tiwari** 1962., (Thesis) Onset and changes of puberty in females
4. **Low, W.D., Kung, L.S. and Leong, J.C.Y.:** Secular trend in the sexual maturation of Chinese girls. *Hum. Biol.*, **54:**339-351 (1982).
5. **Wyshak G, Frisch RE.** Evidence for a secular trend in age of menarche. *N Engl J Med* 1982; 306: 1033-5.
6. **Chowdhury S, Shahabuddin AK, Seal AJ, Talukder KK, Hassan Q, Begum RA *et al*.** Nutritional status and age at menarche in a rural area of Bangladesh. *Ann Hum Biol* 2000; 27: 249-56.
7. **Osteria TS.** Nutritional status and menarche in a rural community in the Philippines.*Philipp J Nutr* 1983; 36: 150-6.
8. **Frisch RE, Revelle R (1970)** Height and weight at menarche and hypotheses of critical body weights and adolescent events. Science 69:397-399
9. **Simmons K, Greulich WW (1943)** Menarcheal age and the height, weight and skeletal age of girls age 7 to 17 years. J Paediatrics 22:518-548.
10. **Frisch RE (1972):** Weight at menarche: Similarity for well-nourished girls at differing ages, an evidence for historical constancy. Pediatrics 50:445-450.
11. **Purushotham, G.R.:** *A Study on Some Demographic Aspects of Balija and Sugali Populations in Chittoor and Cuddapah Districts, Andhra Pradesh*. M.Sc., Dissertation, S.V. University,(1978).
12. **Amrita Bagga, S. Kulkarni.** Age at menarche and secular trend in Maharashtrian(Indian) girls Acta Biologica Szegediensis Volume 44 (1-4): 53-57,2000
13. **Banerjee I, Chakraborty S, Bhattacharya NG, Bandopadhyay S, Saiyed HN, Mukherjee D.** A cohort study of correlation between body mass index and age at menarche in healthy Bengali girls. Journal of the Indian Medical Association 2007; 105(2): 75-8.
14. **Chakravartti, M.R. and Renuka, Y.**: A trend of age at menarche in India. *J. Soc. Res.*, **13:** 82-94 (1970).
15. **Kundalkar (1981)** Age at menarche for different social groups. Unpublished M. D. dissertation, University of Pune, India.
16. **Rakshit S (1962)** Reproductive life of Maharashtrian Brahmin women. Man in India 56:65-70.
17. **Indian Council of Medical Research (ICMR) (1972)** Growth and physical of development of Indian infants and children. Technical Report Ser 18, New Delhi.
18. **Bai Ki, Vilajayalakshmi B(1973)** Sexual maturation of Indian girls in Andhra Pradesh. Hum Biol 45:695-707.
19. **Sidhu, Sharda:** Age at menarche among Scheduled Caste girls of Punjab. *J. Hum. Ecol.,* **13:** 327-328 (2002).
20. **Vaidya RA Shringi MS , Bhatt MA ,GajjanM, Joshi JV ,Galvankar P** Menstrual pattern and growth of school girls in Mumbai. J Family welfare 1998 44(1): 66 72.

Table.1: Age Distribution of cases

Current age (yrs)	Total no. of cases	cases having menstruation		cases not having menstruation
		No	%	
10+	12	4	33.33 %	8
11+	16	6	37.50%	10
12+	15	8	53.33 %	7
13+	18	10	55.56 %	8
14+	20	14	70.00 %	6
15+	14	11	78.57 %	3
16+	15	15	100 %	-
17+	11	11	100 %	-
18+	14	14	100 %	-
19+	15	15	100 %	-
Total	150	108	72(%)	42

Table.2: Frequency distribution

S	Menarche age (yrs)	No. of cases having Menarche	% cases having Menarche
1	8	1	0.9%
2	9	2	1.85%
3	10	8	7.41%
4	11	17	15.74%
5	12	24	22.22%
6	13	32	29.63%
7	14	15	13.89%
8	15	9	8.33%
Total		108	

Mean ± S.D = 12.43 ± 1.49

Table 3: Mean age at Menarche

Variables	Cases Observed	Mean ± S.D
Socio-economic status		
Class I	20	13.05 ± 1.09
Class II	25	12.76 ± 1.24
Class III	33	12.12 ± 1.48
Class IV-V	30	12.07 ± 1.77
Body Mass Index		
Underweight	18	12.72 ± 1.18
Normal	33	12.67 ± 1.37
Overweight	28	12.43 ± 1.55
Obese	29	11.97 ± 1.68
Residence		
Urban	**63**	12.37± 1.46
Rural	**45**	12.51± 1.55

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

An Autopsy Study of Socio-Etiological Aspects in Dowry Death Cases

*Radhika.R.H, **Ananda.K

Abstract

Violence affects lives of millions of woman worldwide, in all societies, one of the most heinous and shocking forms among them is ***DOWRY DEATH,*** is one among the various reasons for suicidal (i.e. abetted suicide) and homicidal deaths of women in India, other being marital infidelity, sexual jealousy etc. This study done at Kempegowda Institute of Medical Sciences and Research Hospital, Bangalore South, was conducted during the period July 2006 to January 2008, aims and objectives were to know the magnitude, socio etiologic profile and methods used for committing suicide/homicide, and various other factors affecting the alarming rise in incidence of dowry death and also to lend valuable suggestion to concerned authorities to prevent this heinous social evil of our society. Most of the victims were aged between 18 to 25 years of age, maximum of the victims died within three years of married life, most commonly between 1 to 2 years of married life. Hanging is the most common method used for dowry deaths.

Key words: Bride burning, Dowry deaths, dowry death, Unnatural female deaths

Introduction

Even after years of campaigning by voluntary organizations against the menace of dowry and their efforts to create awareness on it, the number of dowry deaths and dowry harassment cases is on the rise and according to the National Crime Records Bureau Bangalore is now the “crime capital” of the South. The city has seen an increase in organized crime, economic offences, cyber crime, crime against women and children, extortions and gang wars over the last couple of decades. [1]

The dowry related harassments and deaths are increasing day by day due to prevailing socio-economic lifestyle. The dowry is closely interlinked to many crimes committed against women, viz, female infanticide, domestic violence, and neglect of the girl child, denial of educational and career opportunities to daughters, rape, extortion, homicide and discrimination against women.

Corresponding Author:

* Assistant Professor
Department of Forensic Medicine & Toxicology
MVJ Medical College and Research Hospital
Hosakote – 562 114,Karnataka, India
Email: rhr_doc@yahoo.com
**Professor and Head, FMT
Kempegowda Institute of Medical Sciences
Bangalore-560004.Karnataka, India

High incidence of unnatural deaths of young newly married females through suicide/homicide following disputes over the dowry is a dark spot on the noble tradition of our society. Dowry and dowry related suicide and murders are such evils in the society which are putting the society in great shame.

In a case report, one of the variant of the typical Indian phenomenon of greed circumventing sanity and inventing ways to evade the law while still gaining the objective, i.e., the death of the wife, was ‘Dowry cannibalism’, where a man was accused by his wife of regularly extracting and drinking her blood, mixed with liquor, to punish her for not bringing him enough of a dowry at their marriage. Author also says that this was the first instance to their knowledge, where a person has indulged in cannibalism.

Legal and medical people must be aware that such an event has occurred in an out of the way part of India. [2] The evil of the dowry system is a matter of serious concern to everyone in view of its ever increasing and disturbing proportions. They are well planned crimes, executed within the four walls of a house by the family members. Most of the victims die on the spot and those who survive hesitate to make a statement before a magistrate either due to fear psychosis on account of lack of alternative support, or they are persuaded or threatened not to do so.

Sadly, awareness and education, particularly of young people and women, has not helped to ease the situation. In fact, families of people who are better educated, more qualified with foreign degrees, etc have often demanded or given more dowry. Unless the perpetrators of the crime are punished, the incidence of dowry related deaths will not decrease or be prevented.

The present study is undertaken to evaluate the magnitude and study various socio etiological factors of dowry deaths in Bangalore south, and various other factors affecting the alarming rise in incidence of dowry death.

Methodology:

Autopsy cases of dowry deaths within 7 years of married life were conducted at Department of Forensic Medicine, Kempegowda Institute of Medical Science Hospital and Research Centre, Bangalore, during the period July 2006 to January 2008.

All dead bodies of married women dying within 7 years of married life, brought to Kempegowda Institute of Medical Science Hospital and Research Centre Mortuary, cases being booked under Section 176 Cr.P.C, 174 Cr.P.C, 304(B) IPC, 498(A) IPC, where inquest is conducted by Executive Magistrate were the inclusive criteria. Death of women within 7 years of marriage due to road traffic accidents, natural cases and Homicide victims within 7 years of marriage, unrelated to dowry were excluded in the study.

Proforma was filled in each case regarding the history given by relatives, Information obtained during Magistrate's inquest and by the Investigative Officer, Post mortem findings with particular reference to manner of death, Histopathology and Chemical Analysis Reports to establish the cause of death.

Results:

With reference to **age of the victim,** the dowry death occurred at any age from 18 to 45 years of age. Maximum number of dowry deaths occurred between 18 to 25 years of age, 36 (60%) cases, and only 35-40 years of age, 1 (1.66%) cases, results are shown in figure 1.

With respect to **duration of married life**, maximum number of dowry death occurred within first 3 years of marriage i.e. 44 (73.33%) cases, among these 12 (20%) in first years, 24 (40%) cases in 1 to 2 years and 8 (13.33%) in 2 to 3 years, and only 1 (1.66%) case in 6 to 7 years of marriage, shown in Figure 2.

With regard to **type of family**, most of the brides belonged to nuclear type of family 33 (55%) cases, and 27 (45%) cases in joint family, in Figure 3.

With regard to **methods used for dowry deaths** like hanging, poisoning, burns, strangulation etc, hanging constituted the maximum number of dowry deaths i.e. 47 (78.33%) cases out of 60 cases, followed by poisoning 7 (11.66%) cases, burns 5 (8.33%) cases, strangulation 1 (1.66%) case, in figure 4.

Attempt has also been put to study the **time duration taken between death and the inquest conducted in dowry deaths**. In present study, maximum cases had taken time gap of 18-24 hours to hold inquest i.e. 20 (33.33%) cases, only in 5 (8.33%) cases inquest was held within 6 hours. In remaining 3 (5%) cases inquest was held after 30 hours, in figure 5.

Out of 60 cases of dowry deaths, only in 4 (6.66%) cases suicide note was found in which there was strong history of victim being harassed for want of dowry. In remaining 56 (93.33%) cases suicide was not found. 93.33% cases were suicidal and 5% cases were accidental and remaining 1.66% cases were homicidal in nature.

Discussion and Conclusion:

Unnatural deaths of married women amongst the total female deaths have been an increasing trend in Indian society during the recent past years, which may be suicide, homicide, or even accidents. But these suicides and homicides are currently more commonly associated with the dowry disputes. Magnitude of dowry deaths in each year of my study period shows increase i.e. 17 cases in 2006, 20 cases in 2007 and 23 cases in 2008, in comparison to Anil Agnihotri study, [5] incidence being steadily increasing with time, indicating that stringent anti dowry laws remain insignificant and hence these dowry related crimes cannot be curbed with law alone, they need to be tackled by other means too.

Most of the victims are aged between 18-25 years (60%) cases, followed by 25% cases in 26-30 years, 11.66% cases in 31-35 years and only 1.66% case has occurred in 36-40 years of age, findings are similar to studies by Sharma.B.R et al [11] study who report 56% of victims belong to the age group of 18-25 years, and also Virendra Kumar et al, [3] Kusa Kumar Saha and Sachidananda Mohanty [4] reported similar findings.

With respect to duration of married life, maximum cases were reported between 1 to 2 years of married life i.e. 40% cases, followed by less than 1 year in 20% cases, 13.33% cases in

2 to 3 year of married life. Findings were similar in A.K.Srivastava[7]. However Sharma.B.R et al[11] study reports similar findings except for a slight increase observed in 3-5 years after marriage i.e. 23.33%, probably because of problems of infertility of infidelity.

With regard to type of family, this study shows most cases were from nuclear family 55% where suicides were easily committed, and 45% from joint family. This is in contrary to studies by Virendra Kumar et al, [3] Kusa Kumar Saha and Sachidananda Mohanty, [4] Anil Agnihotri. [5] This may be due to rapid urbanization where families settle in urban areas in search of work and other issues, and more often wife accompanies husband, segregating from joint families.

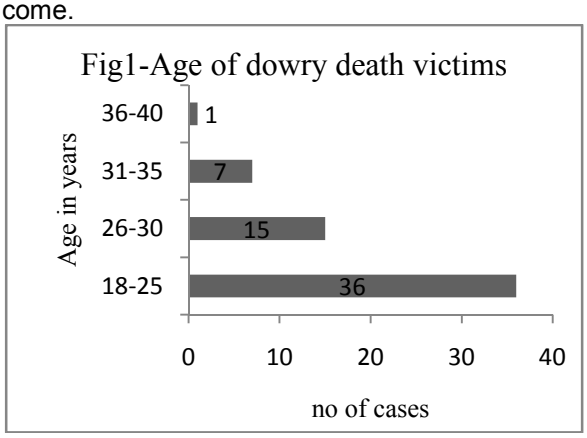
Majority of dowry death victims used hanging 78.33% cases, followed by poisoning 11.66% cases, burns 8.33% cases, strangulation 1.66% case, which is in consistent with B.R.Sharma et al [9] study, and Sachidananda Mohanty et al, [6] the reason attributed for this is the easy availability of the ligature material and the poison. A.K.Srivastava [7] noted that in suicidal cases, hanging was the commonest 29.37% cases, followed by burning 23.61% cases, and poisoning 12.59% cases, and in homicidal cases, strangulation/throttling was the commonest 41.67%. In Anil Agnihotri[5] study it was recorded that maximum cases of poisoning were due to aluminium phosphide, and also in B.R.Sharma et al [9] study but whereas in my study organo phosphorus insecticide was the commonest poison consumed and only one case was of cyanide poison.

Attempt has also been made in relation to time duration between death and inquest conducted in dowry deaths, where 33.33% cases were done between 18-24 hours, which indicates that the executive magistrate are busy with limited time in their busy day to day appointments, often are not available to hold an inquest on body, leading to unnecessary delay. Followed by 20% cases in 12-18 hours, 6-12 hours in 11 (18.33%) cases, 24 -30 hours in 7 (11.66%) cases, only in 5 (8.33%) cases inquest was held within 6 hours. In remaining 3 (5%) cases inquest was held after 30 hours. This is consistent with Shashidar.C.Mestri [10] who stress out that executive magistrate are busy with limited time in their busy day to day appointments, often are not available to hold an inquest on body, leading to unnecessary delay.

As executive magistrates don't get time to completely investigate the case, in many cases all formalities of inquest are attended by police. This delay leads to wrong interpretation of vital ante mortem changes on the body; sometimes certain essential findings can be missed. And in my study 10% of cases police inquest was held because of the difficulty in attributing the case as dowry death or not, often later the case turns to be the case of dowry death, which should have been investigated by the magistrate in the beginning.

This finding is similar to Virendra Kumar3 where in 77% cases police inquest were done unlike dowry death victims. 93.33% cases were suicidal and 5% cases were accidental out of which in 3.33% case the history given was deceased caught fire while cooking which is the common method employed by husband and in laws to conceal the crime, and remaining 1.66% cases were homicidal in nature.

In line with already existing anti dowry cell-separate courts can be established at each district head quarters in line with already existing fast track courts in order to speed up the trial and dispose dowry death cases. Certain amendments are to be incorporated in Dowry Prohibition Act; with investigations and trial of the case being modified in the concerned I.P.C., CrPC and I.E.A. We feel this will definitely be going to bring down the rate of young woman falling prey to dowry system in the years to come.



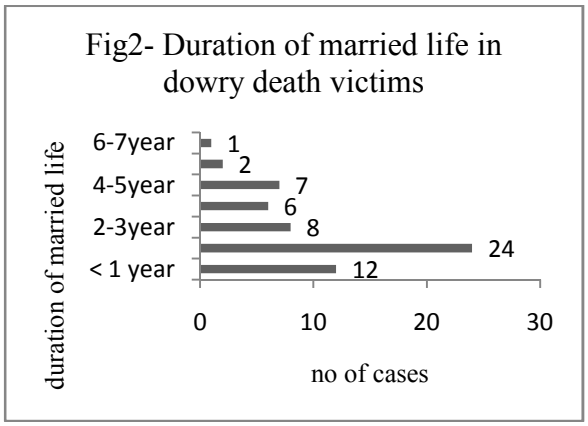


Figure 3-Occurence of dowry deaths in relation to type of the family

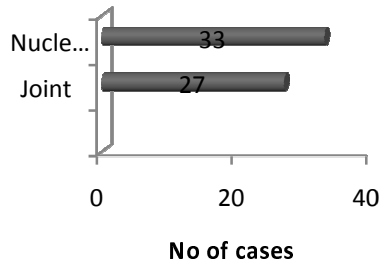


Fig 4- Methods used for dowry deaths

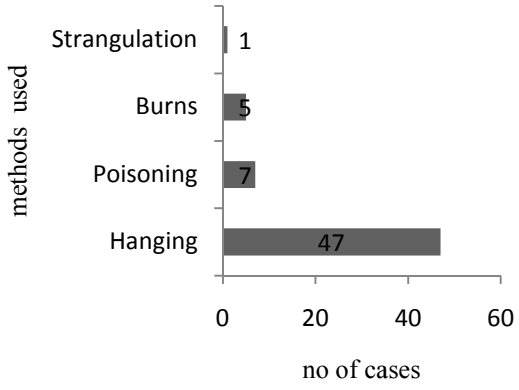
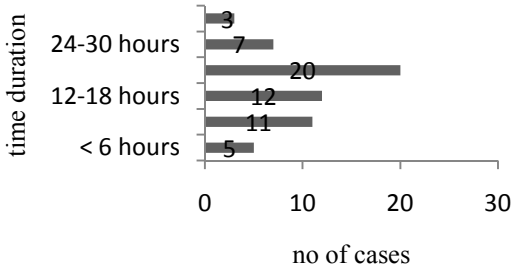


Fig5-Time duration between death and inquest conducted in dowry deaths



References:

1. **The Hindu,** online edition of India's national newspaper, Tuesday, Feb 08, 2011.
2. **Hussain.M, Rizwi.SJ, Usmani.J.A.** Dowry Cannibalism. Journal of Clinical Forensic Medicine.1996; 3: p.179-181.
3. **Virendra Kumar, Tripathi CB, Kanth S.** A Sociologic Study. International Journal of Medical Toxicology & Legal Medicine.1999; Vol.2 (1).
4. **Saha KK, Mohanty S**. Alleged Dowry Death: A study of homicidal burns. Med.Sci.Law. 2006; Vol.46 (2):105.
5. **Anil Agnihotri.** The Epidemiological Study of Dowry Death Cases with Special references to burial cases in Allahabad zone. Anil Aggarwal's Internet Journal of F.M & T. 2001; Vol.2 (1).
6. **Mohanty S, Sahu G, Mohanty MK and Patnaik M**. Suicide in India – A four year retrospective study. Journal of Forensic and Legal Medicine. 2007;14: 185-189.
7. **Srivastava.AK and Arora.P.** Suspicious Deaths in Newly Married Females – A Medico Legal Analysis.JIAFM. 2007; Vol.29 (4):63-67.
8. **Virendra Kumar.** Poisoning deaths in Married Women.Journal of Clinical Forensic Medicine. 2004; Vol 11:2-5.
9. **Sharma BR, Singh VP, Sharma R, Sumedha**. Unnatural deaths in Northern India – A Profile. JIAFM.2004; 26(4):140-146.
10. **Shashidhar.C.Mestri**. Role of doctor in Dowry deaths. JFMT.1993; Vol.10 (3&4):36-37.
11. **Sharma.B.R, Harish.D, Manish Gupta and Virendra Paul Singh**. 'Dowry – A deep rooted cause of violence against women in India. Med.Sci.Law. 2005; 45(2):161-168.

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research paper

Patterns of head injuries in fatal road traffic accidents in a rural district of Maharashtra- Autopsy based study

*Ranjit M. Tandle, **A. N. Keoliya

Abstract

Road traffic accidents are the major causes of death worldwide. Head injury is the single most common cause of mortality in road traffic accidents; head being the most vulnerable part of the body. The present study was undertaken on 138 victims of road traffic accidents, died due to head injury to find out the patterns of head injuries, their age and sex distribution and site distribution of different types of fractures. The highest incidence was seen in age group of 21-30 years and males clearly outnumbered females. In the present study, most of the incidents occurred between 1200 to 1800 hours. The maximum number of victims (39.57%) died while on the way to hospital. The motor-cyclists were the commonest group of victims and trucks being the commonest offending vehicles. Intracranial haemorrhages were seen in 113 cases, skull fractures were found in 95 cases and injury to brain in 51 cases.

Linear fracture of skull with basal fracture was the commonest type and temporo-parietal region was involved predominantly. Subdural haemorrhage was the commonest haemorrhage observed.

Key Words: Head Injury, Skull Fractures, Intracranial Haemorrhages, Road Traffic Accidents

Introduction:

India being one of the fastest developing nations in the world with a huge population density, the road traffic density is also increasing. In India, for individuals older than four years of age, more life years are lost due to traffic accidents than cardiovascular diseases. [1] India accounts for about 10% of road accident fatalities worldwide. [2] WHO defined the accident as, “an unexpected, unplanned occurrence that may involve injury”. [3] Head injury has been defined as, “a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of the skull, produced by mechanical forces”. [4]

Depending upon whether or not the dura matter was torn, the head injury may be termed as open or closed type. [5] The extent and degree of injury to the skull and its content is not necessarily proportional to the quantum of force applied to the head. According to Munro, any type of cranio-cerebral injury is possible with any kind of blow on any sort of head. [6]

Corresponding Author:

*Assistant Professor,
Deptt. of Forensic Medicine
Government Medical College,
Aurangabad, (Maharashtra)
E-mail: ranjit_tandle@rediffmail.com
**Professor and Head,
IGGMC, Nagpur

Severe head injury, with or without peripheral trauma, is the commonest cause of death and/ or disability up to the age of 45 years in developed countries. [7]

The head being the most vulnerable part of the body is involved frequently and lead to morbidity and mortality in road traffic accidents. In this paper, patterns of head injury in road traffic accidents with regards to age, sex, frequency of occurrence, anatomical sites involved is analyzed and presented.

Material and Methods:

The present study was carried out in the Department of Forensic Medicine & Toxicology, S.V.N. Government Medical College, Yavatmal, Maharashtra. Total 187 cases of road traffic accidents studied of which head injury was present in 138 cases. The information regarding age, sex, residence, marital status, date and time of time of accident and of death was gathered from police inquest report, relatives, dead body challan and clinical details from hospital records. During autopsy, detailed examination was carried out and data regarding both external and internal injuries and carefully recorded analyzed and presented in this paper.

Observations:

1.Age and sex distribution:

The highest incidence was seen in age group of 21-30 years comprising 49 (35.50%) cases, followed by 31-40 years having 31 (22.46%)

cases. The lowest incidence was seen in age group of more than 70 years (2.89%). Males comprised 86.95% of the total victims with male to female ratio as 6.67:1.

Table 1: Age and sex distribution

Age (yrs)	Males (%)	Females (%)	Total (%)	Sex Ratio
0-10	3	1	4 (2.13)	3:1
11-20	12	4	16 (8.55)	3:1
21-30	**48**	5	**53 (28.34)**	**9.6:1**
31-40	38	**9**	47 (25.13)	4.22:1
41-50	33	5	38 (20.32)	6.6:1
51-60	15	2	17 (9.09)	7.5:1
61-70	5	2	7 (3.74)	2.5:1
> 70	2	3	5 (2.67)	.67:1
Total	**156(83.42)**	**31(16.58)**	187(100)	5.03:1

2.Time of the accident

In the present study, most of the incidents occurred between 1200 to 1800 hours, comprising 37.43% of total cases, followed by time interval 6000 to 1200 hours (26.20%). The least number of cases (10.70%) occurred between 0000 to 6000 hours.

3.Place of death

The maximum number of victims (39.57%) died while on the way to hospital, followed by victims died in the hospital (34.76%). The number of victims who died on the spot was 25.67%.

4.Profile of the victim

The motor-cyclists were the commonest group of victims, comprising 69(36.90%) cases, out of which 59 were drivers, followed by Light Motor Vehicle users comprising 46 (24.60%) cases of which 43 were occupants. Pedestrians constituted 32 (17.11%) of the cases. Overall, occupants of the vehicles (81) outnumbered the drivers (74).

5.Offending vehicle

In present study, truck was the commonest offending vehicle being involved in 64 (59.81%) cases, followed by Light Motor Vehicle (15.89%) and buses (9.35%).

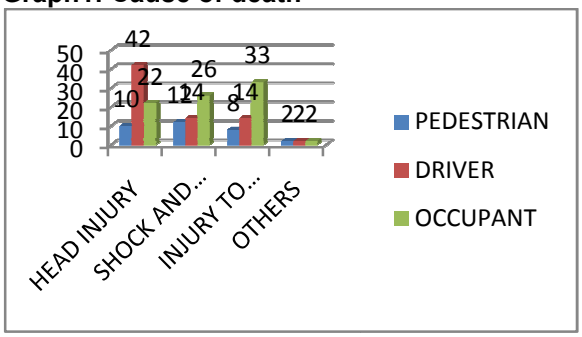
6.Site of injury

Extremities suffered maximum injuries (32.64%), followed by Head, neck and face region (30.93%). Least numbers of injuries were observed on spine (1.33%). Pedestrians, two wheeler and three wheeler users sustained maximum injuries on extremities, followed by on head, neck and face. Four wheeler users had maximum injuries on head, neck and face region, followed by on extremities.

7.Cause of death

The head injury was the commonest cause of death comprising 39.57% cases. In drivers, head injury was the commonest cause of death observed in 42 cases. In occupants of the vehicles, injury to vital organs was the commonest cause of death seen in 33 cases. In pedestrians, shock and haemorrhage was predominant cause of death seen in 12 cases.

Graph1: Cause of death



8.Head injury

Intracranial haemorrhages were seen in 113 cases, skull fractures were found in 95 cases and injury to brain in 51 cases. A combination of multiple injuries in the form of scalp injury, skull fracture, intracranial haemorrhage and injury to brain was predominantly seen in 46 (33.33%) cases, followed by combination involving scalp injury, skull fracture and intracranial haemorrhage (29.71%).

From table no. 6, it is evident that injury to scalp was noted in 129 out of 138 cases of head injuries. Injury to scalp only was present in 23 cases and in 106 cases along with injury to scalp associated other internal damage in the form of intracranial haemorrhage, skull fracture, brain damage were present.

Table2: Classification of Head Injury Cases as Per Pattern of Cranio-Intracranial Injuries

Type of Head Injury	Cases	%age
Injury to Scalp Only	23	16.67
Scalp Injury + Skull#	2	1.45
Scalp Injury +ICH	13	9.42
Scalp Injury +Skull# + ICH	**41**	**29.71**
Scalp Injury +ICH+ Brain Injury	4	2.90
Skull# +ICH+ Brain Injury	1	0.72
Skull# +ICH	5	3.62
Only ICH	3	2.17
Scalp Injury +Skull#+ICH+ Brain Injury	**46**	**33.33**
Total	138	100

#- Fracture, ICH- Intracranial haemorrhage

Table 3: Incidence &Type of Skull Fracture

Type Of Skull Fracture	Cases	%Age
LN # Vertex Only	**16**	**16.84**
DP # Vertex Only	14	14.74
Com # Vertex Only	15	15.79
Basal # Only	15	15.79
LN # Vertex +Basal #	**23**	**24.21**
DP # Vertex + Basal #	7	7.37
Com # Vertex + Basal #	3	3.16
LN +Com # Vertex	1	1.05
Com+ DP # Vertex	1	1.05
Total	95	100

LN- Linear, DP- Depressed, COM- Comminuted, #- Fracture

In Table 3, linear fracture of skull with basal fracture was the commonest type seen in 23 (24.21%) of the total cases, followed by linear fracture only (16.84%). Basal fracture alone was observed in 15.79% of the total cases. Least common was the depressed fracture, observed in 14.74% of the total cases. Skull vault fracture was seen in 80 of the total cases, out of which linear fracture was the commonest.

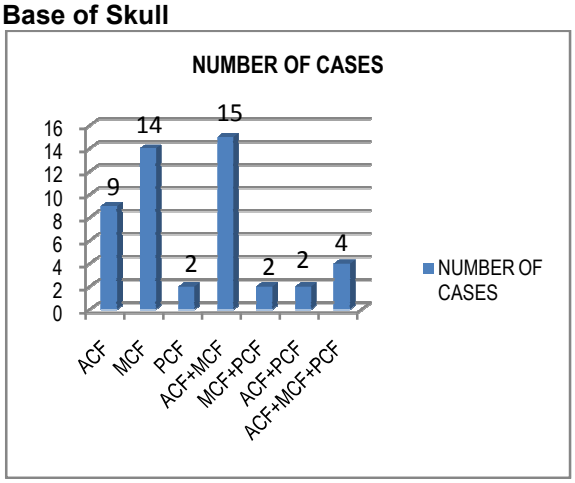
Table 4: Anatomical Location of Fracture of Skull Vault

Site of Skull Fracture	Cases	%age
FRONTAL	8	10.00
TEMPORAL	6	7.50
PARIETAL	**11**	**13.75**
OCCIPITAL	5	6.25
T + P	**16**	**20.00**
F + P	10	12.50
F + T	2	2.50
T + O	2	2.50
P + O	2	2.50
F + P + O	1	1.25
F + T + O	1	1.25
F + P + T	**14**	**17.50**
F + P + O + T	2	2.50
TOTAL	80	100

F- Frontal, T- Temporal, P- Parietal, O- Occipital

Table 4 shows the anatomical location of skull fracture. There were 95 cases of skull fractures out of which vault was involved in 80 cases. Temporo-parietal region was involved predominately in 16 (20%) cases, followed by fronto-parieto-temporal region (17.50%). In present study, parietal bone was the most commonly fractured single bone of vault of skull, comprising of 11 (13.75%) of total skull vault fractures.

Graph 2: Anatomical Location Fracture of Base of Skull



Graph-2 shows the distribution of fractures at the base of skull. Fracture at base of skull was present in 48 cases out of 95 cases of skull fracture. In present study, the fracture of base of skull was at anterior and middle cranial fossae in 15 (31.25%) cases, followed by middle cranial fossa 14 (29.17%) out of 45 cases. The least common site for fracture was at posterior cranial fossa (4.17%).

Table 5: Types of Intracranial Haemorrhages

Intracranial Haemorrhage	cases	Percentage
EDH ONLY	0	0
SDH ONLY	7	6.19
SAH ONLY	4	3.54
ICR ONLY	0	0.00
EDH+SDH	3	2.65
SDH+SAH	70	61.95
SAH+ICR	2	1.77
EDH+SDH+SAH	23	20.35
SDH+SAH+ICR	3	2.65
ALL	1	0.88
TOTAL	113	100

EDH- Extradural haemorrhage, SDH- Subdural haemorrhage, SAH- Subarachnoid haemorrhage, ICR- Intra-cerebral haemorrhage

Table 5 shows types of intracranial haemorrhages in road traffic accident cases. Intracranial haemorrhages were noted in 113 cases. A combination of subdural haemorrhage with subarachnoid haemorrhage was most commonly observed in 70 (61.95%) of the total cases of intracranial haemorrhages, followed by combination of extradural, subdural and subarachnoid haemorrhage in 23 (20.35%) cases. In present study, solitary intra-cerebral and extradural haemorrhage was not observed; they were seen only in combination with other haemorrhages. Subdural haemorrhage was the commonest solitary haemorrhage observed in 7 (6.19%) of the total intracranial haemorrhages.

Discussion:

In this study, Males clearly outnumbered females with male to female ratio as 5.03:1. This is in accordance with the other studies [2, 8-12]. In the age group analysis of the victims, maximum incidence was in age group of 21-30 years and least in group 0-10 years. Similar findings were observed by other researchers. [9-12]

The maximum numbers of accidents were reported between 1200 to 1800 hours, comprising 37.43% cases, followed by time interval 6000 to 1200 hours (26.20%). The similar trends are seen by others. [14. 15]

The maximum number of victims (39.57%) died while on the way to hospital, followed by victims died in the hospital (34.76%) and victims died on spot (25.67%). The present study is consistent with other studies. [11, 14, 17]

The motor-cyclists were the commonest group of victims, comprising 36.90% cases, followed by Light Motor Vehicle users comprising 24.60% cases. Pedestrians constituted 17.11% of the cases. Similar trends were seen by Akhilesh Pathak et al (2008). [16]

Trucks were the commonest offending vehicle being involved in 59.81% cases,

followed by Light Motor Vehicle (15.89%) and buses (9.35%). Similar trends were seen by others. [10-13, 17, 19]

In present study**,** the head injury was the commonest cause of death comprising 74 (39.57%) cases, followed by injury to vital organs observed in 55 (29.41%) cases. J. Chandra et al (1979) [17], and Arvind kumar et al (2008) [2] in their study found similar trends.

Extremities suffered maximum injuries (32.64%), followed by head, neck and face region (30.93%) and thorax (17.08%). Least numbers of injuries were observed on spine (1.33%). Others revealed the similar findings. [10, 15]

Scalp injury was the commonest type of injury seen in 129 of the total 138 cases of head injuries, followed by intracranial haemorrhages (113) and skull fractures (95). Injury to brain was observed in 51 cases. The findings correlate with the other studies. [14, 15]

In present study, linear fracture of skull was the commonest. Parietal bone was the most commonly fractured bone of vault of skull. The base of skull had maximum fractures at anterior and middle cranial fossae and least number at posterior cranial fossa (4.17%). Other researchers found the similar findings. [14, 16]

Subdural haemorrhage was the commonest single haemorrhage observed in 6.19% of the total intracranial haemorrhages. The similar trends were seen by others. [10, 14, 16]

References:

1. **Mohan D.** Road traffic accidents and injuries in India: Time for action, Nat. Medical Journal of India, 2004;17:63-6
2. **Arvind Kumar, Sanjeev Lalwani, Deepak Agrawal, Ravi Rautji, T D Dogra.** Fatal road traffic accidents and their relationship with head injuries: An epidemiological survey of five year.Indian Journal of Neurotrauma, Vol.5, N0.2, 2008
3. **Hogarth J**. Glossary of Health care terminology, WHO, Copenhagen, 1978.
4. **Dr. K H Chavli, Dr. B R Sharma, Dr. D Harish, Dr. Anup Sharma.** Head injury: The principal killer in road traffic accidents. JIAFM, 2006:28(4) ISSN: 0971-973.
5. **Reddy KSN.**The Essentials of Forensic Medicine and Toxicology, 26th Edition, 2007; Page215.
6. **Munro D.** Cranio-cerebral injuries. Oxford University Press, as quoted by Gordon I, Shapiro HA in "Forensic Medicine: A Guide to Principles", 3rd Ed, 1988, Page252.
7. **Baethman A, Lehr D, Wirth A**: prospective analysis of patient management in severe head injury. Acta Neurochirargica, 1998; 715; 107-110
8. **Y N Singh,. Kanak Ch. Das**, **et al.** An epidemiological study of road traffic accident victims in medico legal autopsies. Journal of Indian Academy of Forensic Medicine, 2005:27(3), ISSN: 0971-0973.
9. **B H Tirpude,. R S Naik, A J Anjankar**, **et al.** A study of the pattern of cranio-cerebral injuries in road traffic accidents; Journal of Indian Academy of Forensic Medicine, 1998, Vol.20, No.1 ISSN: 0971-0973.
10. **Harnam Singh, S K Dhattarwal.** Pattern and distribution of injuries in fatal road traffic accidents in Rohtak (Haryana) ;Journal of Indian Academy of Forensic Medicine,2004;26(1),ISSN 0971-0973.
11. **B R Sharma, A K Sharma, Swati Sharma, Harshabad Singh.** Fatal road traffic injuries in Northern India: Can they be prevented? Trends in medical Research 2(3):142-148, 2007.
12. **Gautam Biswas, S K Verma, N K Agrawal**, **et al.** Pattern of road traffic accidents in north east Delhi; Journal of Forensic Medicine and Toxicology Vol. 20, No.1, Jan-Jun2003.
13. **Accidental Deaths in India.** National Crime Record Bureau, 2007.
14. **Anand Menon, Nagesh K R.** Pattern of fatal head injuries due to vehicular accidents in Manipal. JIAFM, 2005:27(1), 19-22.
15. **Sangeet Dhillon, H S Sekhon.** Pattern and distribution of injuries in fatal road traffic accidents in Shimla (Himachal Pradesh**).** Medico-legal Update, Oct-Dec, 2007, Vol.7 No.4.
16. **Pathak Akhilesh, Vyas P C, Gupta B M.** Autopsy finding of pattern of skull fractures and intra-cranial hemorrhages in cases of head trauma: A prospective study. Journal of Indian Academy of Forensic Medicine, 2006:28(4), 187-190.
17. **J Chandra, T D Dogra, P C Dixit.** Pattern of cranio-intracranial injuries in fatal vehicular accidents in Delhi, 1966-76 Med. Sci. Law (1979) Vol.19, No.3, 186-94.
18. **Rakhi Dandona, Ashish Mishra.** Deaths due to road traffic crashes in Hyderabad city in India: Need for strengthening surveillance. The National Journal of India, Vol.17, No.2, 2004.
19. **Abhishek Yadav, Anil Kohli, N.K. Aggarwal.** Study of pattern of skull fractures in fatal accidents in northeast Delhi. Medico-Legal Update, Vol.8, No.2 (2008-07 - 2008-12).

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Radiological Study of Disappearance of Tri-Radiate Cartilage in Pelvic-Bone in Gujarati Population

*Dharmesh Shilajiya, **Dharmesh Patel, ***Kalpesh Shah, ****Ganesh Govekar, *****Gaurang Patel

Abstract

For medico-legal purposes evidence of age is very essential in various types of cases such as Identification, Consent, Rape, Attainment of Majority, and Eligibility for Employment, etc. Various work done on the study of age determination by the study of appearance of ossification centers and epiphyseal union of different bones in India as well as abroad indicate a reasonable variation. Majority of them conclude that, the ossification and epiphyseal union of a bone vary in different part of the world.

To the best of our knowledge very little work has been done on the study of disappearance of tri-radiate cartilage out of various bony parts useful for age estimation. The present study comprising of 50 subjects (male=35; female=15),was carried out during the period January 2000 to July 2001 at the Forensic Medicine department and Department of radiology, B.J. Medical College, Ahmedabad.

Key Words: Identification, Age Estimation, Epiphysial Union, Tri-Radiate Cartilage

Introduction:

For medico-legal purposes evidence of age is very essential in various types of cases such as identification, consent, rape, attainment of majority, adoption of child, infanticide, eligibility for employment, etc. Wide spectrum work has been done on the study of age determination by the study of appearance of ossification centers and epiphyseal union of different bones in India as well as abroad.

Studies have been carried out on this subject by Davis DA and Parsons FG (England, 1927), Galstaun G. (Bengal, 1930 & 1937), Flecker (Australia, 1932), M.J.S. Pillai (Madras, 1935), Johnston (1961) and Dr.C. M. Rao, Dr.Suresh Sankhyan, Dr.Harinderjit Sekhon (Himachal Pradesh, 1993). Several studies carried out in India and other countries conclude that, the ossification and epiphyseal union of a bone vary in different part of the world. This difference could be due to different climatic, socio-economic and hereditary conditions and food habits.

Aims and Objectives:

1. To study the progress of union of Ilium, Ischium and Pubis in relation to tri radiate cartilage of acetabulum in both sides.
2. To study the associated factors like socioeconomic classes, food habits and body weight etc. with the disappearance of the tri radiates cartilage in both sides.

Corresponding Author:

*Assoc. Prof., Forensic Medicine & Toxicology
B.J. Medical College, Ahmadabad, Gujarat
E-mail:dsilajiya@yahoo.com
** Assoc. Professor
*** Professor
**** Professor & Head, Govt. Medical College, Surat
*****Assist. Prof. Govt. Medical College, Vadodara

Materials and Methods:

The present study was carried out during the period January 2000 to July 2001 at the Department of Forensic Medicine and Department of Radiology, B.J. Medical College, Ahmedabad.

- For the present study 50 persons residing in Gujarat since birth in the age group 10-17 years were selected, out of whom 35 were males and 15 were females.
- For verification of their birth dates, birth certificates and school leaving certificates were considered. Only Healthy subject were selected & Subjects having history of any chronic illness, any skeletal abnormality were deleted from the present study.
- For the categorization of the socio-economic class, Prasad's-modified classification method was used and the subjects were classified in five classes.

For analytical study, Multiplication factor = 4.93*value of CPI/100.
(Consumer Price Index (CPI) by reserve bank of India (1999) = 415)
From each subject a written consent was taken from the child & their parents.

- The heights of the subjects were measured in centimeters and their weight was noted in kilograms by using the ideal method.

- For proper view, right Posterior oblique view (judet view) and left posterior oblique (judet view) of the pelvis were preferred.

In the right Posterior oblique (judet view) view of the pelvis gives the clear picture of tri-radiate cartilage between the right sided Ilium and ischium bone, but it does not give the picture of tri-radiate cartilage between right sided Ilium and pubis bone and the picture of tri-radiate cartilage between right sided ischium and pubis bone. But in the same film (elevated hip) gives the clear picture of tri-radiate cartilage between the left sided Ilium and pubis bone and tri-radiate cartilage between the left sided ischium and pubis bone.

Same way left posterior oblique view of the pelvis (judet view) gives the clear picture of tri-radiate cartilage between the left sided Ilium and ischium bone and clear picture of tri radiate cartilage between the right sided Ilium and pubis bone and tri radiate cartilage between the right sided ischium and pubis bone.

Hence to observe the tri radiate cartilage of either side, two x-rays should be taken i.e. the right and the left posterior oblique views, because the right posterior oblique view gives the clear picture of tri-radiate cartilage between the right sided Ilium and ischium bone, of tri-radiate cartilage between the left sided Ilium and pubis bone and tri-radiate cartilage between the left sided ischium and pubis bone, Whereas the left posterior oblique view gives the clear picture of tri-radiate cartilage between the left sided Ilium and ischium bone, of tri radiate cartilage between the right sided Ilium and pubis bone and tri radiate cartilage between the right sided ischium and pubis bone.

The Acetabulum part of the tri radiate cartilage between the ischium and pubis is sometimes not clearly visible in an x-ray due to the over lapping of the head of femur, but postero-superior angle of the obturator foramen is clearly visible. It is better to use a magnifying lens. In the present study stages are given as follows:

0 = No commencement.
+ = just commencement.
++ = Disappearance of tri radiate cartilage in process.
+++ = Near complete disappearance of tri radiate cartilage.
++++ = Complete disappearance of tri radiate cartilage.

Observations: X-ray of 50 persons (35 males &15 females) of following age groups between 10 to 17 years disseminated following results.

Table 1:

Age groups (yrs)	Male	Female	Total
10-11	2	1	3
11-12	3	1	4
12-13	3	3	6
13-14	9	7	16
14-15	6	3	9
15-16	6	0	6
16-17	6	0	6
Total	35	15	50

The range 10-11 years is considered as those who has completed 10 years but not completed 11 years. The criteria were same for the other age groups.

As observed in table -2 the age group of 16-17 shows 100% disappearance of tri radiate cartilage. The above table considers both sexes hence they do provide exact idea of the disappearance of tri-radiate cartilage with respect to the sex. Table 3 and Table 4 provide detailed information of female and male respectively.

The categorization is modified as follows in the present study, which is similar to the Galstaum G. stages of process of union.

0 = No commencement.
+ = just commencement.
++ = Disappearance of tri radiate cartilage in process.
+++ = Near complete disappearance of tri radiate cartilage.
++++ = Complete disappearance of tri radiate cartilage.

From the table-2 we can see that, in the age group 10-11yr, there is no commencement of union but in the age group 11-12yrs, 33.33% cases show the appearance of secondary center in the cartilage. According to study shows in the table in the age group 12-13, no cases shows near complete ossification of tri radiate cartilage.

The table-2 shows that in the age group 13-14 out of 9 cases 22.22% cases have nearly completed ossification of the tri radiate cartilage while in remaining cases disappearance of tri radiate cartilage are in the process.

The table-2 shows that in the age group 14-15 out of 6 cases 66.67% have near completed the ossification of tri radiate cartilage while no cases shows complete disappearance (complete ossification) of tri radiate cartilage.

The table-2 shows that in the age group 15-16 out of 6 cases 100% have near completed the ossification of tri radiate cartilage while in 50% cases shows complete disappearance (complete ossification) of tri radiate cartilage and in the age group 16-17 100% have shows completed the ossification of tri radiate cartilage means complete disappearance of tri radiate cartilage.

The Table-3 shows that in the age group 10-11, there is no commencement of union but in the age group 11-12, cases shows the appearance of secondary center in the cartilage. The table-3 shows that in the age group 12-13, out of 3 cases 66.66% cases have nearly completed ossification of the tri radiate cartilage while in 33.33% cases disappearance of tri-radiate cartilage is in the process.

The table shows that in the age group 13-14 out of 7 cases 100% have nearly completed the ossification of tri radiate cartilage while in 57.14% cases shows complete disappearance (complete ossification) of tri radiate cartilage and in the age group 14-15, 100% have shown the completed ossification of tri radiate cartilage means complete disappearance of tri radiate cartilage.

In the present study, all the subjects were healthy and none was suffering from mal-nutrition. Out of 50 subjects 28, were purely vegetarian and 22 were occasional non-vegetarian. Above table-4 shows that there is no effect of disappearance of tri radiate cartilage in relation to vegetarian and occasional non-vegetarian diet. Nobody was purely non-vegetarian. In population of Gujarat majority of people are vegetarian and occasional non-vegetarian group are considered as vegetarian group.

This study considered as study of vegetarian group in relation to tri radiate cartilage, which disappears at the age of 16-17 in male and 14-15 in female. The chi-square test for various age group and food habits (occasional non-veg) was found insignificant at (P=0.05) with X2 = 0.45 Degree of freedom=2. For analytical purpose age group were clubbed & the chi square was applied which was found insignificant. (X^2 test was at probability of 0.05 with x2 value 0.05 with degree of freedom =4.)

Discussion:

In the present study, the disappearance of tri radiate cartilage takes place 2 years earlier in females than in males, which matches with the findings of Galstaun, Flecker and pryor.

This also supports the Adair Scammon (1921, USA) conclusion, that ossification proceed slightly rapid in females than in males.

In the present study, observation of right side and left sides of tri radiate cartilage (Acetabulum) has been done and both the sides showed simultaneous disappearance of tri radiate cartilage, this matches with the finding of Pryor J. W. who concluded that the ossification is bilaterally symmetrical regardless of normal variation that may occur.

Table.5: Comparisons of results of present study with other authors:

Author	Complete Disappearance of Tri radiate cartilage	
	Male	Female
Present Study (Gujarati)	16-17	14-15
G. Galstaun (Bengalis, 1930-37)	15-16	14
M.J. Pillai (Madras, 1936)	Commencement 11 years Completion 14 years	
Flecker H. (Australian, 1932)	15	13
Davis & Parson (England, 1927)	Completion 16 years	
Mckern & Stewart (1957)	Completion 17 years	
Dr. CM Rao, Dr. Suresh Sankhyan, Dr. Harinderjit Sekhon (Himachal Pradesh, 1993)	16.5+1, 16.5-1	14.5+1, 14.5-1

Galstaun who studied Bengali people concluded that disappearance of tri radiate cartilage take place in male at the age of 15 to 16 while in our present study it occurs at the age of 16 to 17 which is nearly one years late than the Bengali male According to his conclusion disappearance of tri radiate cartilage takes place in female at the age of 14 while in our present study it occurs at the age of 14 to 15, which is nearly similar to the Bengali female.

M.J. Pillai [3] who studied Madrasi people concluded that disappearance of tri radiate cartilage take place at the age of 11 and is complete at 14. He has not given separate reading for female and male. While in our present study ossification starts at the age group of 11 or 12 and is complete at the age of 16-17 in male while 14 to 15 in female. Thus our study co-relate with the findings of M. J. Pillai [3] who concluded the average age of epiphyseal union is in advance by two to three years than in temperature climates.

In the present study it was found that, the disappearance of the tri radiate cartilage is seen with complete eruption of second molar, but eruption of second molar is also observed in the subjects who show near complete or disappearance of tri radiate cartilage. The present study concludes that the tri radiate cartilage is consolidated by the age of puberty or shortly after puberty.

Conclusion:

1. The complete disappearance of tri radiate cartilage in pelvic bone occurs at the age of 16-17 years in Gujarati male & at 14-15 yrs in Gujarati female.
2. The complete disappearance of tri radiate cartilage in the pelvic bone is 2 years earlier in female than in male.
3. The fusion of tri radiates cartilage starts in the Acetabulum & Final union occurs at the

greater sciatic notch between Ilium and Ischium.

4. The fusion between Ilium & Ischium, ischium & pubis, Ilium and pubis (in Acetabulum) occurs simultaneously.
5. The ossification of tri radiate cartilage is bilaterally symmetrical.
6. Complete & near complete disappearance of tri radiate cartilage is associated with eruption of second molar tooth in progress.
7. Region As far as climate is concerned, the union takes place later in the temperate climates than in tropical climates.
8. As far:
   a. The Bengali males and females show earlier union of tri radiate cartilage (in Acetabulum) than those of Gujarati male and females considered in present study by 1 year.
   b. The Madrasis show earlier union of tri radiates cartilage (in Acetabulum) than those of Gujarati male and females considered in present study by more than 2 years.
   c. The Australians show earlier union of tri radiates cartilage (in Acetabulum) than those of Gujarati considered in present study by 6 months to 1 year.
   d. The Gujarati people show earlier union of tri radiate cartilage (in Acetabulum) than those of Himachal Pradesh by 6 months to 1 year.
9. The present study concludes that the tri radiate cartilage is consolidated by the age of puberty or shortly after puberty.

References:

1. **B.V. Subramanian.** Modi's "Medical jurisprudence of toxicology"; 22nd edition.
2. **Wilton Marion Krogman.** "The Human Skeleton in Forensic Medicine" 2nd edition.
3. **M. J. S. Pillai, L.R.C.P. & S., ETC., D.RE. (Edin).** "The study of epiphysial union for determining the age of south Indians" by Medical Superintendent, the Bernard Institute of Radiology, Madras.
4. **Galstaun G**. Indian Journal of Medical Research, 1937, 25, 267.
5. **J. H. Green and P. H. S. Silver.** "Age and Ossification of some hip-bone centers in Himachal Pradesh"& "An introduction to human Anatomy" Journal of Forensic Medicine and Toxicology, July- Dec 1993, & Jan-June 1994.
6. **Charles R. Noback.** 'the appearance of ossification centers and the fusion of bone" American journal of Physical and Anthropology, March 1954, page 63-69
7. **Mcminn R. M. H..** Last's Anatomy: Regional and Applied 10th edition, 1999: Churchil Livingstone.
8. **Gag Decker, DJ du plessis.** Lee McGregor's "synopsis of Surgical Anatomy" (tenth edition, pg 251) Indian edition by K. M. Varghese Co.
9. **K. T. Evans, B. Knight, D. K. Whittaker**. Forensic Radiology1stt ed 1981.
10. **Guyton and Hall.** Textbook of Medical Physiology, 9th edition.
11. **C. C. Chatterjee.** Human Physiology, 10th edition.
12. **Jack Edeiken, Murry Dalinka, David Karasick.** Edkin's Roentgen Diagnosis of disease of bone; vol. 1, 4th edition.
13. **Kenneth L. Bontrager.** "Textbook of Radiographic Positioning and related Anatomy." 3rd edition.
14. **Adams Greens.'** Man in Orthopedic Radiology, part 1 : chapter Trauma 5.2 to 5.13
15. **Kumar P.** Modified Prasad Social classification given by Indian journal of community medicine, 1993.

Table 2: Disappearance of Tri Radiate Cartilage in Pelvic Bone in Gujarati Male

Age group (yrs)	Total cases	Different stage of ossification of tri radiate cartilage (Acetabulum)					% of cases with near complete ossification of tri-Cart.	% of cases with complete ossification of tri-Cart.
		0	+	++	+++	++++		
10-11	2	2	-	-	-	-	0	0
11-12	3	2	1	0	-	-	0	0
12-13	3	-	1	3	2	-	0	
13-14	9	-	1	6	6	-	22.22	
14-15	6	-	-	2	4	-	66.67	0
15-16	6	-	-	-	-	3	100	50
16-17	6	-	-	-	-	6	100	100

Table 3: Disappearance of Tri Radiate Cartilage in Pelvic Bone in Gujarati Female

Age group(yrs)	Total cases	Different stage of ossification of tri radiate cartilage (Acetabulum)					% of cases with near complete ossification of tri-Cart.	% of cases with complete ossification of tri-Cart.
		0	+	++	+++	++++		
10-11		1	-	-	-	-	0	0
11-12		-	1	-	-	-	0	0
12-13		-	-	1	2	-	66.66	
13-14		-	-	-	3	4	100	
14-15		-	-	-	-	3	100	100
15-16		-	-	-	-	-	0	0
16-17		-	-	-	-	-	0	0

Table -4 : Relation of the type of food habit with complete disappearance of tri radiate cartilage at different age group in male and female

Age group	Vegetarian						Occasional non vegetarians					
	Total cases			Cases with complete disapp. Of T.C.		% of cases showing complete disapp. Of T.C.	Total cases			cases with complete disapp. Of T.C.		% of cases with complete disapp. Of T.C.
	M	F	Tot	M	F		M	F	Tot	M	F	
10-11	1	1	2	0	0	0	1	0	1	0	0	0
11-12	1	0	1	0	0	0	2	1	3	0	0	0
12-13	3	2	5	0	0	0	0	1	1	0	0	0
13-14	5	3	8	0	2	25	4	4	8	0	2	25
14-15	4	1	5	0	2	20	2	2	4	0	2	50
15-16	3	0	3	0	0	33.33	3	0	3	2	0	66.66
16-17	4	0	4	4	0	100	2	0	2	2	0	100

Obituary

Professor [Dr] Sheetal Jain

[July 10,1956 – August 13, 2011]

He did his MBBS & MD from the University of Rajasthan in 1981 &1996 respectively. Joined the government services in 1986 as senior demonstrator. He worked as an enthusiastic persona at Kota, Jaipur and Udaipur. Promoted to Assistant Professor in 2000, as Associate Professor in 2004-05 and as Professor in 2010.

He will be remembered for his generous nature, courage, leadership and decisiveness. For those who were in stress he always stood as a supporting pillar.

Dr Sheetal Jain had an inclination towards anthropology, entomology, domestic and environmental toxicology. May the love of friends comfort and strengthen the family in these difficult days. His name can't be erased from the hearts of his students and colleagues.

We will miss you a lot

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Epidemiological Profile of Suicide by Hanging in Southern Parts of Kerala: An Autopsy based Study

*Sharija.S, **K. Sreekumari, ***O. Geetha

Abstract

Suicide rate is increasing all over the world; but the rate is disproportionately higher in Kerala. One hundred and eighty one cases of known dead bodies of both genders brought for medico-legal autopsy with history of suicide by hanging, were studied at the Department of Forensic Medicine, State Medico Legal Institute, Government Medical College, Thruvananthapuram, Kerala, India.

There was a male preponderance in the study group (71.3%) and majority of males were young or middle aged (82.1%) whereas females were adolescents or young adults (73.1%). Among the males, only 2.3% were farmers. Alcoholism was noted in 75.2% of males. Immediate psychological problems were the reason for suicide in 33.7% of cases, majority of them being married (55.8%).

Soft materials, that were easily available, were used as ligatures (48.6%) which were tightened around neck by slip knots (58%) on the sides of neck (53%).

Key Words: Suicide, Hanging, Psychological Problems, Alcoholism, Soft Ligature Material

Introduction:

Suicide is a self directed act having a fatal outcome. Of all the deaths 0.4 to 0.9% are suicides. Suicide rate is increasing all over the world; but the rate is disproportionately high in Kerala. Kerala with 3.1% of total population has the highest suicide rate among the states of India constituting up to 10% of national average. Suicide is the second most common manner of death in adolescents and young adults. [1] In India, according to Report of National Crime Records Bureau, common methods of committing suicide are poisoning (36.6%), hanging (32.1%), self immolation (7.9%) and drowning (6.8%) [In Kerala, 49% of suicide in the year 2006 and 48% in 2007 were due to hanging [Crime data, State Crime Records Bureau, Thiruvananthapuram].

Suicide rate increases with age and at all ages males predominate the females. Suicide is low among Jews. Marriage is a protective factor and married persons have lowest suicide rate than single, divorced or separated. [2]

Corresponding Author:

*Assistant Professor, Deptt. of Forensic Medicine, Medical College, Thiruvananthapuram
Kerala, Pin- 695011
E mail: sharijajp@yahoo.co.in
**Professor & Head,
Medical College, Alappuzha, Kerala,
***Associate Professor,
Sree Gokulam Medical College and Research Foundation, Thiruvananthapuram, Kerala

Risk factors for suicide are psychiatric disorders, social factors, immediate psychological factors and physical disorders. [2] As per the national data, mental illness constitutes only 5%. As per the data gathered by Kerala State Crime Records Bureau, “family problems” were the most common cause (23.4%) followed by physical illness (15.3 %) and mental illness (12.2%). Alcoholism increased the risk of suicide from 2.2 to 3.4%. [2] According to Bertolote J. M, 80% cases are associated with alcohol abuse and depression. [3] Hanging is a form of violent asphyxial death produced by suspending the body with a ligature around neck and the constricting force being the weight or part of the body weight. [4] All cases of hanging are considered to be suicidal until the contrary is proved. [5]

Any substance available at hand is used as ligature. Articles commonly used as ligature are soft materials like ‘dhothie’, ‘Saree’, ‘Bed-sheet’, ‘Sacred thread’, ‘handkerchief’, ‘neck tie’, hard and pliable materials like ‘Electric cord’, ‘Belt’, ‘wire’, ‘Leather strap’ and materials producing patterns like ‘Rope’ made of cotton, coconut fibre or jute, etc or anything handy and available near the place of occurrence.[6]

Present study was an attempt to analyze the socio demographic pattern, causes and precipitating events for persons who committed suicides by hanging.

Material and Methods:

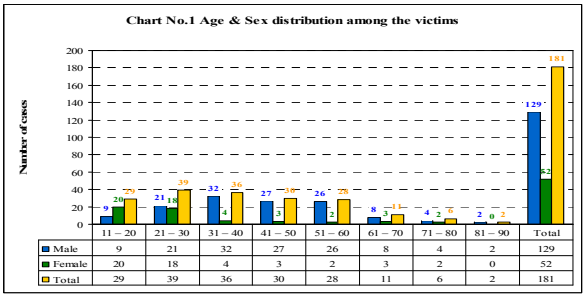
This cross-sectional study was conducted on 181 cases of known dead bodies

of both genders, brought for medico legal autopsy with a definite history of suicide by hanging, at the Department of Forensic Medicine, State Medico legal Institute, Medical College, Thiruvananthapuram during the period from October 2006 to September 2008. The inquest reports and police records were scrutinized in detail.

One of the near relatives, having good, personal information of the deceased was interviewed in detail in every case and information regarding history of the incident, motive for suicide, precipitating factors and personal habits were gathered from them. The ligature material, whenever available, was examined for its nature, texture and strength.The data/findings of the examinations were recorded in the Proforma, coded into a chart and analyzed. The analysis was done using SPSS (Statistical Package for Social Sciences) 11.5 Version.

Results:

On analyzing the 181 cases of suicide by hanging the following observations were made.



χ^2 = 46.561 df = 7 p = 0.00

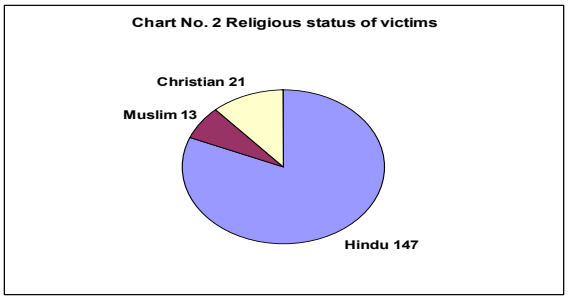
Majority of the victims were in the age group of 21 - 40 years (41.4%). (Chart 1) Among the females 26.9% were students. (Table 1)

Table 1: Occupation of victims

Occupation	Male		Female	
	No.	% age	No.	%age
Professional	3	2.3	0	0
Govt. servant	5	3.9	0	0
Private employee	7	5.4	4	7.7
Manual labourer	58	45.0	1	1.9
Farmer	3	2.3	0	0
Unemployed	20	15.5	2	3.8
Student	7	5.4	14	26.9
Housewife	0	0	28	53.8
Others	16	12.4	2	3.8
Business	3	2.3	1	1.9
Driver	4	3.1	0	0
Self employed	3	2.3	0	0
Total	129	100	52	100

χ^2 =119.75 df = 11 p = 0.00

Suicide rate was lowest among Muslims (13cases) in this study (Chart No.2). A good number of the victims in this study were married (55.8%). (Chart No.3)



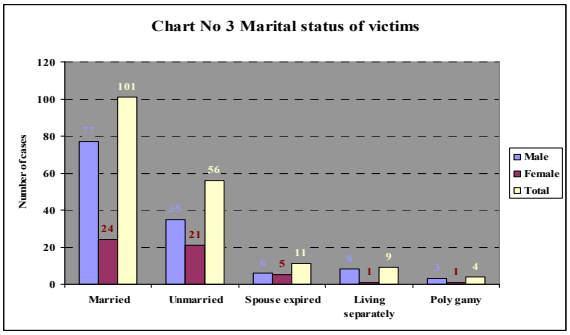


Table 2: Personal Habits of victims:

Personal habits	Male		Female	
	No.	% age	No.	% age
Nil special	16	12.4	50	96.2
Smoking	8	6.2	0	0
Alcoholism	31	24.0	1	1.9
Smoking & Alcoholism	66	51.2	0	0
Poly substance abuse	8	6.2	1	1.9
Total	129	100	52	100

χ^2 =115.173 df =10 p = 0.000

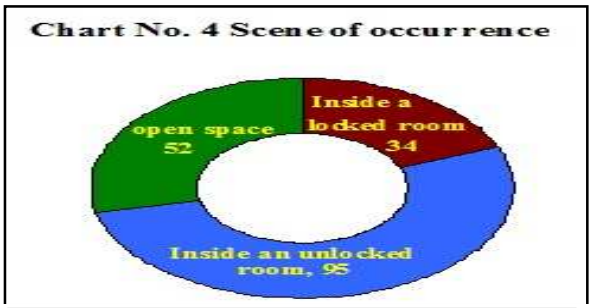
A good majority of victims, 75.2% were alcoholics (Table 2). Immediate psychological problems were stated as an important reason for suicide (33.7%). (Table.3)

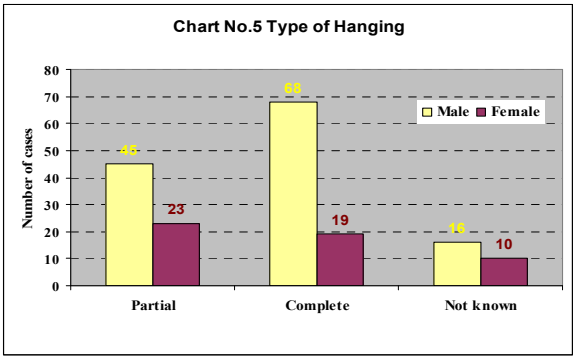
Table 3: Reason for Suicide

Reason for suicide	Male		Female		Total	
	No	%age	No	%age	No	%age
Psychological problems	37	28.7	24	46.1	61	33.7
Chronic illness	25	19.4	3	5.8	28	15.5
Debt	11	8.5	0	0	11	6.1
Family problems	18	14.0	8	15.4	26	14.4
Unknown	14	10.8	11	21.2	25	13.8
Mental illness	12	9.3	4	7.7	16	8.8
Stress of police enquiry	1	0.8	0	0	1	0.5
Death of a loved one	9	7.0	0	0	9	5.0
Alcoholism	2	1.5	2	3.8	4	2.2
Total	129	100	52	100	181	100

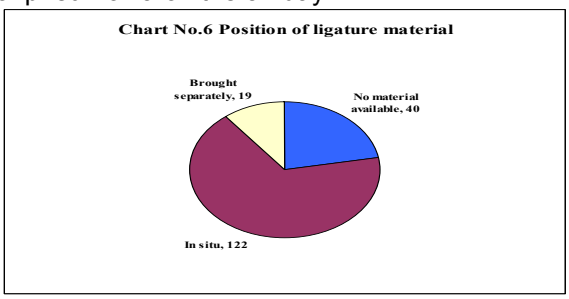
χ^2 = 20.153 df = 8 p = 0.010

Only 18.8% of victims were found in rooms locked from inside before the act (Chart No.4). In majority of males (52.7%), hanging was 'complete'. (Chart No.5)

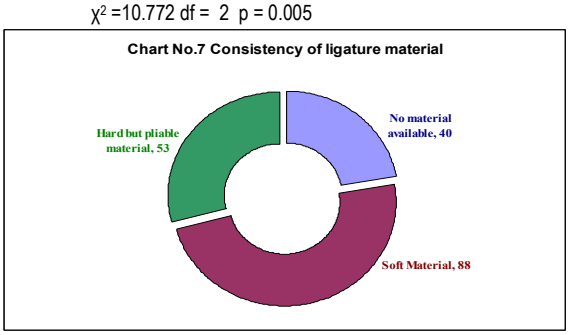




Only one among the 181 cases survived for more than one hour. He was treated, but died of pneumonia on the 5th day.



χ^2 =10.772 df = 2 p = 0.005



χ^2 =13.170 df =3 p=0.004

Table 4: Type of the ligature material

Type of ligature material		Male		Female	
		No.	%age	No.	%age
No material available		21	16.3	19	36.6
Soft material	saree	14	10.9	9	17.3
	shawl	2	1.6	14	26.9
	lungie	32	24.8	1	1.9
	dhothie	11	8.5	0	0
	bed sheet	3	2.3	2	3.9
Hard but pliabl	coir rope	6	4.6	1	1.9
	plastic rope	34	26.3	5	9.6
	others	6	4.7	1	1.9
Total		129	100	52	100

χ^2 =56.675 df = 8 p=0.000

Soft materials like saree, shawl, lungie etc were used by 48.6% of the subjects (Chart 7 and Table 4). In majority of the victims a running noose was created on the ligature material with a slip knot for constricting the neck (58%). Reef knot, which formed a fixed noose, was seen in only one case (Table 5). Though not overwhelming, preference was for the right side of the neck for the placement of the knot (53%). (Table.6)

Table 5: Type of knot:

Type of knot	Number	Percentage
No ligature material	40	22.1
No knot	19	10.6
Half knot	10	5.5
Slip knot	105	58.0
Multiple knots	3	1.7
Reef knot	1	0.5
Twisted together without knot	3	1.7
Total	181	100

Table 6: Site of knot:

Site of knot	Number	Percentage
No ligature material	40	22.1
Not informed	25	13.8
Back of neck	17	9.4
Front of neck	3	1.7
Right side of neck	53	29.3
Left side of neck	43	23.7
Total	181	100

Chronic illnesses like Occlusive coronary artery disease, Obstructive airway disease, and chronic venous ulcer on leg were present in one case each. In addition, corrosive and non corrosive poisons were present in one case each; alcohol was present in 11 cases.

Discussion:

One hundred and eighty one cases of suicide by hanging brought for autopsy during a period of two years were studied. A male preponderance was noted in this study group also, similar to the study by Davidson. [7] A preponderance of female victims was noted in the younger age groups. Males committed suicide a little bit later, between 21 to 60 years. Similar observations noted in other studies conducted in India. [8, 5] Western studies are not in agreement with these findings, where maximum occurrence in both sexes was between 21 to 30 years. [2]

As age advanced, Indian females appear to be capable of facing 'problems of life' with more responsibility, guts and courage, probably due to strong emotional ties and a feeling of responsibility and bonding to their family and children, the socio cultural scenario being peculiar to India, particularly to Kerala. The youngest among the victims were an 11 year old boy and a girl who committed suicide at home, problems at school being cited as reason. They were not from the same school and were

from different areas of the same city. This substantiates Modi's statement that 'age is no bar to suicide by hanging'. [4] Polson and Gee also reported suicide of a 10 year old child by hanging. [9]

Majority of male victims were manual labourers (45%); majority of females were housewives (53.8%), and students (26.9%). Only a very small proportion of females were working women in the society. Unemployed persons constituted 15.5% of the victims, probably due to lack of social/financial support. Increased stress of daily life, faced by persons belonging to lower socio economic strata could have been the precipitating event.

Marriage does not seem to be a protective factor particularly for the males in Kerala unlike western data. In the present study 55.8% of victims were married. Most of the males were alcoholics (76.1%). Kerala is infamously renowned for high alcohol consumption rate when compared to the other major states of the country. Therefore this finding could be a reflection of the ill effects of increased alcohol consumption, on the community. Immediate psychological problems (33.7%), chronic illness (15.5%) and family problems (14.4%) were the other major causes for suicide. This observation is not similar to that of Davidson, who had noticed psychological upset as the major cause for suicide in 62.8% of cases. [7] Cases of complete hanging are more among males (52.7%) due to the easy accessibility of higher suspension points with or without the use of stepping devices. Ligature material was made available for medico-legal examination only in 77.9% of cases. All were 'easily available materials' as observed by Modi also. [4] Soft materials like 'Saree', 'shawl' etc were used by 48.6% of subjects studied. Soft materials are ideal for hanging according to Bhattacharjee.[10] Naik S K had also observed the use of soft materials as ligatures in majority of his cases (54.7%).[11]

A person in police custody committed suicide in a cell room of a Hospital where he was admitted for treatment in this study. He had used a piece of his bed sheet as ligature material. A similar case was also reported previously. [12] In the present study, an unmarried couple hung themselves from the two ends of the same ligature material that was hooked to one point. Suicide pacts like this have also been reported by Di Maio. [13] Different types of knots have been described by Nute. [14] Artificer's knot was used in the case described by Tardieu. [9] A fixed noose is one in which the rope is knotted; running noose is one in which one end of the rope is freely passed through a loop made on the other end. [15] The usual choice was a simple slipknot producing a running noose, as seen in 58% of cases. A simple loop without any knot, as described by Mukherjee, was seen in 1.7% of cases. [6] Knot was seen on the front of neck only in 1.7% of cases.

Conclusion:

Hanging is the most common method of suicide in Kerala. The factors deciding method of suicide like accessibility, feasibility, credibility and rapidity of the method were applicable in this study also, as death by hanging can be easily achieved using cheap and easily available materials. Marked differences were noted in different geographical areas regarding age group, gender, causes and method of suicide. Rate of suicide in Kerala differs from national average but is similar to western standards.

There is an increasing tendency for suicides by hanging, emerging among the youth and families. The reason for this increased rate of suicides may be due to the transition phase from protective to liberal economy in Kerala, growing ambition of youth and lack of social support. The government has to accept this reality and take steps to tackle this growing menace at the grass root level.

References:

1. **Fauci, Baunwald, Kasper et al.** Harrison's Principles of Internal Medicine. New York. 17th ed: 27-28.
2. **Benjamin J Sadock, Virginia A Sadock.** Kaplan & Sadock's Comprehensive Textbook of Psychiatry.7th ed. Lippincort Williams & Wilkins. PA.2000:2031-2036.
3. **Bertolote.** Primary mental, neurological and psychosocial disorders. World Health Organization. Geneva.1998.
4. **Mathiharan K, Amrith Patnaik.** Modi's Medical Jurisprudence and Toxicology. 23rd ed. Lexis Nexis Butterworths. New Delhi. 2006: 565 – 90.
5. **Guhraj PV.** Forensic Medicine. 2nd ed. edited by M.R. Chandran. Orient Longman. New Delhi. 2003: 175-181.
6. **Mukherjee J B**. Forensic Medicine and Toxicology. Academic Publishers. Calcutta. 1981. P. 453-91.
7. **Davidson A, Marshal TK.** Hanging in Northern Ireland- A survey. Med. Sci & Law. Jan.1983: 23.
8. **Farooq Ahammed Khan, B Anand, K Krishna Murthy et al.** Psychological autopsy of suicide- a cross- sectional study. Indian J Psychiatry. 47. (2). 2005: 73-78.
9. **Polson CJ, Gee DJ, Knight B.** The Essentials of Forensic Medicine. 4thed. Pergamon Press. Oxford. 1985: 351- 420.
10. **Bhattacharji PK.** Medicolegal Companion. 2nd edn. Aruna Publications. Lucknow. 1968: 167-180.
11. **Naik SK, Patil DY**. Fracture of hyoid bones in cases of asphyxial deaths resulting from constricting force round neck. JIAFM 27 (3).2005:149- 153.
12. **Arthur R Copeland.** Fatal Suicidal Hanging among Prisoners in Jail. Med. Sci & Law. 29. (4). 1989: 341-345.
13. **DiMaio VJ, DiMaio D.** Forensic Pathology. 2nd ed. CRC Press. London. 2001: 230-75.
14. **Nute HD.** "Mirror Images in Knots". Journal of Forensic Sci. 31. (1). Jan 1986: 272-279.
15. **Parik CK.** Parikh's Text book of Medical Jurisprudence Forensic Medicine and Toxicology – for classrooms and court rooms. 6th ed. CBS publishers & distributors. New Delhi. 2007: 3.40 – 3.56.

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Original Research Paper

Alcohol and Crime Behaviour

*Vijayanath.V, **Tarachand.K.C.

Abstract

Alcohol use has been shown to be associated with High Risk Behaviour (HRB). However, the exact nature of this association remains to be clarified. 100 male patients admitted with an ICD-10 diagnosis of Alcohol Dependence Syndrome (ADS) were studied using both self-report and semi-structured interview. The data was analysed using an Event- analysis technique for the occurrence of HRB, namely Road traffic Accidents, Crime and Violence, Self-injurious behaviour and risky Sexual behaviour. Personality variables were studied using the Sensation Seeking Scale, Form V, Indian Adaptation and Barratt's Impulsivity Scale, version 11. Data was analysed using SPSS, with Independent t-test, chi square and logistic regression.

Out of the 100 patients studied 64 of the sample were exposed to HRB. Analysis of the data found evidence that Severity of Dependence, Personality Constructs of Sensation Seeking and Impulsivity, and lower Educational status showed significant association with HRB. On logistic regression analysis Lower Educational Status, Sensation Seeking Scores and Severity of Alcohol Dependence were found to predict H R B. The occurrence of HRBs was substantial among patients with ADS, with majority of them involved in road traffic accidents.

Key Words: High-risk behaviours, Sensation seeking, Impulsivity, Education

Introduction:

Large surveys involving alcohol and crime have often been conducted on incarcerated populations, with very high levels of abuse and dependence generally reported. Motor vehicle accidents are the single important cause of injury, accounting for nearly 50000 deaths and 4-5 million injuries annually. Alcohol use has been proposed as a potentially modifiable risk factor in the spread of HIV infection. Alcohol is thought to interfere with judgment and decision- making, and it has been suggested that its use in conjunction with sexual activity might increase the probability that risky behaviour will occur. Heavy alcohol use is associated with varieties of HRB. While some studies have highlighted the role of drinking variables such as amount of drinking per occasion and drinking patterns, others have implicated personality variables that result in high-risk behavior.

Material and Methods:

The study was conducted in the Davangere district in different hospitals where patients with ADS were admitted.

Corresponding Author:

*Assoc. Prof., Forensic Medicine & Toxicology, S.S.Institute of Medical Sciences & Research centre, Davangere-577005, Karnataka
E mail: drvijayanath@rediffmail.com
** Professor, Department of Anthropology Karnataka University, Dharwad.Karnataka

Though patients with an Alcohol-related illness with HRB may seek help from other departments, namely Emergency Medicine, Orthopaedics, or Medicine, these patients were not included due to the possible presence of co-morbid debilitating illnesses. The patients were screened to ensure they fulfilled the following inclusion criteria and exclusion criteria.

Inclusion Criteria:

- Male patients, In-patients, ICD-10 diagnosis of ADS.

Exclusion Criteria:

- Any other co morbid Axis-1 psychiatric diagnosis. Any other substance use, except tobacco Presence of cognitive impairment.

Consenting patients were then interviewed on SCID to establish a diagnosis of alcohol dependence syndrome. SCID was also used to exclude any other co-morbid axis-I diagnosis.Patients were then screened using CIWA-AD and Mini-Mental State Examination to ensure that patients were not in withdrawal state and had no cognitive impairment respectively.

Results:

The total number of patients that were enrolled into the study was 100. This sample was obtained from the male patients with a diagnosis of ADS according to ICD-10, admitted in various hospitals/ nursing homes. The mean age of the sample was 41.6 ± 8.8 in years, with 55% of the patients coming from the urban background. The majority of patients were from

nuclear families (79%), whereas 12% of the study group were either separated or divorced.

The distribution of educational qualification showed that 54% of the subjects had primary education, which included those who completed 10th or who discontinued school. 30% of the population had completed graduation, whereas 14 % of the sample had no primary education. 32% of the study population was occupied in the service sector, which included Banks, post offices, public sector, and teaching profession. 31% of the population was agriculturists. Those who were in business and engaged as daily labourers were equally distributed (16%).

Examining the frequencies of HRB in the entire sample it was seen that the occurrence of road traffic accidents (50%) was the highest among the risk behaviours, with 45% also being involved in risky sexual behaviour. Crime and violence was seen in 24 % of the sample, whereas 24% showed self-injurious behaviour. These were values of occurrence of HRB without accounting for any temporal relation with alcohol use.Event- analysis technique was used to determine the occurrence of HRB in temporal relationship with alcohol use. HRB was defined for this purpose as occurrence of the event within 2 hours of the consumption of 32 grams of alcohol that had been consumed in less than 2 hours. The analysis of the results showed that 64% of the sample had been involved in some form of HRB, with a temporal relationship with alcohol use.

The results of the association of sociodemographic data with HRB shows that among all the variables only Education showed a significant association with Chi square of 0.012, with the degree of freedom of 3. HRB was seen in about 39% of patients who had education of primary and less, while 25% of those with higher levels of education showed HRB. 27% of those from the rural background had HRB compared with 37% of those from the urban areas; however the association was not significant. The highest levels of High Risk was seen in those married (49%), however this was also the single largest category under marital status accounting for nearly 79% of the sample. The maximum of HRBs was seen among farmers (18%), with labourers and businessmen accounting for nearly 11% each. 152 (51%) of the patients with HRB s were from nuclear families, however family structure was not significantly associated with HRB with chi square value of 0.145. 64% of the population had a positive family history of ADS and 43% showed HRB, however there was no significant association found between these variables.

Discussion:

This study was conducted to analyse the association between HRB and Severity of ADS and Personality Constructs such as Sensation Seeking and Impulsivity. The study analysed data obtained from 100 male patients who fulfilled the ICD-10 criteria for ADS. [1] Earlier studies, mainly from the West [2, 3, 4] have shown positive association with the above mentioned variables. Though a few studies in India have also examined the association of Alcohol Abuse and HRB [4], studies assessing the personality variables are very few. [5] Hence it was felt that a study analyzing the Severity and the Personality variables would prove beneficial in furthering our understanding in this field especially in the scenario of increasing incidents of road traffic accidents, suicides and risky sexual behavior. [6]

All 100 patients recruited consented to participate in the study. Analysis of the socio-demographic data showed the mean age of the sample was 41.6 ± 8.8 years. The majority of the patients belonged to the urban background (56%). 79% of the study population were married, and 9% were separated from their spouse, while 6 patients were divorced. 10% of them were single. Majority of patients were from nuclear families (82%) while 11% were staying in extended or joint families and only 7% were living alone.

The educational level of the population consisted of 54%. 14% had no formal education. Around 30% had graduated, while only about 2% had done post graduation or specialized in any field. Thus, if the study group was divided into those who had completed 12 years of schooling versus those who had less, it profile of participants showed that 67% of the group had less than 12 years of education. 31% of participants were employed in agricultural sector, 17% were daily labourers, while 17% were businessmen. 32% of the patients were in the service sector, which included such establishments like banks, public sector organizations and schools. Only about 3% of participants were professionals. The socio-demographic data appears to be comparable on many of the variables to a study conducted at

The PGIMIER, Chandigarh by Mattoo et al [5] 37, where 230 men undergoing treatment for substance dependence at the Drug De-Addiction and Treatment Centre, showed that the mean age of the sample was 37.2 ± 7.78 years, with 72% coming from an urban

background, and 83% were married and 59% had an education of less than 12 years.

The next step in the analysis was to determine the frequency of occurrence of High Risk Behaviour in the sample. This was done using self- reporting of the occurrence of the highrisk behaviours. The HRBs that were specifically examined in the present study were Road Traffic Accidents, Crime and Violence, Self-Injurious behaviour and Risky Sexual Behaviour.

A large number of western [2, 7, 8] and Indian studies [5, 9] have shown association of these risky behaviours with alcohol use. In the present study, majority of the patients (51%) were involved in road traffic accidents, 46% in risky sexual behaviour and fewer number were involved in crime and violence (23.7%), which included assault, stealing, arson, homicide, weapon possession, rape, and drug peddling.

This category does not involve drunken driving or convictions for consequences of driving while drunk. Self- injurious behaviour was seen in 24.3% of the sample. This was inclusive of suicidal attempts, selfmutilating behaviour and voluntary use of large quantities of alcohol on specific occasions with the intention to cause self-harm at that instance. Many of the other studies have found similar prevalence of HRB. In a study by Lapham et al [10] the prevalence of psychiatric disorders among persons convicted with Driving While Impaired (DWI) studied.

The sample was drawn from a database of convicted DWI offenders referred to and screened by the Lovedale Comprehensive Screening Program (LCSP). Diagnosis of the various psychiatric conditions was made using the Diagnostic Interview Schedule. A total of 612 women and 493 men were studied who were convicted for DWI. This data was compared with the National Comorbidity Survey data which had 602 women and 578 men. Prevalence rates showed that 70% of the male offenders had a diagnosis of ADS, whereas only 35.7% of the men had a diagnosis of ADS in the National Comorbidity Sample. High rates could be explained due to the age characteristics of this sample which had 60% of the males in the age group less than 34 years, and only 27.6% were married at the time of the study with 35.1% being single and a large number (37.3%) either divorced, separated or widowed.

However, other studies namely by Fish and colleagues [11] and also in a longitudinal study of a community sample of young men McCord58 found that in those later convicted with drunk driving nearly 50% were Alcohol Dependent at follow-up, with a constant increase in the prevalence of a diagnosis of ADS in following convictions as seen by 70% of the second- time offenders, with further increases to nearly all those convicted with multiple convictions for drunken driving fulfilling the criteria for dependence.

Thus, what these studies show are that Road Traffic Accidents are one of the most common HRB seen in people with ADS as has been noticed in our study, though the rates may vary. The differences could be explained mainly on the basis that the other studies mentioned were community- based studies which could have picked up many others with ADS who would otherwise not have approached any centre for help. Moreover confounding variables of age and personality have not been accounted for in these studies.

Studies have also supported the association between Alcohol dependence and Criminal behaviour. Some of the important studies that have studied the concept have found meaningful association. In a study by Greenfield et al [12] to analyse the association between criminal behaviour and alcohol the authors used data obtained from the US National Alcohol Survey 1990 and also the 1989 General Population Survey of a large Western county. Illegal behaviours were measured in each survey using a questionnaire prepared for the study that took Illegal behaviours as being the dependent variable.

Six items representing various types of illegal behaviours were included in the analysis. These items were either identical or similar enough to be considered the same type of illegal behaviour. They included 2 alcohol offences: public drunkenness and driving intoxicated, and four others, including motor vehicle theft, burglary-theft, assault and robbery and selling drugs. These were similar to the conditions sought in this current study. Prevalence of the criminal behaviour apart from drunk driving accounted for nearly 22.6% of the total illegal behaviour. Logistic regression of the variables showed that male gender (Odds ratio=3.35), age 60 (Odds ratio= 0.16), alcohol problems (Odds Ratio= 0.27) with even education showing a negative correlation with illegal behaviour with higher rates in those with education less than high school. The association with male gender and alcohol problems showed the greatest significance with a p-value of <0.001.The lifetime drinking problems significantly predicted current criminal behavior.

The occurrence of Risky Sexual Behaviour in association with alcohol has been

established in many western and Indian studies, as has also been seen in the present study. In a large prospective study conducted by Chandra et al [9] in patients admitted between 1993 and 1997 to the psychiatric wards at the NIMHN, Bangalore with a positive HIV infection, it was found that of the 2283 patients detected to have HIV infection, nearly 44% fulfilled the criteria for ADS.

Multiple heterosexual contacts were the commonest route of transmission recorded with 65.2% of the sample reporting the same. The finding in the current sample of nearly 46% showing high risk sexual behaviour, which appears lower than the 65.2% indulging in sexual encounters with multiple partners, could be accounted for the fact that the NIMHANS study consisted of only those patients who had HIV infection. Hence spontaneous reporting of HRB may have been much higher, compared to the fact that our sample consisted of patients who had been admitted primarily for de-addiction from alcohol.

This study used an Event-Analysis technique. In the present study HRB was considered to be related to prior alcohol use if the following guidelines were satisfied:

. Consumption of 32 gms or more of alcohol in the two hours preceding the occurrence of the event, and this amount being consumed in less than two hours. In the National Health and Nutrition Examination Survey (NHANES) [13] conducted by the National Centre for Health Statistics in 1971 in the US, around 11361 patients were interviewed using a questionnaire to examine the relationship between the usual number of drinks consumed per occasion and the incidence of fatal injuries. The crude incidence of fatal injury was 6.6 per 10000 person-years. For men it was found that the incidence of fatal injuries increased when the usual number of drinks reached 3-4 per occasion. For women, the incidence of fatal injuries increased when the usual number of drinks consumed reached 5-8 per occasion. After adjusting for age, sex, education, and race using the Cox proportional hazards method, the relative risk of fatal injury was 1.9 (95% confidence interval, 1.0 -3.5, $p<0.05$) for persons who consumed five or more drinks per occasion compared with all other persons.

In an event analysis technique to study the association of alcohol use with sexual activity, Leigh [14] 35 used a dairy technique to record drinking and sexual activities for a week. 99 people completed the full study of which 37 were heterosexual women, 17 lesbians, 30 heterosexual men, and 15 homosexual men.

The age of the sample varied from 18 to 60 years, with the mean age of 29 years. Respondents averaged 2.6 sexual encounters and 4.7 drinking incidents per week, with an average of 3.5 standard drinks consumed per drinking episode. Drinking episodes were matched with sexual incidents if drinking took place within the four hours before the commencement of sexual activity. 41% of all sexual encounters followed a drinking episode, and 21% of drinking episodes were followed by a sexual encounter.

Many other studies [27] have also looked at blood alcohol levels in patients reporting to the Emergency room with road traffic accidents and have been found to have blood alcohol concentrations more than 50mg /dl. Therefore, the aforementioned criteria that deemed the occurrence of a HRB were related to prior alcohol use used in the present study. Using this criterion the overall occurrence of HRB in the sample was 64.3 % with some patients having multiple

High-Risk Behavior (HRB):

HRB and its association with the various sociodemographic variables, Severity of Alcohol Dependence, Personality variables of Sensation Seeking and Impulsivity were studied. These were the Severity of Alcohol Dependence as measured by the Addiction Severity Index (ASI) Composite score ($p <0.05$) that was obtained using the ASI manual, the Personality variables of Sensation Seeking and its subscales of Thrill and Adventure Seeking (TAS), Experience Seeking (ES), Disinhibition (Dis) and Boredom Susceptibility (BS) and the measures of Impulsivity namely, the Total BIS Score and its subscores of Nonplanning, Cognitive and Motor. All the above-mentioned measures showed significant association with HRB with the p-values less than 0.05. These results were in accordance with several other studies done earlier. In a study on the relationship between Intimate partner violence (IPV) and the role of Alcohol, Thompson and Kingree [15] examined 501 men and 1,756 women who had experienced an IPV physical assault.

Logistic regression analyses showed that after controlling for relevant covariates, women whose partners had been drinking were significantly more likely to be injured than were women whose partners had not been drinking. A woman's own alcohol use was unrelated to victimization outcomes.

A study by Greenfield and Wiesner [7] who analysed data from two probability surveys of household populations after controlling for

age, gender, income, marital status, employment, education, race and drug use, lifetime drinking problems significantly predicted criminal behavior (odds ratio 1.3 and 1.5, respectively) with slightly stronger relationships noted in equivalents models predicting arrest (odds ratio 1.7 and 1.8, respectively) and conviction (odds ratio 1.7 and 1.6).

Macdonald and Pederson [16] investigated the driving behaviors of 258 male alcoholics receiving treatment for alcoholism using a self-administered questionnaire about their driving behaviour, over which their official driver records were accessed. On average, the surveyed individuals drank and drove about 8.6 days per month at the legal level of impairment in Canada (i.e., 80 mg %).

Evidence showed that about 88.3% of the sample had driven while impaired. The probability of being arrested for impaired driving was estimated to be about one in 1168 impaired driving events. People were divided into three groups according to their number of Driving While Impaired (DWI) arrests in the previous 10 years, as determined by self-reports and official driving records: zero DWI arrests, one DWI arrest, and multiple DWI arrests. Those with multiple DWI arrests drove while impaired more frequently and with more risky styles of driving than people with zero arrests.

Those with two or more arrests also reported that they enjoyed driving under a greater variety of situations as compared to those with zero arrests. Multiple offenders had significantly more total collisions than zero time offenders; however, there were no significant differences among the three DWI groups for collisions without alcohol involvement or other types of traffic violations. Results showed that the number of DWI arrests was generally not related to worse driving when sober. Thus, this indicated that persons with Alcohol dependence had a higher risk of being involved in Risky Driving, with greater frequency of arrests for the same. In a study by Morrison and Diclemente et al [17], the frequency of alcohol use in the past 30 days and HIV-related risk behaviours among adults in an African-American community were analysed. Data were collected by trained street outreach workers, from 522 persons in 4 areas selected on the basis of 7 health and criminal justice indicators of high risk for HIV, STD and substance abuse, and drug-related arrests.

A survey assessed demographics, substance use, sexual behaviour, HIV knowledge, attitudes and depression. Subjects reporting using drugs other than alcohol (n=201) were excluded from analyses to avoid the confounding influence of polysubstance use. Of the remaining 321 subjects (mean age=37.1; 58.5% were male), 43.6% reported no alcohol use in the past 30 days, with 37.4% and 19.0%, respectively, having used alcohol < =15 days and = > 16 days in the past 30 days. Alcohol use frequency (no alcohol, 1-15 days, 16-30 days in past month) was significantly associated with being male, STD history, non-use of condoms, higher perceived risk of HIV, lower condom use self-efficacy, multiple sex partners in the past 30 days, and lower HIV-related knowledge.

Though the association between Alcohol Dependence and the occurrence of HRB has been established many of these studies have proposed that this association may be due to unobserved variables that co-determine both alcohol use and HRBs. Studies in the west and in India have shown that Personality variables were related to HRB.

The two important personality variables considered in this study were Sensation Seeking and Impulsivity. The former was measured using the Sensation Seeking Scale (SSSc) that was first developed by Zuckermann, and later modified to the Indian context by Malhotra et al [18] at PGIMER, Chandigarh. The total score obtained (total SSS) and the scores obtained on subscales viz. thrill and adventure seeking, experience seeking, disinhibition and boredom susceptibility all showed significant association with HRB, with the p-value < 0.05. This finding has been seen in another earlier study by Mattoo et al [5] in which 230 men being treated for ICD-10 diagnosis for Alcohol, opioid and both Dependence syndromes were studied 2-4 weeks after their last use of substances. This study used the same Modified version of the SSSc-Form V as was used in the present study. Results showed that all three groups had higher scores for total scale, boredom susceptibility and disinhibition scales, and lower scores for the subscales of thrill and adventure seeking and experience seeking.

The alcohol group had the highest scores for boredom susceptibility and disinhibition scales and total SSSc, and the lowest for thrill and adventure seeking subscale. Though other studies have found varying results especially in terms of the subscales of the SSSc for example in a study by Zuckermann, [19] thrill and adventure seeking determined the sensation seeking behaviour while Basu et al [20] who studied sensation seeking in persons with opioid dependence found that disinhibition was more contributory to sensation seeking. However, the consensus finding of most studies was that the total SSS was indicative of HRB.

This finding has been found to be consistent even in the present study, validating the hypothesis that personality variables may influence risk- taking in patients abusing substances including alcohol. In addition to Sensation Seeking Behaviour studies from the west have reported that Impulsivity measured by the Barratt's Impulsivity Scale version 11(BIS-11) is associated with HRB. In a study by Walton and Roberts61 studying the relationship between substance use and personality traits, 118 undergraduate students from a large Midwestern university were assessed using both self-reports and structured measures. Several items from the Behavioural Risk Factors Surveillance System (BRFSS) and the Youth Risk Behaviour Survey were used to assess substance use and then persons were categorized into three groups of abstainers, moderate drinkers and heavy drinkers.

The quantity of alcohol used to determine these groups were: no alcohol in the past year, not more than 12-16 drinks per week and more than this amount respectively. Personality traits were assessed using the Goldberg's IPIP-AB5C Inventory that assessed the Big Five dimensions of personality namely extraversion, agreeableness, conscientiousness, emotional stability and intellect. Results showed that Heavy users compared to abstainers or moderate users had lower scoreson measures of conscientiousness t (70) = 4.18, p<0.001. This corroborated significantly with a higher BIS-11 score total score. This study result was consistent with findings that heavy users of alcohol and substances were more disagreeable, irresponsible and neurotic compared to abstainers or even moderate drinkers. Thus, the current study seems to give credence to the findings that Impulsivity is associated with HRB. On reviewing the variables that were found to be associated with HRB, as was hypothesized the Severity of AIDS, the Personality variables of Sensation Seeking and Impulsivity appeared to show significance. Among the sociodemographic variables only education was seen to be significantly associated. Lower education taken as less than high or less than 12 years of education have been shown to beassociated with HRB.

A Study by Anda et al that analysed data from the NHNES (n=11361) found that men, the young and those with lower education consumed more than 5 drinks per occasion, with a progressive decrease in the number of drinks per occasion. Another study analyzing the risk factors for criminal activity showed that other factors being equal, those who have not completed high school report more crime with an Odds Ratio of 0.75 in the national survey and 0.41 in the county sample.

This study also seems to strengthen the possibility that the level of education is associated with HRB. However, a significant difference observed in this study was that age was not significantly associated with HRB. The possible reason for this difference may be that earlier studies that have reported relationship between HRBs and alcohol use have included a younger population (under 25 yrs), who were over-represented in traffic accidents and fatalities 29, hence leading to some confounding as there is evidence that greater risk was primarily a function of their propensity to take risk. However, in our study the mean age of the population was 41.6± 8.8 yrs , with age of the youngest patient being 22 years, with only 27 patients being younger than 30 years(i.e.<10% of the sample).

This was an important strength of the study because the confounding effect of younger age had been nullified in the study by the natural characteristics of the study population. This may support the hypothesis that younger age (under 25 years) may be an independent risk factor for high - risk behaviour as has been seen in other studies. There is robust data linking family history of alcohol Dependence and severity of dependence. Earlier age at onset and occurrence of higher risk taking are seen in patients with family history of dependence especially in the earlier concept of Type-2 alcoholism.

However, in our study there was no significant association seen between family history of dependence and HRB (p= 0.343). Though in this study we have not specifically looked for the relationship between severity of alcohol dependence and Family history, some of this difference could be due to the difference in the measures that have been used for assessing severity. In order to test the strength of the different variables in predicting HRB, variables that were significantly associated with HRB on univariate analysis were logistic regression equation.

This indicates that for every 1% increase in the composite ASI score indication overall severity of ADS, the risk of associated HRB increases by about 8%. Previous studies have also found that the Severity of Alcohol Dependence is positively correlated with HRB. Hence, heavy drinking seems to be an important indicator for occurrence of the HRB. Hence, the finding from the present study appears to support the first objective that it set out to test

namely that Severity of Alcohol Dependence is associated with HRB.

The association of the Total SSS with HRB validates the influence of certain personality variables in determining the occurrence of such risky behaviours. The results indicate that for every 1% rise in the total sensation seeking score the propensity to indulge in HRB.

The level of Education with an Odds ratio of 0.41 indicates that there is an inverse association of education with HRB. Whether these associations are universal across each individual type of risky behaviour or only some of them is not suggested as such an association was not studied in this study. To conclude the discussion Severity of ADS, Sensation Seeking Personality and a lower level of Education seems to be relevant variables in predicting HRB. The presence of both alcohol dependence and personality as important indicators of HRB lends support to the hypothesis that both these variables may indeed be part of a higher yet unknown construct that is prone to risk taking, probably with a common genetic vulnerability.

Summary and Conclusions:

The present study aimed to study the association between HRB and ADS.The total sample size was 300 patients who were being treated for ADS diagnosed according to ICD-10 guidelines. Event analysis method was used to determine the association between alcohol use and the occurrence of HRB. The risk behaviors that were examined in the present study were: Road traffic accidents, risky sexual behavior, self-injurious behaviour and crime and violence.

The following were the salient findings from the present study:

1. The occurrence of HRB was substantial among patients with ADS.
2. Event analysis method indicated that road traffic accidents associated with prior heavy drinking was the most frequently observed HRB.
3. Severity of alcohol dependence was significantly associated with the occurrence of HRB.
4. Patients scoring high on certain personality constructs such as sensation seeking and impulsivity were particularly vulnerable to indulge in HRB.
5. Among the demographic characteristics, low educational status is associated with an increased prevalence of HRB among patients with ADS.
6. Analysis indicated that severity of alcohol dependence interacted with personality variables and demographic characteristics resulting in occurrence of HRB.
7. The results of the present study suggest that treatment interventions must inquire into and specifically target such HRB to reduce morbidity and mortality associated with heavy drinking.

References:

1. **International Classification of Diseases-10 Revision**
2. **Leigh, B.C.** The risks of drinking among young adults. Peril, chance, adventure: concepts of risk, alcohol use and risky behaviour in young adults. Addiction 999; 94 (3): 371 383.
3. **Leigh, B.C and Stall, R.** Substance use and risky sexual behaviour for exposure to HIV. Issues in methodology, interpretation, and prevention. American Psychologist 1993; 48 (10):1035-1045.
4. **Waller, P.F., Stewart, J.R., Hansen, A.R., et al.** the potentiating effects of alcohol on driver injuries. JAMA 1986; 256: 1461-1466.
5. **Mattoo, S.K., Varma, V.K., Singh, R.A. et al.** Alienation, Sensation seeking and Multiphasic Personality Questionnaire profile in men being treated for alcohol and/or opioid dependence. Indian Journal of Psychiatry 2001; 43(4): 317-326.
6. The World Health Report – 2003, The World Health Organization.
7. **Greenfield, T.K., and Weisner, C.** Drinking problems and self-reported criminal behaviour, arrests and conviction: 1990 US alcohol and 1989 county surveys. Addiction 1995; 90: 361- 373.
8. **Preuss, U.W., Schuckit, M.A., Smith, T.L., Danko, G.P.,Bucholz, K.K., Hesselbrock, M.N., Hesselbrock, V., and Kramer, J.R**.Predictors and correlates of suicide attempts over 57 5years in 1,237 Alcohol-Dependent Men and Women. American Journal of Psychiatry 2003; 160 (1): 56-63.
9. **Chandra, P.S., Krishna, V.A., Benegal, V., Ramakrishna, J**. High risk sexual behavior and sensation seeking among heavy alcohol users. Indian Journal of Medical Research 2003 Feb; 117: 88-92.
10. **Lapham, S.C., Smith, E., Baca,J.C. et al.** Prevalence of psychiatric disorders among persons convicted with driving while impaired. Archives of General Psychiatry 2001; 58: 943– 949.
11. **Fine, E.W., Scoles, P., Mulligan,M.** Under the influence: characteristics and drinking practices of persons arrested for the first time for drunk driving, with treatment implications. Public Health Report 1975; 90: 424 – 429.
12. **Thompson, M.P., and Kingreef, J.B.,** The roles of victim and perpetrator alcohol use in intimate partner violence outcomes. Journal Interpersonal Violence 2006; 21 (2): 163-177.
13. **Anda, R.F., Williamson, D.F., Remington, P.L.,** alcohol and fatal Injuries among U.S. adults. Findings from the NHANES I Epidemiologic follow-up study. JAMA 1988Nov; 260(7): 2529-2532.
14. **Leigh, B.C.** Alcohol consumption and sexual activity as reported with a diary technique. Journal of Abnormal Psychology 1993; 102(3):490-493.
15. **Thompson, M.P., and Kingreef, J.B.,** The roles of victim and perpetrator alcohol use in intimate partner violence outcomes. Journal Interpersonal Violence 2006; 21 (2): 163-177.
16. **Macdonald, S., Pederson, L L.** Occurrence and patterns of driving behaviour for alcoholics in treatment. Drug alcohol Dependence 1988; 22(1-2):15-25.
17. **Morrison, T.C., DiClemente, R.J., Wingwood, G.M., Collins, C.** Frequency of alcohol use and its association with STD/HIV-related risk practices, attitudes and knowledge among an African-American community-recruited sample. International J STD/AIDS
18. **Basu, D., Verma, V.K., Malhotra, S., Malhotra, A.** Sensation seeking scale: Indian Adaptation. Indian Journal of Psychiatry 1993; 35(3):155-158.
19. **Zuckermann, M.** Sensation- seeking: the balance between risk and reward, in: Lipsitt, L.P. and Mitnick, L.L. (Eds). Self Regulatory Behaviour and Risk Taking: cause and consequences, 143-152. (Norwood, NJ, Ablex).
20. **Basu, D., Varma, V.K., Malhotra, S., & Malhotra, A.** The sensation seeker who is also alienated: towards a new hypothesis for the genesis of opiate addiction. Indian Journal of Psychiatry 1995; 37: 17 -22.

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Review Paper

Right to Emergency care: Consumer court

*Mukesh Yadav, **Pooja Rastogi, ***Imran Sabri

Abstract

Indifference towards victims of accidents and those in emergency medical conditions and even women under labour who are about to deliver is not peculiar to India but is prevalent in other countries also. The SC of India as long back as 1989 observed in Parmanand Katara v. Union of India that when accidents occur and the victims are taken to hospitals or to a medical practitioner, they are not taken care of for giving emergency medical treatment on the ground that the case is a medico-legal case and the injured person should go to a Government Hospital. The SC emphasized the need for making it obligatory for hospitals and medical practitioners to provide emergency medical care.

Delhi State Consumer Court first taken up for consideration the question of maintainability of award against the hospital in case of brought dead patient: This paper deals with critical review of recent judgment of State Consumer Court of Delhi on the issue of right to emergency care of common man and deficiency of service in Indian context.

Key Words: Right to Emergency Care, Consumer Court, Compensation, Medicolegal

Introduction:

The Constitution envisages the establishment of a welfare state at the federal level as well as at the state level. In a welfare state the primary duty of the Government is to secure the welfare of the people. Providing adequate medical facilities for the people is an essential part of the obligations undertaken by the Government in a welfare state. The Government discharges this obligation by running hospitals and health centres which provide medical care to the person seeking to avail those facilities.

Article 21 imposes an obligation on the State to safeguard the right to life of every person. Preservation of human life is of paramount importance. The Govt. hospitals run by State and the medical officers employed therein are duty bound to extend medical assistance for preserving human life. Failure on the part of a Govt. hospital to provide timely medical treatment to a person in, results in violation of his right to life.

Corresponding Author:

*Prof. & HOD, Forensic Medicine & Toxicology,
School of Medical Sciences & Research [SMSR],
Sharda University,
Plot No.32, 34, Knowledge Park-III, Gr. Noida,
U.P. 201306
Email: drmukesh65@yahoo.co.in
** Assoc. Professor
*** Assist. Professor

Hon'ble SC first examined whether the failure to provide medical treatment to a patient in emergency [Hakim Seikh] by the Govt. hospitals [in Calcutta] has resulted in violation of his rights and, if so, to what relief he is entitled. [3]

Brief facts of the Case:

- One Naik Subedar, Sh.K.L. Gulyani travelling in a bus in Delhi was attacked with a knife by one of a gang of pick-pockets who tried to take away his purse, which the army man resisted. He received a deep knife wound in his right thigh and started bleeding. At the bus stop on the red light the injured person disembarked presumably with a view to proceed to his house but he could not proceed due to the injury and fell down in front of the clinic of Doctor, was a paediatrician. He saw the injured person lying in front of his clinic and bleeding profusely but he went back into his clinic to attend to his patient and did nothing for the injured person. [Para 1-2][1]
- Sh. Naveen Kumar who along with his wife had come with their child to consult Doctor ran to a nearby Orchid Hospital and brought a stretcher and within the help of another person carried him to the hospital. The hospital authorities say by the time the injured person arrived he was dead and on the relevant papers it was mentioned that he was brought dead. [Para 3][1]
- The police was telephonically informed and they also arrived at the hospital and finalised

their normal and formal paper work and sent the body for post-mortem. [Para 4][1]

- The wife of the deceased army man thereafter filed a complaint before the District Forum against the hospital and Doctor and Orchid Hospital respectively and the District Forum after consideration of the evidence on record awarded a compensation of Rs.5,00,000/- (Rs. Five lac) against the hospital authorities and Rs.3,00,000/- (Rs. Three lac) against Doctor. [Para 5][1]
- Both of them have filed appeals, which have been amalgamated because both relate to the same occurrence. [Para 1-6][1]
- **Medicolegal case:** It is clear from the above mentioned facts that it was an emergency and a medicolegal case.

Case before the State Consumer Forum:

Consumer court first taken up for consideration the question of maintainability of award against the hospital in case of brought dead patient:

- Having considered the evidence about the same, Court was of the view that the hospital cannot be heaped with liability for the incident.

The contention of the hospital:

It was contended that by the time the patient was brought to the hospital he was dead. There is no plausible evidence to indicate that the deceased was alive when he was brought to hospital. Although the District Forum held that deceased was alive been brought to the hospital since his dead body was lying in the courtyard of the hospital.

This is the main circumstance on which reliance has been placed, Court observed "the mere fact that the dead body was lying in the hospital will not suffice to indicate that the deceased was alive when he was brought to the hospital because the dead body could have been placed in the hospital after the doctors had recovered that he had expired".

There is no positive evidence about the fact of his being alive at the time of being brought to the hospital. At the same time there is an endorsement of the doctor on the official papers that he was brought dead. [Para 8][1]

DMC's Enquiry Committee Report:

The Delhi Medical Council (DMC) held an enquiry about this circumstance and a committee of six doctors was formed for this purpose. The doctors after examining the whole matter concluded that the deceased was not alive when he was brought to the hospital.

Court observed that there is no reason to disbelieve the result of this enquiry. [Para 8][1]

Complainant defense:

It was argued by the counsel for the complainant that the doctors are inclined to support another doctor because of fraternity brotherhood and their report should not therefore be relied upon.

Court observed that this contention is unacceptable because in the ultimate analysis it is only a doctor who can look in to matters of medical negligence as well as other relating matters and no non-doctor will be able to do that.

Bolam Test relied:

Court further observed that is what the principle which is the Bolam Test Theory postulated by the Supreme Court upholds. [Para 9][1]

Objection on the partial nature of the Enquiry:

It was pointed out by the counsel for the complainant/respondent that no public witness was examined by the Enquiry Committee which suffices to indicate the partial character of the Enquiry. [Para 10]

Court observed that the non-examination of a public witness by the Committee will not make any difference because the question whether the patient is dead or alive, is beyond the comprehension of a layman.

Court justified the stand as if, for example the patient is in a coma a layman will not be able to determine whether he is dead or alive. [Para 10][1]

District Forum observations based on assumption and presumptions:

Court observed that the finding of the District Forum about the fact of the deceased being alive at the time of being brought to the hospital is based on assumption and presumptions. [Para 10][1]

Court concluded on this point that "It must therefore be held that the deceased was not alive at the time of being brought to the hospital". [Para 10][1]

Case of doctor's role in emergency:

Court ruled that the case of Doctor stands on a different footing. The injured army man was bleeding profusely and fell down right in front of the clinic of Doctor, who came out, saw him and went back into his clinic to see his patient. The injured army man continued to bleed profusely.

How callous and cruel on part of Doctor Manocha?

Doctor saw that the injured person was bleeding profusely and did not try to render any help or first aid. Court further went on to add that this is being inhuman and something beyond. [Para 11]

Defense by the Doctor:

It was pointed out by the counsel for Doctor that the Orchid Hospital was nearby and that is why presumably he did not render first aid.

Court observed:

That Doctor Manocha is a doctor and he would have and should have realised that it will take some time to the patient to be taken to hospital and since he was bleeding profusely it may be too late by the time he reaches the hospital and as such immediate aid was necessary.

It is not possible to say that Doctor Manocha being a doctor would not have realised the gravity of the situation and would not have foreseen that the profuse bleeding may result in death, and that it may be too late by the time he reaches the hospital.

The callous indifference of the doctor needs to be denounced in no uncertain terms. [Para 12][1]

Evidence of uninterested witness realized:

The evidence about the fact of Doctor having slammed the door of his clinic after seeing the injured person is invincible because Sh.Naveen Kumar and his wife Mrs.Vandna who had taken their daughter to Dr.Manocha have both categorically stated this fact, as observed by the District Forum.

Their evidence cannot be disbelieved because they are deposing against a doctor to whom they had gone for the treatment of their daughter and there was no reason for them, whatsoever to depose against the doctor except to disclose the truth. [Para 13]

Can a private doctor obliged to treat every injured before him?

On the defense by the counsel for Doctor that in any case he is a private doctor and he was under no obligation to attend any injured person lying outside his clinic, court observed in following words:

- "It is not only a doctor of the Govt. Hospital who is bound to render help to a dying man. Every doctor is bound by the Hippocratic oath and must render help to a seriously injured person. [Para 14][1]
- Here Consumer court mentioned about Hippocratic Oath, for which some doctors may differ that it is not legally binding on them because it is only a moral obligation. It is important to remind those doctors that modified version of Hippocratic Oath is now part of the Indian Medical Council (Professional Conduct, Ethics and Etiquettes) Regulations-2002, now binding and have force of law.

Chapter I, Point No. is relevant as it cast same duty on the physican mention in this case. [4]

Consumer court referred to the case of S.C. decided way back in 1989 [11] where it has been observed as follows:

- *"Every doctor whether at a Government Hospital or otherwise has the professional obligation to extend his service with due expertise for protecting life.*
- *No law or state action can intervene to avoid/delay the discharge of this paramount obligation cast upon members of the medical profession. The obligation being total, absolute and paramount." [Para 14][1]*

Lack of Information:

It was further observed in the aforesaid case [11] as follows:

- We are of the view that every doctor wherever he be within the territory of India should forthwith be aware of this position and therefore we direct that this decision of ours shall be published in all journals reporting decision of this court and adequate publicity highlighting these aspects should be given by the National Media as also through Door Darshan and All India Radio.
- The Registry shall forward adequate number of copies of this judgment to every High Court so that without delay the respective High Courts can forward them to every Session Judge within their respective jurisdiction and the Sessions Judge in their turn shall give due publicity to the same within their jurisdiction.
- The Medical Council of India shall forward copies of this judgment to every Medical College affiliated to it. Copies of the judgment shall be forwarded to every State Government with a direction that wide publicity should be given about the relevant practice so that every practising doctor would soon become aware of the position." [Para 15][1]

Consumer Court emphasized about deemed awareness by doctors:

Doctor must therefore be deemed aware of this position. It was further observed in the aforesaid case as follows:

- "We would also like to mention that whenever on such occasion a man of the medical profession is approached and if he finds and whatever assistance he could give is not sufficient really to save the life of a person but some better assistance is necessary it is also the duty of the man in the medical profession to render all the help which he could and also see that the person reaches the proper expert as early as possible." [Para 16][1]

Duty of doctors towards injured:

Court observed that if at all Doctor was of the view that the injured person should be shifted to a hospital for proper treatment he failed in his duty as a doctor because he did not render any assistance in transporting the injured army man to the hospital and closed the doors of his clinic and went in to examine his patient.[Para 17][1]

Civil or Criminal liability:

Court clarified that "We are not concerned here with the question whether criminal liability is cast upon Doctor Manocha but it is clear from what has been stated above that a civil liability for damages is inevitable if he fails to perform his duty as a doctor". [Para 18][1]

Applicability of the Consumer Protection Act 1986:

On the argument by the counsel for Doctor Manocha that since he was a private doctor and there was no payment or promise to pay there was no relationship of consumer and service provider between the two, and as such the Consumer Protection Act 1986 will not be applicable. [Para 19][1]

Court observed that however, in view of the finding of the Hon'ble Supreme Court as noted above this objection is unsustainable because the Supreme Court has mentioned that the obligation of every doctor whether a Govt. or otherwise for protecting life is a paramount obligation and is total and absolute. [Para 19][1]

Law by the Supreme Court Constitutional validity:

Article 141 of the Constitution of India says that the law laid down by the Supreme Court will be binding on all.

Doctor as service provider and dying person as consumer in emergency:

Court observed that the decision of the Supreme Court casts an absolute liability even on a private doctor to save life and in that manner he becomes a service provider to a dying and injured person who is in need of urgent medical help and the injured person becomes a consumer within the meaning of the Consumer Protection Act (COPRA) 1986. [Para 19][1]

Additional remedy under COPRA:

Besides, the remedy under the COPRA 1986 is an additional remedy and compensation in such matters can therefore be claimed thereunder. [Para 19][1]

Applicability of International Law:

The Universal Declaration of Human Rights has recognised the inherent dignity and the equal and inalienable rights of all members of the human family. The rights of the patients have developed on the concept of fundamental dignity and equality of all human beings. [Para 20][1]

Article 25 of The Universal Declaration of Human Rights begins: everyone has a right to a standard of living adequate for health and well-being of himself and his family including food, clothing and medical care.

The World Medical Association (WMA) declaration on the right of the patient represents the principle rights of patients that should be recognised and respected by physicians and health care institutions. [7]

WMA's principle rights of patients:

They are as follows, every patient has a:

i. Right to health care, irrespective of age, sex, caste, creed, religion and economic status.
ii. Right to be treated with respect, care, compassion, attention and dignity without any discrimination.
iii. Right to get treatment in case of emergency.
iv. Right to be properly instructed regarding follow up and subsequent treatment.
v. Right to be referred to a better medical centre for better management.
vi. Right to know the rules regulations and charges of the clinic or hospital before getting treated or admitted.
vii. An absolute right to privacy, medical consultation, examination, findings, case discussions, test reports, procedures and treatment must be kept confidential and

should not be disclosed except in certain circumstances, such as under a court order. Patients have a complete right to ask any person who is not directly involved in his or her treatment to not be present during his consultation, examination and so on.

viii. Right to obtain medical certificate of illness or fitness and all other medical records.

ix. Relatives or attendants of a deceased patient have a right to obtain a death certificate from the doctor or hospital which has treated the deceased.

x. Right to examine and receive an explanation in detail about the bill of a doctor or hospital and to receive a receipt for the amount paid. [Para 20][1][7]

- India is a signatory to this declaration and this declaration is therefore binding on India. [Para 21][1]
- These conditions have therefore the Force of Law and are enforceable.
- It has been clarified by the Supreme Court in the case of PUCL Vs Union of India 1997 [8] that Rules of International Law which are not contrary to Municipal Law shall be applicable in India.[Para 21][1]

Every patient has a right to get treatment in case of emergency:

Court emphasized that Rule No.3 of the aforesaid declaration which mentions that every patient has a right to get treatment in case of emergency. [6, 7]

The case of the injured person in hand was a case of emergency. He had a right of treatment.

A doctor was there at hand, who could render first aid and save life, but he turned his face the other side and refused to render first aid.

Court further emphasized that "There was as such violation of this specific condition and in this manner also liability is cast on Doctor Manocha". [Para 22][1]

On the issue of Compensation:

As regards the quantum of compensation awarded by District Forum against Doctor Manocha, Court observed "we are not inclined to accept the plea of his counsel that the compensation is excessive and oppressive".

Court further added "No amount of compensation can be considered as adequate where life is lost, because fatalities are irreversible. Looking into the enormity of callousness, displayed by the doctor the compensation can in no way be deemed excessive".

Court concluded on this issue and the appeal of Orchid Hospital was allowed and the award made against it by the District Forum is set aside while the award made by the District Forum against Doctor Manocha is maintained and his appeal stands dismissed.[1]

Role of MCI:

Court for the unethical conduct on the part of doctor leave it to MCI and observed that "Let a copy of this judgment be sent to the Medical Council of India for such action against Doctor Manocha if any, as may be considered appropriate".

Summary and Conclusions:

Now time will tell how MCI responds to this discretion given by the Consumer Forum and obligation of enforcing its on Regulations-2002, to gain the trust of the general public on its credibility as regulator of the Medical Profession which is already at stake due to recent allegation of corruption and subsequent dissolution of the MCI.

Health care provision, in popular perception is no longer viewed as a charity. It is a service like any other service that a consumer may buy, especially in the private health care sector. How the doctor is then obligated to provide health care without thought of economic returns? Does such a claim to health care become at once economic and moral because it involves human life? How does one decide when health care is a commercial service available on payment and when a moral service to be rendered without any pecuniary returns?

This might depend on individual perception. In this case the perception of the doctor, the couple who took the injured Gulyani to a nearby hospital, Gulyani's family and the consumer court differs in their perceptions about emergency health care provision. While the doctor's response to the sight of injured Gulyani just outside his clinic turns health care provision as a commercial proposition, the consumer court has clearly taken a more moral than a commercial position, but the logic used to arrive at its moral stand is premised on health care being a commercial venture. [10]

If a doctor in private practice who is not in any way supported by the state / government provides emergency care to a patient to save his life, he needs to be gratefully thanked and compensated for this by the state through a suitable mechanism [such as the following: Either an insurance scheme for emergency treatment by doctors of persons who are not

their patients but are brought to them in an emergency, the insurance premium being paid to the insurance company by the government and the cost of treatment being reimbursed to the doctor by the insurance company; Or, a scheme such as the solatium fund scheme in respect of those injured or killed by untraceable motor vehicles.

The Clinical Establishments Act, 2010, strikes at the very root of the principles laid down above and seeks to impose a mandatory legal binding, at the threat of punishment, upon all establishments (single doctor's private OPD clinics as well as hospitals) that they must treat a patient brought in an emergency, without there being any provision for necessary fees. [10] This might as well prove to be the straw that breaks the camels back. The pity is that the camel in this case is highly educated and intelligent and prides itself to be the œcream of the cream and is highly organised in the form of an elephantine organisation called the IMA, which might as well be spelled out as Indian Morose Association. This great profession / organisation refuses to see what is written on the wall. [9]

I would like to express my views based on various court judgments including 1996 SC Judgement of Mazdoor Khet Sangh case [11]:

- All the doctors are morally bound to serve humanity especially when emergency demands saving the life of human being
- Earning money is always a secondary consideration
- Whenever there is conflict between morality and law or conflict between two rights, the right which is morally correct or which protects public good always prevails
- In larger public interest such cases come very rarely in the professional life of any doctor
- Medical profession's nobility rest in its philanthropic nature
- Meaning of Democracy as well as Fundamental Duties under Article 51A demands such actions on the part of every citizen including doctors
- Government, due to economic constraints may demand such actions from the doctors as in case of war (services of any citizens can be availed) irrespective of fact that its' the duty of the State to Protect its' subjects
- We all should think above individual, and group interests in larger interest of humanity
- This judgment is good in all probabilities, it reminds us about our duty to attend the person in emergency to save the life within resources which I think we as a doctor can do very easily.

References:

1. **Appeal No. A-2008/752,** (Arising from the order dated 16.06.2008 passed by District Forum(West) Janak Puri, New Delhi, in Complaint Case No.52/2006), Principal Officer, M/s. Orchid Hospital & Heart Centre, C-3/91, Janak Puri, New Delhi vs. Mrs. Savita Gulyani, B-2C/7-A, Janak Puri, Janta Flats, New Delhi and
2. **Appeal No. A-2008/751** (Arising from the order dated 16.06.2008 passed by District Forum (West) Janak Puri, New Delhi, in Complaint Case No.52/2006) Doctor A.K. Manocha, C/o Manocha Child Care Clinic, C-3/95, Janak Puri, New Delhi vs. Mrs. Savita Gulyani, decided by State Consumer Court, Delhi on 12.07.2010
3. **Pt.Parmanand Katara vs. Union of India & Ors.** 1989 SCC (4) 286: [AIR 1989 SC 2039.
4. The Indian Medical Council (Professional Conduct, Ethics and Etiquettes) Regulations-2002.
5. The Consumer Protection Act 1986
6. The Universal Declaration of Human Rights, 1948
7. The World Medical Association declaration on the right of the patient (Amended by the 47th World Medical Association General Assembly Bali Indonesia Sept. 1995).
8. PUCL Vs Union of India 1997-1-SCC 301
9. **Tulsi Patel.** Right to emergency health care: How does one decide when health care is a commercial service available on payment and when a moral service to be rendered without any pecuniary returns? http://www.tribuneindia.com/2010/20100819/edit.htm#6, the writer is Professor of Sociology, Delhi School of Economics, University of Delhi.
10. The Clinical Establishments Act, 2010
11. **Paschim Bengal Khet Mazdoor Samity & Others vs. State of West Bengal (SLP (C) NO.796 / 92,** Dated 06-05-1996).

Review Paper

Bioterrorism - "My Role as a Dentist"

*Deepak Bhargava, **Kalyani Bhargava, ***Imran Sabri, ****M Siddharth, *****Aparna Dave, ******Jagadeesh HG ******* Manish Goel

Abstract

Bioterrorism is the intentional use of micro-organisms and toxins to produce disease and death in humans, livestock and crops, their attraction in war and for use in terrorist attacks is attributed to various unique features. Biological weapons can be disseminated by aerosol sprays, explosives or food and water contamination. They can strike suddenly without any warning and inflict considerable mortality and morbidity that can continue for a long period, such attacks may create high level of panic, environment contamination and extreme pressures on emergency health services. Accurate and substantial information given to the public by credible public health and medical experts can do much to allay their fears and encourage their cooperation and participation in constructive, organized community response efforts. The dental profession could potentially play a significant role in the emergency response to a major bioterrorism attack.

Key Words: Bioterrorism, Biological Agents, Dental Clinics, Death, Attack, Biodefence

Introduction:

Bioterrorism is terrorism involving the intentional release or dissemination of biological agents. These agents are (bacteria, viruses or toxins) may be in a naturally occurring or a human modified form.

A Bioterrorism attack is the deliberate release of viruses, bacteria, toxins and other harmful agents used to cause illness or death in people, animals or plants. These agents are typically found in nature but it is possible that they could be mutated or altered to increase their ability to cause disease, make them resistant to current medicines or to increase their ability to spread into the environment. Biological agents can be spread through the air, water or in food. Terrorists tend to use biological agents because they are extremely difficult to detect and do not cause illness for several hours to several days. Some bioterrorism agents, like the smallpox virus, can be spread from person to person and some, like anthrax cannot. [1]

Corresponding Author:

*Prof. & HOD, Department of Oral Pathology, School of Dental,Science, Sharda University, Greater Noida
**Prof. & HOD, Department of Oral Pathology, Inderprastha Dental College & Hospital, Sahibabad
***Asst. Prof. Deptt. of Forensic Medicine, SMSR
****Prof. & HOD, Department of Periodontia
*****Prof. Deptt. of Oral Pathology, SGTDC,, Gurgaon
******Dean, School of Dental Science, Sharda University
******* Prof. Deptt. of Paedodontics, MCDRC, Durg, Chhattisgarh

Bioterrorism is an attractive weapon because biological agents are relatively easy and inexpensive to obtain, can be easily disseminated, and can cause widespread fear and panic beyond the actual physical damage they can cause. [2]

Biological terrorism dates back to Ancient Rome, when faeces were thrown into faces of enemies. [3] This early version of biological terrorism continued on into the 14th century where the bubonic plague was used to infiltrate enemy cities, both by instilling the fear of infection in residences, in a hope that they would evacuate, and also to destroy defending forces that would not yield to the attack. [4]

Over time, biological warfare became more complex. Countries began to develop weapons which are more effective, & much less likely to cause infection to wrong party.

Types of Agents:

U.S. Centers for Disease Control and Prevention (CDC) has categorized various agents into three main groups A, B & C. Which have potential to pose a severe threat to public health and safety and officially defined as "select agents."

Category A:

These high priority agents pose a risk to national security, can be easily transmitted and disseminated, result in high mortality, have potential major public health impact, may cause public panic, or require special action for public health preparedness.

Tularemia: Tularemia, or rabbit fever, has a very low fatality rate if treated, but can severely

incapacitate. The disease is caused by the Francisella tularensis bacterium, and can be contracted through contact with the fur, inhalation, ingestion of contaminated water or insect bites. Francisella tularensis is very infectious. A small number (10-50 or so organisms) can cause disease. If Francisella tularensis were used as a weapon, the bacteria would likely be made airborne for exposure by inhalation. People who inhale an infectious aerosol would generally experience severe respiratory illness. including life-threatening pneumonia and systemic infection, if they are not treated. The bacteria that cause tularemia occur widely in nature and could be isolated and grown in quantity in a laboratory. [5, 6]

Anthrax: Anthrax is a non-contagious disease caused by the spore-forming bacterium Bacillus anthracis. An anthrax vaccine does exist but requires many injections for stable use. When discovered early anthrax can be cured by administering antibiotics (such as ciprofloxacin). [7] Its first modern incidence in biological warfare were when Scandinavian "freedom fighters" supplied by the German General Staff used anthrax with unknown results against the Imperial Russian Army in Finland in 1916. [8] In 1993, the Aum Shinrikyo used anthrax in an unsuccessful attempt in Tokyo with zero fatalities. [9] Anthrax was used in a series of attacks on the officers of several UnitedStates Senators in late 2001. The anthrax was in a powder form and it was delivered by the mail. [10].

Smallpox: Smallpox is a highly contagious virus. It is transmitted easily through the atmosphere and has a high mortality rate (20-40%). [11] Smallpox was eradicated in the world in the 1970s, thanks to a worldwide vaccination program. [12] However, some virus samples are still available in Russian and American laboratories. Some believe that after the collapse of the Soviet Union, cultures of smallpox have become available in other countries. Although people born pre 1970 have been vaccinated for smallpox under the WHO program, the effectiveness of vaccination is limited since the vaccine provides high level of immunity for only 3 to 5 years. Revaccination's protection lasts longer. As a biological weapon smallpox is dangerous because of the highly contagious nature of both the infected and their pox. Also, the infrequency with which vaccines are administered among the general population since the eradication of the disease would leave most people unprotected in the event of an outbreak. Small pox occurs only in humans, and has no external hosts or vectors. [13]

Botulinum toxin is one of the deadliest toxins known, and is produced by the bacterium Clostridium botulinum. Botulism causes death by respiratory failure and paralysis. Furthermore, the toxin is readily available worldwide due to its cosmetic application in injections. [14, 15]

Bubonic Plague: Plague is as disease caused by the Yersinia Pestis bacterium. Rodents are the normal host of plague, and the disease is transmitted to humans by the flea bites and occasionally by aerosol in the form of pneumonic plague. [16] It is considered a threat due to its ease of culture and ability to remain in circulation among local rodents for a long period of time. The weaponized threat comes mainly in the form of pneumonic plague (infection by inhalation). [17]

Viral hemorrhagic fevers: This includes hemorrhagic fevers caused by the Filoviridae (Marburg and Ebola), and by the Arenaviridae (for example the Lassa fever and the Bolivian hemorrhagic fever). Ebola has fatality rates ranging from 50-90%. Death from Ebola is commonly due to multiple organ failure and hypovolemic shock. Marburg was first discovered in Marburg Germany. The arenaviruses have a greatly reduced fatality rate, but a larger presence, chiefly in central Africa and South America. [18]

Category B:

Category B agents are moderately easy to disseminate and have low motality rates.

- Brucellosis (Brucella species) [19]
- Epsilon toxin of Clostridium perfringens
- Food safety threats (for example, Salmonella species, E coli O157H7, Shigella, Staphylococcus aureus)
- Glander (Burkholderia mallei) [20]
- Melioidosis (Burkholderia pseudomallei) [21,22]
- Psittacosis (Chlamydia Psittaci)
- Q Fever (Caxiella burnetii) [23]
- Ricin toxin from Ricinus communis (castor beans) [24]
- Abrin toxin from Abrus precatorius (Rosary peas)
- Staphylococcal enterotoxin B
- Typhus (Rickettsia prowazekii)
- Viral encephalitis (alphaviruses, for example,: Venezuelan equine encephalitis, eastern equine encephalits, western equine encephalitis)
- Water supply threats (for example, Vibrio cholerae, [25] Cryptosporidium parvum)

Category C:

Category C agents are emerging pathogens that might be engineered for

mass dissemination because of their availability, ease of production and dissemination, high mortality rate, or ability to cause a major health impact. For example:

- Nipah virus
- Hantavirus
- SARS
- HINI a strain of influenza (flu)
- HIV/AIDS

Planning and response:

Planning may involve the development of biological identification systems.

Preparedness: Early detection and rapid response to bioterrorism depend on close cooperation between public health authorities and law enforcement. [27]

Biosurveillance: Real-Time Outbreak Disease Surveillance, RODS is designed to draw, collect data from many data sources including clinic data, laboratory data and data over the counter during drug sales and use them to perform signal detection, that is, to detect the a possible bioterrorism event at the earliest possible moment. Health-related data such as that from hospital computer systems, clinical laboratories, electronic health record systems, medical examiner record-keeping systems, SOS call centre computers, and veterinary medical record systems could be of help. Researchers are also considering the utility of data generated by ranching and feedlot operations, food processors, drinking water systems, school attendance recording, and physiologic monitors, among others. Systems which collect more than one type of data to be more useful than systems which collect only one type of information, such as single-purpose laboratory or SOS call-center based systems. [28, 29]

Researchers are experimenting with devices to detect the existence of a threat like by tiny electronic chips that would contain living nerve cells to warn of the presence of bacterial toxins or fiber-optic tubes lined with antibodies coupled to light-emitting molecules (identification of specific pathogens, such as anthrax etc). [29]

Role of a dentist:

Dentistry can contribute valuable assets, both in personnel and in facilities, to the preparation for and in the immediate response to a bioterrorist attack and its aftermath. These assets can make a significant difference in the outcome. In a major bioterrorist attack, the local needs could be massive and immediate. As hospitals become filled, alternate sites for the provision of health care may be required, and dental offices could fill that need. [30] Other areas where dentist can play their role include:

- **Preparation before an attack**
- **Assistance during an attack**
- **Diagnosis and Monitoring**
- **Referral**
- **Immunizations**
- **Triage**
- **Decontamination and Infection Control**
- **Medical care augmentation:**

Some of the services dentists may provide include the following:

- Treatment of cranial and facial injuries;
- Providing or assisting in administration of anesthesia;
- Starting intravenous lines;
- Performing appropriate surgery and suturing;
- Providing cardiopulmonary resuscitation. [30]

After the initial attack:

Dentists trained in forensic odontology will work closely with local Disaster Mortuary Operational Response Teams, (DMORTs). Dentists also may provide local surveillance to detect any spreading of disease beyond the original area of attack or re-emergence of infections in the original attack area. [30]

Conclusion:

Terrorism with biological weapons is likely to remain rare. Because the magnitude of the threat is so difficult to calculate, however it is sensible to focus on dual-use remedies: pursuing medical countermeasures that will improve public health in general, regardless of whether major biological attacks ever occur.

This would include strengthening the international system of monitoring disease outbreaks in humans, animals, and plants; and developing better pharmaceutical drugs. The current public discussion of the threat of biologic terrorism is an opportunity to evaluate our collective capabilities and to assess weaknesses and vulnerabilities. Raising the level of national preparedness will require leadership and action by responsible federal agencies. A thoughtful analysis of the consequences of unpreparedness provides a mandate for action.

For longer-term solutions, the medical community must educate both the public and policy makers about bioterrorism and build a global consensus condemning its use. Current concerns regarding the use of biological warfares result from the increasing number of countries that are engaged in the proliferation of such weapons and their acquisition by terrorist organizations. The need of the hour is to develop biodefence by full international cooperation and to educate the likely target

populations about precautions and protective measures to be taken in such attacks. [31]

Dentists can provide a valuable service to their patients and communities by providing quality information about the potential for attacks, what to watch for, and how to respond appropriately should an attack occur. [30].

References:

1. **Centers for Disease Control and Prevention, USA**: Bioterrorism Overview www.bt.edc.gov/bioterrorism/overview.asp accessed on August 19, 2011.
2. Biologics as Weapons Bioterrorism: A Threat to National Security or Public Health Defining Issue? MM&I 554 University of Wisconsin–Madison and Wisconsin State Laboratory of Hygiene, September 30, 2008 http://www.medmicro.wisc.edu/undergraduate/courses/554/ppt/BT-PHproblem081030.ppt#332,5,Advantages)
3. Steven Block (2001), The growing threat of biological weapons, *American Scientist* (American Scientist) Vol:89: No. 1: Pg: 28, doi:10.1511/2001.1.28.
4. Eitzen, E.; Takafuji, E. (1997), "Historical Overview of Biological Warfare", Military Medicine: Medical Aspects of Chemical and Biological Warfare, Office of the Surgeon General, Department of the Army.
5. **Centers for Disease Control and Prevention, USA**: Tularemia: http://www.bt.cdc.gov/agent/tularemia Accessed on August 19, 2011.
6. http://www.bt.cdc.gov/agent/tularemia/facts.asp Accessed on July 30, 2011.
7. **Vietri N. J. et al (2009),** A Short Course of Antibiotic Treatment Is Effective in Preventing Death from Experimental Inhalational Anthrax after Discontinuing Antibiotics. J Infect Dis. Feb 1; 199(3): 336-41.
8. **Jemie Bisher**, "During World War I, Terrorists Schemed to Use Anthrax in the Cause of Finnish Independence," Military History, August 2003, pp. 17-22.Anthrax Sabotage in Finland http://web.archive.org/web/20091027151654/http://geocities.com/jamie_bisher/anthrax.htm accessed on August 12, 2011
9. **Hiroshi Takahashi et al. (2004)** Bacillus anthracis Incident, Kameido, Tokyo, 1993: Emerging Infectious Diseases Vol. 10, No. 2 Jan.2004.
10. **Puneet K. Dewan, Alicia M. Fry, Kayla Laserson, et al (2002).** Inhalational Anthrax Outbreak among Postal Workers, Washington, D.C., 2001 Emerging Infectious Diseases, Vol 8, No 10, October 2002.
11. http://www.bt.cdc.gov/agent/smallpox accessed on August 10, 2011
12. What CDC Is Doing to Protect the Public From Smallpox http://emergency.cdc/agent/smallpox/prep/cdc-prep.asp
13. CDC Botulism http://emergency.cdc.gov/agent/botulism
14. CDC Botulism Factsheet http://emergency.cdc.gov/agent/botulism/factsheet.asp
15. CDC Plague (http://emergency.cdc.gov/agent/plague
16. CDC Plague www.cdc.gov/agent/ncidod/dvbid/plague/index.htm
17. CDC Viral Hemirrhagic Fevers (http://emergency.cdc.gov/agent/vhf
18. CDC Brucellosis http://emergency.cdc.gov/agent/brucellosis
19. CDC Glanders www.cdc.gov/nczved/dfbmd/disease_listing/glaners_gi.html
20. CDC Melioidosis www.cdc.gov/nezved/dfbmd/disease_listing/melioidosis_gi.html
21. CDC Why has melioidosis become a current issue? www.cdc.gov/nezved/dfbmd/disease_listing/melioidosis_gi.html#2)
22. CDC Q Fever (http://emergency.cdc.gov/agent/qfever)
23. CDC Ricin (http://emergency.cdc.gov/agent/ficin/)
24. http://www.webmd.com/a-to-z-guides/cholera -11156. Accessed on 18-08-2011.
25. **Edmond Hooker, Melissa Conrad Stoppler**, Bioterrorism-MedicineNet.com
26. **Bernett, Brian C. (2006),** US Biodefense and Homeland Security: Toward Detection and Attribution (http://www.ccc.nps.navy.mil/research/theses/bernett06.pdf), Monteray,California, United States: Naval Postgraduate School, p.21, http://www.ccc.nps.navy.mil/research/theses/bernett06.pdf, retrieved 2009-05-24
28. **Wagner MM, Espino, Jeremy;et al. (2004),** "The role of clinical information systems in public health surveillance", Healthcare Information Management Systems (3 ed.), New York: Springer-Verlag, pp. 513–539
29. **Wagner MM, Aryel R, Dato V.** Availability and Comparative Value of Data Elements Required for an Effective Bioterrorism Detection System. Washington, DC: Agency for Healthcare Research and Quality, 2001.
30. **Prakash N, Sharada P, Pradeep GL.**Bioterrorism: Challenges and considerations. Forensic Dent Sci 2010; 2: 59-62.
31. **Alok Kumar, Archana Verma, Mukesh Yadav, Imran Sabri, Ashish Asthana,** Biological Warfare, Bioterrorism and Biodefence; J Indian Acad Forensic Med. Jan-Mar 2011, Vol. 33, No. 1; 60-73.

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Review Paper

A Review of the Chronology of Epiphyseal Union in the Bones at Knee and Ankle Joint

*Pradeep Bokariya, **D.S.Chowdhary, **B.H.Tirpude, ***Ruchi Kothari, ****JE Waghmare,

*****Aaditya Tarnekar

Abstract

Determination of the age of an individual from the appearance and the fusion of the ossification centres is a well accepted fact in the field of medical and legal professions. The process of formation of bones is called as "ossification". Ossification of bone is a diagnostic tool for estimation of age until the process is complete for the particular bone. The long bones of lower limb play a vital role in assessment of age both in living and dry remains. Many scientists have tried to conclude there observations on bones of lower limb owing to differences in regional and environmental factors. Countable differences are noticed in the appearance and fusion activities of ossification centers depending on race geographic distribution and sex. Following is a review of works carried out so far in different regions of country as well as throughout the world.

Key Words: Epiphyseal union, knee joint, ankle joint, Ossification

Introduction:

Evaluation of age of an individual using various methods is required for medico legal purposes in both civil and criminal matters. The principal means which are employed by a medical man to have a fair accurate estimate about age of a person can be categorized as microscopic and macroscopic methods.

Microscopic method includes Osteon counting (based on remodeling in long bones) and the other is based on dental microstructure. Macroscopic means include-dental development, determination of general physical development (Height and Weight), puberty changes (Secondary sexual characters) and ossification of bones. 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.

Corresponding Author:

*Lecturer, Dept. of Anatomy
Mahatma Gandhi Institute of Medical Sciences,
Sevagram Wardha (M.S)
Email: pradeepbokariya@rediffmail.com
** Professor & Head, Dept of Anatomy,
.S. N Medical College, Jodhpur, Rajasthan
** Professor & Head, Dept. of FMT
*** Lecturer, Dept. of Physiology
**** Associate Professor, Dept. of Anatomy
**** Associate Professor & Head, Dept. of Anatomy
Mahatma Gandhi Institute of Medical Sciences,
Sevagram Wardha (M.S)

Until the teenage years, the diaphyses of the long bones are separated from their epiphyses on both the ends.There are hundreds of ossification centers in the bones of the body. The appearance and fusion of some centers in the bones with others of the same bones form the basis of estimation of age. The long bones of lower limb play a vital role in assessment of age both in living and dry remains. A wide range of work has been carried out on the estimation of age by this method in various provinces of India as well as foreign country and from that it is clear that there is remarkable variation amongst the data not only in India but also abroad owing to disparities in climatic conditions and socio-economic status.

Hepworth S.M. (1929) was first one to conduct work on epiphyseal union in India. He compared the data with data of other countries and concluded that Indians are ahead of English and American people. Sidhom G. studied fusion in Egyptian boys and concluded that age of fusion is similar to boys of Australia.

Stewart T.D. (1957) had concluded (using a statistical method very different from that used by all earlier workers in filed) that the range of error in ossification test may be up to 3 years. Mehta H.S. (1963) stated that from puberty to the consolidation of skeleton (about 18 years in girls and about 20-21 year in boys), fairly close estimation within a margin of two years may be made mainly on the progress of the epiphyseal union.

Discussions:

The variation in time of fusion of different bones of lower limb has been established long back. Countable differences are noticed in the appearance and fusion activities of ossification centers depending on race geographic distribution and sex. The process of ossification may also be influenced by food habit, nutritional status, infectious disease, hormonal and metabolic disorders and physical activity. The long bones of lower limb play a vital role in assessment of age both in living and dry remains. Currently there is an obvious lack of standards for epiphyseal union for the purposes of assignment of chronological age. The union of epiphyses is easy to observe because the ununited diaphyseal surface is characteristically irregular "billowed" in appearance. While most researchers determine union visually, some scholars advocate the use of radiographs to determine the degree of union. While selecting the patients following criteria are to be kept in consideration-

- They are born to parents living in that particular region and subject is living in the same region since birth.
- They have authentic documentation of their date of birth
- The subjects should not have any bony deformity or pathology & should not have any known chronic disease affecting the general health of person.
- Subjects from all strata of society are included.

Similar care should be taken regarding centering of the X- ray tube over the epiphyses as it is quite easy to give an ununited epiphysis - the appearance of union by directing the cone of X ray obliquely.The observations thus made by different authors for lower end of Femur, upper end of Tibia, upper end of fibula, lower end of tibia & lower end of fibula are shown in Table I, II, III, IV and V respectively.

Conclusion:

Such work has been carried out by different researchers from time to time. Most of them have shown regional as well as sexual variations in time of occurrence of epiphysis of bones of lower limb.

In all studies females have shown earlier fusion as compare to their male counterparts. Observing such a wider differences in ages of fusion in different regions studied so far, it requires further studies in different regions of India so that common consensus about data can be made.

Table I: Comparison of age of Distal Epiphyseal Union of Femur

S.N	Researcher	Region	Age of Fusion	
			Male	Female
1.	Stevenson (1924)	USA	19	19
2.	Davies and Parson (1927)	England	19	19
3.	Hepworth (1929)	Punjabi	16½-17 ½	16 ½-17 ½
4.	Paterson (1929)	UK	18	16-17
5.	Todd (1930)	USA	17½-18½	17½-18½
6.	Flecker (1932)	Australians	19	17
7.	Pillai (1936)	Madrasis	14-17	14-17
8.	Galstaun (1937)	Bengalis	14-17	14-17
9.	Basu and Basu (1938)	Hindu	-	16
10.	Flecker (1942)	Australian	16-19	14-19
11.	Agarwal and Pathak (1957)	Punjab	-	15-16
12.	Narain and Bajaj (1957)	Uttar Pradesh	18-19	18-19
13.	McKern & Stewart (1957)	United States	22	-
14.	Johnston (1961)	American Indian	18½	17-18
15.	Hansman (1962)	US	14-19	12-17
16.	Saxena and Vyas (1969)	Madhya Pradesh	18-19	18-19
17.	Das Gupta et al (1974)	Uttar Pradesh	18-19	16-17
18.	Schaefer & Black (2005)	Bosnian	17-20	-
19.	Connor JE, Bogue C(2008)	Irish	17-17.9	17-17.9
20	Bokariya et al (2009)	Rajasthan	18-19	16-17

Table II: Comparison of age of Proximal Epiphyseal Union of Tibia

S.N	Researcher	Region	Age of Fusion	
			Male	Female
1.	Stevenson (1924)	United States	19	19
2.	Davies and Parson (1927)	England	19-20	19-20
3.	Hepworth (1929)	Punjabi	16½-17 ½	16½-17 ½
4.	Paterson (1929)	UK	18-19	16
5.	Todd (1930)	United States	17½-18½	17½-18½
6.	Flecker (1932)	Australians	18	-
7.	Pillai (1936)	Madrasis	14-17	14-17
8.	Galstaun (1937)	Bengalis	15-17	14-15
9.	Basu and Basu (1938)	Hindu	15-16	15-16
10.	Flecker (1942)	Australian	16-19	14-19
11	Agarwal and Pathak (1957)	Punjab	-	15-16
12.	Narain and Bajaj (1957)	Uttar Pradesh	18-19	18-19
13.	McKern & Stewart (1957)	United States	23	-
14.	Johnston (1961)	American Indian	18	16-18
15.	Hansman (1962)	US	14.5-19.5	12-17
16.	Saxena and Vyas (1969)	MadhyaPradesh	18-19	16-17
17.	Das Gupta et al (1974)	Uttar Pradesh	18-19	17-18
18.	Schaefer & Black (2005)	Bosnian	17-20	-
19.	Connor JE, Bogue C (2008)	Irish	18-18.9	17-17.9
20	Bokariya et al (2009)	Rajasthan	17-18	14-15

Table III: Comparison of age of Proximal Epiphyseal Union of Fibula

S.N	Researcher	Region	Age of Fusion	
			Male	Female
1.	Stevenson(1924)	United States	19	19
2.	Davies and Parson (1927)	England	18-19	18-19
3.	Hepworth (1929)	Punjabi	16½-17 ½	16½-17 ½
4.	Paterson (1929)	UK	18	16-17
5.	Todd(1930)	United States	17½-18½	17½-18½
6.	Flecker (1932)	Australians	19	17
7.	Pillai (1936)	Madrasis	14-17	14-17
8.	Galstaun (1937)	Bengalis	11-19	14-16
9.	Basu and Basu (1938)	Hindu	16-17	16-17
10.	Flecker(1942)	Australian		
11	Agarwal and Pathak (1957)	Punjab	-	15-16 ½
12.	Narain and Bajaj (1957)	Uttar Pradesh	18-19	18-19
13.	McKern & Stewart(1957)	United States	22	-
14.	Johnston(1961)	American Indian	18	16-19
15.	Hansman(1962)	US	15-20	12-17
16.	Saxena and Vyas (1969)	Madhya Pradesh	18-19	16-17
17.	Schaefer & Black(2005)	Bosnian	17-20	-
18.	Connor JE, Bogue C(2008)	Irish	17-17.9	17-17.9
19.	Bokariya et al (2009)	Rajasthan	18-19	16-17

Table IV: Comparison of age of Distal Epiphyseal Union of Tibia

S.N	Researcher	Region	Age of Observation	
			Male	Female
1.	Davies and Parson (1927)	England	18	18
2.	Hepworth (1929)	Punjabi	17-18	17-18
3.	Flecker (1932)	Australians	17	14
4.	Pillai (1936)	Madrasis	14-17	14-17
5.	Galstaun (1937)	Bengalis	14-16	13-15
6.	Basu and Basu (1938)	Hindu	15	15
7.	Narain and Bajaj (1957)	Uttar Pradesh	17-19	17-19
8.	Agarwal and Pathak(1957)	Punjab	-	15-16
8.	Singh Z (1998)	Punjab	18	-
9.	Christian C,(2005)	Mexican Americans	19	16
10.	Bokariya et al (2009)	Rajasthan	17-18	14-15

Table V: Age of Distal Epiphyseal Union of Fibula

S.N	Researcher	Region	Age (Yrs)	
			Male	Female
1.	Davies and Parson (1927)	England	18	18
2.	Hepworth (1929)	Punjabi	17-18	17-18
3.	Flecker (1932)	Australian	17	14-15
4.	Pillai (1936)	Madrasis	14-17	14-17
5.	Galstaun (1937)	Bengalis	14-16	13-15
6.	Basu and Basu (1938)	Hindu	15-16	15
7.	Narain and Bajaj (1957)	U.P.	17-19	17-19
8.	Agarwal and Pathak (1957)	Punjab	-	15-16
9.	Singh Z (1998)	Punjab	18	-
10	Christian C, (2005)	Mexican American	18	16
11.	Bokariya et al (2009)	Rajasthan	17-18	13-15

References:

1. **Hepworth SN.** On the determination of age in Indians from a study of ossification of the epiphysis of long bones. Ind Med Gaz. 1929; 64: 128.
2. **Sidhom G, Derry DE.** The data of union of some epiphysis in Egyptians from X-ray photographs. J Ind Anat. 1942; 65:196-211.
3. **Mehta HS.** Age Determination Medical Law & Ethics in India. The Bombay Samachar Pvt. Ltd. Red House, Harmiman Circle, Bombay.1963; 335-38.
4. **Galstaun G.** A study of ossification as observed in Indian subjects. Ind J Med Res 1937; 25: 267-324
5. **Basu SK, Basu S.** Age order of epiphyseal union in Bengali girls in preliminary study. J Ind Med Asso. 1938; 7: 571-578.
6. **Aggarwal MI and Pathak IC.** Roentgenologic study of epiphyseal union in Punjabi girls for determination of age. Ind. J. Med. Res. 1957; 45: 283-289.
7. **Narain D, Bajaj ID**. Ages of epiphyseal union in long bones of inferior extremity in U.P. subjects. Ind J Med Res. 1957; 45: 645-649.
8. **McKern TW, Stewart TD.** Skeletal age changes in young American males, Analysed from the standpoint of Age Identification. Natick, MA: Headquarters Quartermaster Research and Development Command, Technical Report EP-45. 1957.
9. **Hansman CF.** Appearance and fusion of ossification centres in the human skeleton. Am J Roentgenol. 1962; 88: 476-482.
10. **Saxena JS, Vyas SK.** Epiphyseal union at the wrist, knee and iliac crest in residents of Madhya Pradesh. JIMA. 1969; 53(2): 67-68.
11. **Das Gupta SM, Prasad, Singh S**. A Roentgenologic study of epiphyseal fusion around elbow, wrist and knee joints and pelvis in boys and girls of Uttar Pradesh. J Ind Med Assoc 1974; 62(1): 10-12.
12. **Schaefer MC, Black SM.** Comparison of ages epiphyseal union in North American and Bosnian skeletal material. J Forensic Sci. 2005; 50: 777-784.
13. **Connor JEO, Bogue C, Spence LD, Last J.** A method to establish the relationship between chronological age and stage of union from radiographic assessment of epiphyseal fusion at the knee: an Irish population study. J Anat. 2008; 212: 198-209.
14. **William B, Sangma C, Fremingston KM, Singh M, Kharrubon B.** Age Determination in Girls of North – Eastern Region of India. JIAFM, 2007; 29(4): 102-08
15. **Pradeep Bokariya, DS Chowdhary, Ruchi Kothari.** Estimation of age of individual by radiographic examinations of bones at knee joint in Western Rajasthan Population. Journal of Forensic Medicine & Toxicology, Vol. 26; No.2, July-December 2009; 1-3.
16. **Pradeep Bokariya, DS Chowdhary, Ruchi Kothari.** Determination of age of boys of Western Rajasthan by epiphyseal union of bones at ankle joint. Indian Internet Journal of Forensic Medicine & Toxicology. 2009; 7(4): 111-15.
17. **Singh Z.** Time of fusion of epiphyses at ends of bones at knee joints in Punjabi Jat Sikhs boys. Journ Anat Soc India. 1998; 47: 168
18. **Christian C, Austin D**. Age ranges of epiphyseal fusion in the distal tibia and fibula of contemporary males and females. J Forensic Sci. 2005; 50 (5):1001-7.

J Indian Acad Forensic Med. July-September 2011, Vol. 33, No. 3 **ISSN 0971-0973**

Review Paper

Domestic Violence against Woman: Past, Present, Future

*Sunil S. Kadam, **Vinod A. Chaudhari

Abstract

The United Nations defines violence against women as any act of gender-based violence that results in, or is likely to result in, physical, sexual or mental harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life Domestic violence occurs daily in homes throughout the world. The National Coalition against Domestic Violence reports that 1.3 million women are victims of domestic abuse each year. Violence against women is a serious problem in India. Overall, one-third of women age 15-49 have experienced physical violence and about 1 in 10 has experienced sexual violence. It is very disturbing as well as discouraging to think that a country that praises womanhood through epics and their devotion to goddesses can be so demeaning and indifferent when it comes to the common women living in the country. Although there are laws (civil & criminal) to tackle the issues of domestic violence, it is not implemented effectively.

Key Words: Domestic violence, Protection Officer, Sexual Violence, Physical Violence

Introduction:

The United Nations defines violence against women. [1] It could be verbal or physical [2]. This article focuses on domestic violence involving women, the existing law & incorporation of new act safeguarding them from domestic violence. The status of women in India has been subject to many great changes over the past few millennia. From equal status with men in ancient times through the low points of the medieval period, to the promotion of equal rights by many reformers, the history of women in India has been eventful. It is very disturbing as well as discouraging to think that a country that praises womanhood through epics and their devotion to goddesses can be so demeaning and indifferent when it comes to the common women living in the country.

There are many forms of violence against women, including sexual, physical, or emotional abuse by an intimate partner; physical or sexual abuse by family members or others; sexual harassment and abuse by authority figures (such as teachers, police officers or employers); trafficking for forced labour or sex; and such traditional practices as forced or child marriages, dowry-related violence; and honour killings when, women are murdered in the name of family honour.

Corresponding Author:

*Associate Professor,
K.J. Somaiya Medical College,
Sion, Mumbai, 400 022
E mail- sunilkadam.fm@gmail.com
** Assistant Professor

Systematic sexual abuse in conflict situations is another form of violence against women. [1]

Causes of violence:

There are 4 main reasons for domestic violence to persist in India.

1. **Male dominated society:** Even though women had risen to top positions, India was & still remains as a male dominated country.
2. **Lack of awareness of Laws:** Victims of domestic violence are afraid to protest as there is lack of awareness or rather lack of initiative to make her aware of her rights.
3. **Laxity in implementation of the existing Acts:** No or less efforts are made to increase awareness amongst the women by the authorities posted to implement the Act.
4. **Bureaucracy & Fear:** If a domestic violence is reported by a third party then he/she is scrutinized as an intruder and problem maker by the community. The bureaucracy associated with reporting of domestic violence, lack of funds for support group adds up to the continued domestic violence in India.

There are many different theories as to the causes of domestic violence. These include psychological theories that consider personality traits and mental characteristics of the perpetrator, as well as social theories which consider external factors in the perpetrator's environment, such as family structure, stress, social learning. As with many phenomena regarding human experience, no single approach appears to cover all cases. [3]

Researchers suggest it is useful to think of three sources of Domestic Violence:

1.Childhood socialization
2.Previous experiences in couple relationships during adolescence, and
3.Levels of strain in a person's current life.

People who observe their parents abusing each other, or who were themselves abused may incorporate abuse into their behaviour within relationships that they establish as adults (Kalmuss & Seltzer 1984) [3]

The various theories put forward are: [3]

Psychological theory:

80% of men have personality disorder, psychopathology, poor impulse control, low self esteem.

Behavioral, Social theories:

External factors in the offender's environment such as: family structure, stress & social learning.

Resource theory:

Women who are most dependent on the spouse for economic well being (e.g. homemakers/housewives, women with handicaps, the unemployed), and are the primary caregiver to their children, fear the increased financial burden if they leave their marriage. Dependency means that they have fewer options and few resources to help them cope with or change their spouse's behavior.

Social stress theory:

Inadequate finances or other such problems in a family may further increase tensions. Violence is not always caused by stress, but may be one way that some people respond to stress. Some speculate that poverty may hinder a man's ability to live up to his idea of "successful manhood", thus he fears losing honor and respect. Theory suggests that when he is unable to economically support his wife, and maintain control, he may turn to misogyny, substance abuse, and crime as ways to express masculinity.

Social learning theory:

People learn from observing and modeling after others' behavior. If one observes violent behavior, one is more likely to imitate it. If there are no negative consequences (e. g. victim accepts the violence, with submission), then the behavior will likely continue. Often, violence is transmitted from generation to generation in a cyclical manner.

Power and control theory:

In some relationships, violence is posited to arise out of a perceived need for power and control.

Mental illness:

Psychiatric disorders are sometimes associated with domestic violence, like Borderline personality disorder, conduct disorder in childhood, antisocial personality disorder, Bipolar disorder, Schizophrenia, Drug abuse & personality disorder [3].

Statistics:

Domestic violence occurs daily in homes throughout the world. The National Coalition against Domestic Violence reports that 1.3 million women are victims of domestic abuse each year. 85% of domestic abuse victims are women. Most cases of domestic violence are never reported to the police. There are approximately 16,800 homicides each year due to physical abuse. Rape associated with domestic violence occurs in about 40-45% of violent homes. [2]

In India, married women are more likely to experience physical or sexual violence by husbands, than by anyone else. Nearly two in five (37 percent) married women have experienced some form of physical or sexual violence by their husband. One in four married women has experienced physical or sexual violence by their husband.

The prevalence of spousal physical or sexual violence is much higher among women in the poorest households (49 percent) than among women in the wealthier households (18 percent). Women whose mothers were beaten by their fathers are twice as likely to experience violence as women whose mothers were not beaten by their fathers: 60%, compared with 30 %. Never married Women also experience Physical and Sexual Violence, 16 % of never married women have experienced physical violence since they were 15 years of age, generally by a parent, a sibling, or a teacher. Only 1% of never married women report having ever been sexually abused by anyone & 27 % say that the perpetrator of the violence was a relative.

The prevalence of physical or sexual violence ranges from 6% in Himachal Pradesh, 13% in Jammu and Kashmir and Meghalaya, 46% in Madhya Pradesh Rajasthan and 59% in Bihar. Other states with 40% or higher prevalence include Tripura, Manipur, Uttar Pradesh, Tamil Nadu, West Bengal, and Assam [4].

Risk Factors: [1]

The potential risk factors can be grouped into the following subsets:

- **Individual:** limited education, a young age, lower socio-economic status, Partner traits that put women at risk include alcohol or drug use, negative attitudes about women, and witnessing domestic violence against women or being abused as a child.

- **Family and relationship:** risk of violence increases with marital conflicts, male dominance, economic stress and poor family functioning.
- **Community:** the risk is higher where there is gender inequality, and a lack of community cohesion or resources.
- **Societal:** higher risk is found in societies with traditional gender norms or a lack of autonomy for women, and where there are restrictive laws on divorce and ownership and inheritance of property, or when there is social breakdown due to conflicts or disasters.
- **Factors concerning women:** Bad temperament, lack of understanding & sympathetic attitude towards family members, lack of sense of reciprocal respect, persistent lack of interest in husband. [5]

Consequences: [1]

- **Health effects:** Health consequences can result directly from violent acts or from the long-term effects of violence.
- **Injuries:** Physical and sexual abuse by a partner is closely associated with injuries. Violence by an intimate partner is the leading cause of non-fatal injuries.
- **Death:** Deaths from violence against women include honour killings (by families for cultural reasons); suicide; and maternal death from unsafe abortion.
- **Sexual and reproductive health:** Violence against women is associated with sexually transmitted infections such as HIV/AIDS, unintended pregnancies, gynaecological problems, induced abortions, and adverse pregnancy outcomes, including miscarriage, low birth weight and fetal death.
- **Risky behaviours:** Sexual abuse, substance use, and additional victimization. Each of these behaviours increases risks of health problems.
- **Mental health:** Violence and abuse increase risk of depression, post-traumatic stress disorder, sleep difficulties, eating disorders and emotional distress.
- **Physical health:** Abuse can result in many health problems, including headaches, back pain, abdominal pain, fibromyalgia, gastrointestinal disorders, limited mobility, and poor overall health.
- **Social and economic costs:** The social and economic costs of violence against women are enormous and have ripple effects throughout society. Women may suffer isolation, inability to work, loss of wages, lack of participation in regular activities, and limited ability to care for themselves and their children.

Prevention and Response [1]

Further evaluation is needed to assess the effectiveness of violence prevention measures. Interventions with promising results include:

- Increasing education and opportunities for women and girls,
- improving their self-esteem and negotiating skills, and
- Reducing gender inequities in communities.
- Other efforts with positive outcomes include:
- Work with teenagers to reduce dating violence,
- Programmes that support children who have witnessed intimate partner violence,
- Mass public education campaigns and
- Work with men and boys to change attitudes towards gender inequities and the acceptability of violence.
- Advocacy for victims,
- Better awareness of violence and its consequences among health workers, and
- Wider knowledge of available resources for abused women (including legal assistance, housing and child care), can lessen the consequences of violence.

WHO Response:

WHO and partners collaborate to decrease violence against women through initiatives that help to identify, quantify and respond to the problem, including:

- **Building evidence** on the scope and types of violence in different settings. This is a key step in understanding the magnitude and nature of the problem at a global level.
- **Developing guidance** for Member States and health professionals to prevent violence and strengthen health sector responses to it.
- **Disseminating** information to countries and supporting national efforts to advance women's rights and prevent violence.
- **Collaborating** with international agencies and organizations to deter violence against women globally.

The law:

In 1983, domestic violence was recognized as a specific criminal offence by the introduction of section 498-A into the Indian Penal Code. This section deals with cruelty by a husband or his family towards a married woman. Four types of cruelty are dealt with by this law:

- Conduct that is likely to drive a woman to suicide,
- Conduct which is likely to cause grave injury to the life, limb or health of the woman,
- Harassment with the purpose of forcing the woman or her relatives to give some property, or

•Harassment because the woman or her relatives is unable to yield to demands for more money or does not give some property.

The punishment is imprisonment for up to three years and a fine. The complaint against cruelty need not be lodged by the person herself. Any relative may also make the complaint on her behalf [6]. The above section relates to the criminal provisions of a more stringent offence. The civil law does not however address this phenomenon in its entirety. There was a need of provision in law with more pliable remedies to(i) offer within the broader framework of civil and criminal laws. A law was enacted keeping in view the rights guaranteed under the article 14, 15 & 21 of the constitution to provide for a remedy under civil law which is intended to protect the woman from being victims of domestic violence and to prevent the occurrence of domestic violence in the society. [7]

The **Protection of Women from Domestic Violence Act 2005** (**PWDVA**) was brought into force by the Indian government from October 26, 2006. The Act was passed by the Parliament in August 2005 and assented to by the President on 13 September; 2005. [7] The Act has 5 chapters & 37 sections. Below are the few important sections of the Act:

Section 2 enumerates various definitions to be used in the Act.

Section 3 Definition of domestic violence:

For the purposes of this Act, any act, omission or commission or conduct of the respondent shall constitute domestic violence in case it:

a) harms or injures or endangers the health, safety, life, limb or well-being, whether mental or physical, of the aggrieved person or tends to do so and includes causing physical abuse, sexual abuse, verbal and emotional abuse and economic abuse; or
b) harasses, harms, injures or endangers the aggrieved person with a view to coerce her or any other person related to her to meet any unlawful demand for any dowry or other property or valuable security; or
c) has the effect of threatening the aggrieved person or any person related to her by any conduct mentioned in clause (a) or clause (b); or
d) Otherwise injures or causes harm, whether physical or mental, to the aggrieved person.

Explanation I: For the purposes of this section,

"physical abuse" means any act or conduct which is of such a nature as to cause bodily pain, harm, or danger to life, limb, or health or impair the health or development of the aggrieved person and includes assault, criminal intimidation and criminal force; "sexual abuse" includes any conduct of a sexual nature that abuses, humiliates, degrades or otherwise violates the dignity of woman;"verbal and emotional abuse" includes:

(a) Insults, ridicule, humiliation, name calling and insults or ridicule specially with regard to not having a child or a male child; and

(b) Repeated threats to cause physical pain to any person in whom the aggrieved person is interested.

"economic abuse" includes:

a) deprivation of all or any economic or financial resources to which the aggrieved person is entitled under any law or custom whether payable under an order of a court or otherwise or which the aggrieved person requires out of necessity including, but not limited to, household necessities for the aggrieved person and her children, if any, stridhan, property, jointly or separately owned by the aggrieved person, payment of rental related to the shared household and maintenance;
b) disposal of household effects, any alienation of assets whether movable or immovable, valuables, shares, securities, bonds and the like or other property in which the aggrieved person has an interest or is entitled to use by virtue of the domestic relationship or which may be reasonably required by the aggrieved person or her children or her stridhan or any other property jointly or separately held by the aggrieved person; and
c) Prohibition or restriction to continued access to resources or facilities which the aggrieved person is entitled to use or enjoy by virtue of the domestic relationship including access to the shared household.

Explanation II: For the purpose of determining whether any act, omission, commission or conduct of the respondent constitutes "domestic violence" under this section, the overall facts and circumstances of the case shall be taken into consideration. [7]

Section 4: creates a social responsibility on members of the community at large who have knowledge of an impending or already committed act of domestic violence, to come forward to file complaint on behalf of the victim, this implies that even an individual has an obligation to react against violence.

Section 5: of PWDVA is a social enactment that creates various legal, social, judicial, and

administrative mechanisms to provide assistance to victims of domestic violence. This section emphasizes upon the, availability of services of the Protection Officers; of her right to free legal services under the Legal Services Authorities Act, 1987; of her right to file a complaint under Section 498-A of the Indian Penal Code (45 of 1860), wherever relevant.

Section 6: clarifies that Shelter Homes are bound to provide shelter.

Section 7: clarifies that the person in charge of a medical facility shall provide medical aid to the aggrieved,

Section 8: of the Act specifies that, as far as possible, Protection Officers should be women and should be appointed as full-time positions.

Section 9: of the PWDVA defines the duties and functions of the Protection Officers.

Section 10: lays down the duties of Service Providers.

Section 11: lays down the various duties of the government to give the Act wide publicity through the media, to conduct periodic sensitization and awareness training of the state/central/police/judicial officers, to co-ordinate different ministries/departments, periodical reviews, and to ensure that protocols for the various ministries concerned including courts are prepared and put in place. The most important essence of this enactment is Section 36 that the Act shall be, in addition to and not in derogation of the provisions of any other law for the time being in force.

Sections 12, 13, 14, 15 and 16 lay out some of the provisions and procedures for obtaining orders or reliefs.

Section 17 of the act allows every woman in a domestic relationship to "have the right to reside in the shared household whether or not she has any right, title or beneficial interest in it… The aggrieved person shall not be evicted or excluded from the shared household or parts save in accordance with the procedures established by law."

Section 19 should not be confused with any provision for providing women with property rights. It merely restrains the respondent from dispossessing or disturbing the victim from the shared household. Through this Section, there can be an order directing the respondent to remove himself from shared household, although no such orders could be passed against women. Orders can also be passed restraining a respondent or his relatives from entering any portion of a household where the victim resides. This Section can help victims to secure an alternate accommodation, get directions for Police protection, for the payment of rent and other payments, or for directions for the return of property, stridhan or other valuables to the woman [8].

The purpose of PWDVA is to provide remedy under the civil law which is intended to protect the women from being victims of domestic violence & to prevent the occurrence of domestic violence in society. It is armed in providing support to woman facing domestic violence. Legal remedies pertain to civil relief such as injunction, compensation and monetary relief. There can be no arrest made on a complaint filed under this law.

Procedure of filing a complaint under PWDVA [9]:

1. The complaint can be made by the aggrieved or by any other person on her behalf to the police officer, service provider, who then informs the protection officer (who ideally is an outreach officer of the court) who liaise between the aggrieved person, police & the service providers (Sec. 5, Rule 5, Form I). He then prepares Domestic Incidence Report (DIR), prepare safety plan (Form V) as desired by the aggrieved to prevent further domestic violence.
2. He arranges legal, medical aid, shelter home, & transport for such facilities. He also updates list of all service providers in the area.
3. The protection officer sends the DIR to the Magistrate.
4. The magistrate can receive application asking relief directly from the aggrieved, from any person on her behalf or from the protection officer (Sec.12).
5. On receipt of application the magistrate then fixes first date of hearing, 3 days after filing of Application. In case of women facing grave danger, the court can pass exparte interim order in her favour and then fix the date. He shall also endeavour to dispose of every application within 60 days of the first hearing {Sec. 12(5)}
6. The respondent is then served with notice of the date of hearing, via the protection officer, within 2 days of filing application and is asked to attend the court.
7. The Magistrate after hearing both the sides may secure assistance of welfare expert (Sec.15) or direct both parties to undergo counselling (Sec. 14). He may also grant exparte orders on the basis of affidavit filed by the aggrieved (Sec. 23(2), Rule 7, Form III). He may carry out entire proceedings in camera if requested by the aggrieved.

8. The Magistrate can pass orders within 60 days of the filing of the application U/S 17, 18, 19, 20, 21 of the PWDVA or any such order is enforceable throughout India, and shall be in force till the aggrieved person applies for discharge.
9. Either party can appeal against the order passed within 30days from the date of official receipt of order passed by the Magistrate (Sec. 29)
10. Violation of orders passed by Magistrate, is liable to one year of imprisonment or fine which may extend to Rs.20000/- or both [Sec 31(1)].

Conclusion:

Since the past 2-3 decades, there are lot of efforts made by the NGO's, social activist and time to time by the Government to curb domestic violence against women and safe guard her constitutional rights, but still there is a rise in domestic violence. The reason being incorrect implementation and misuse of these laws by the miscreants; may it be the accused, the police or the lawyers. If applied correctly the Protection of Women against Domestic Violence Act 2005 (PWDVA) is a powerful act. After the implementation of the act wide range of cases were filed across the states of India and judgments delivered under PWDVA by the family courts, civil courts and in few by the supreme courts. It will still remain worthless if there is lack of awareness amongst the people of society, which could be brought about by:

1. Educating every woman about their rights.
2. Removing fear and coming out of the traditional set up of tolerating violence.
3. Counselling all family members along with the victim when the case is reported.
4. Creating awareness of social responsibility on members of society to report domestic violence.
5. Awareness produced through media sources.
6. Sensitization of the police to these issues and the power given to them.
7. Providing adequate assistance to the victim once the complaint is filed and ensuring her safety.
8. Adequate funding and proper shelter homes by the Government.
9. Lawyers should take on the responsibility of ensuring that each state is discharging its duties effectively & is completely implementing the provisions of the Act.
10. Lawyers should connect criminal, civil & family law while negotiating for women's rights.
11. Inclusion of strict punishment for false charge by petitioner or misuse of the law by the respondent.

Despite useful provisions and positive judgements by the various courts, there are judgement given by supreme court in cases of Batra Vs Batra and Bhaskarlal Sharma and others Vs Monica, which severely limits the definition of 'Shared Household' and interpretation of cruelty faced by a woman. To conclude it is therefore necessary that every member of society and organizations are duty bound to ensure that every woman lives a violence free life.

References:

1. **WHO Media centre**; Violence Against Women; fact sheet No*239, November 2009; at: http://www.who.int/mediacentre/factsheets/fs239/en/index.html
2. **Dawn Hawkins;** Domestic violence; Abuse: violence within home; Jan 01 2011; at: http://crisis_support.helium.com/topic/4594-domestic-violence
3. **C.K.Parikh;** Parikh's textbook of Medical Jurisprudence Forensic Medicine & Toxicology; CBS Publisher's & distributors; 6th edition; 1999; Pg. 4.191.
4. Domestic Violence: cause; at: http://en.wikipedia.org/wiki/Domestic_violence
5. National Family Health Survey (NFHS-3), Final Report , Chapter 15, Domestic Violence; at: http://www.nfhsindia.org/NFHS3%20Data/Press%20Briefing%20Kit/Domestic%20Violence.pdf
6. **Nandy Apurba;** Principles of Forensic Medicine; New Central Agency (P) Ltd; 3rd edition. 2010; Pg.577-78.
7. **Manushi: A** Journal about Women & Society; Laws Against Domestic Violence and Abuse. , 2003 Nov;137: at http://www.indiatogether.org/manushi/issue137/laws.htm
8. The Gazette of India, Registered No. dl-(N) 04/0007/2003—05, The Protection of Women from Domestic Violence Act 2005 (43 of 2005) 13 September 2005.
9. National policy for the empowerment of women; 2001 at : http://wcd.nic.in/empwomen.htm
10. **Advocate Maria Louis**; National consultation on the PWDVA 2005, Report; 21-22 Feb 2010, Mumbai; Provisions of the Protection of Women against Domestic Violence Act 2005, pg.11; at: http://www.hrln.org/hrln/images/stories/pdf/NC-Protection-Women-Domestic-Violence-Act-2005.pdf
11. **Vij Krishnan**; Text book of Forensic Medicine & Toxicology, Principles & Practice; Reed Elsevier India Private Ltd; 4th ed. 2008; Pg 415.
12. **Leela Visaria, Nishi Mitra, Veena Poonacha and Divya Pandey;** Domestic Violence in India : A summary report of three studies; September 1999; at: http://www.icrw.org/files/publications/Domestic-Violence-in-India-1-Summary-Report-of-Three-Studies.pdf

Case Report

Accidental Ligature Strangulation with Avulsion of Scalp

*Zine K. U., **Tandle R. M., **Varma N. M., ***Jambure M. P.

Abstract

With its relatively small diameter, lack of bony shielding and close association of the airway, spinal cord and major vessels, the human neck is uniquely vulnerable to life threatening injuries. Strangulation is a constriction of the neck by a ligature without suspension of the body, the constricting force being applied directly to the ligature. In this paper, we present case of a 25 years old woman who was accidentally strangled when her one end of saree was entrapped in moving crop thresher during separating grains from dry crops in the field. She was immediately brought to the hospital where she was declared dead. Complete and meticulous autopsy was done and cause of death given as accidental ligature strangulation. This phenomenon is unusual and highlights the hazards of working with such conditions leading to such unfortunate machinery incidences and safety measures to be taken while working with such machines.

Key Words: Strangulation, ligature, accidental, Crop thresher

Introduction:

With its relatively small diameter, lack of bony shielding and close association of the airway, spinal cord and major vessels, the human neck is uniquely vulnerable to life threatening injuries**.** [1] Strangulation is a constriction of the neck by a ligature without suspension of the body, the constricting force being applied directly to the ligature. [2] Strangulation deaths are typically homicidal and accidental cases are unusual. [3] Accidental strangulation is usually involved in auto-erotic asphyxiation. In adults accidental ligature strangulation involving article of clothing getting trapped in crop thresher is not seen usually. In present paper a case of accidental ligature strangulation due to entrapment of saree in the crop thresher during work in the field is presented.

Case Report:

This paper present a case of a female aged 25 years who while working near a crop thresher gets strangulated accidentally due to entrapment of upper saree end in the moving crop thresher. It was evening of cold winter day. The crop thresher is used to separate grains from dry crop kept after cutting in the field.

Corresponding Author:

*Associate Professor and Head, FMT,
Government Medical College [GMC], Aurangabad
Email:kailashzine@gmail.com
**Assistant Professor, FMT, GMC, Aurangabad
***Resident Doctor, FMT, GMC, Aurangabad

At 16.00 hrs in evening the upper end of saree of the deceased got entrapped in the machine during work. The saree got tightened around neck which pulled scalp hairs towards machine. The pull over scalp hairs was so severe that it resulted in avulsion of scalp exposing the skull. She was immediately brought to Government Medical College, Aurangabad, where she was declared dead.

The postmortem examination was done in the morning of next day .On examination, reddish abraded ligature mark seen around neck over thyroid cartilage, horizontally placed of size 16x2cm. It was situated 7cm above suprasternal notch, 5cm below chin, 4cm below left mastoid and 4.5cm below right mastoid.

There was evidence of petechial haemorhages over eyelid, face and forehead. On dissection of neck tissue, contusion was present over strap muscles of neck corresponding to ligature mark. Sub-capsular interstitial thyroid haemorrhage was present. There was haemorrhagic infiltration over pharynx, epiglottis, and larynx. Lymphoid follicles at base of tongue and palatine tonsils are congested. On palpation, there was evidence of undisplaced fracture at middle of right femur with evidence of blood infiltration in surrounding tissues. On dissection, scalp was found completely avulsed and separated exposing skull.

The brain was congested with petechial haemorrhages in white matter. The cause of death was given as accidental strangulation with multiple injuries and right femur fracture.

Discussion:

Accidental strangulation though unusually reported, circumstantial evidence alone can sufficiently indicate the accidental nature of the occurrence. Ambade V N et al [4] reported a case of accidental ligature strangulation in a male due to entrapment of shawl in the moving electrical crop thrasher.

The first written case report of accidental strangulation in an adult was the world famous dancer Isadora Duncan who died on 14th September 1929 the long scarf, which she was wearing, became caught in the wire wheels of her Buggati car, stopping the vehicle. Isadora died at the spot and was later found to have sustained a fractured larynx on a carotid artery injury [5]. Cases are documented where cloth entwined in a cycle powered rickshaw by Aggrawal N K et al, Kohli A, Verma S K. [6] Jain V reported dupatta causing cervical spine injury in a thresher. [7] Even an animal has caused this bizzare form of accidental strangulation as reported by Verma S.K., Agrawal NK. [8] The lesion may vary from injury to superficial tissues to laryngeal rupture and carotid artery stenosis as in Isadora Duncon syndrome. [5] Accidental strangulation deaths result from a compression of the neck leading to asphyxia and also stimulation of carotid sinus or vagal stimulation. [9]

The present case report illustrates an unusual but a peculiar form of injury due to traditional Indian garment. The article of cloth gets entangled in moving wheels or machinery and cause trauma to body parts.

Accidental ligature strangulation usually occurs at the extremes of life or otherwise healthy adults, usually under the influence of alcohol or drug. The common mechanism by which accidental ligature strangulation occurs is the progressive constriction of the neck by an article of the victim's clothing. In this case, because of the increasing constriction of neck with victim's saree end and severe pull by entrapped scalp hairs. Scalp is avulsed and separated, exposing skull.

In Conclusion, this accidental death highlights that these kinds of machines need to be produced with increased safety mechanism and people using them should be educated on hazards of working with machinery as well as using safety measures such as use of plastic or saree guards and alteration in dress to prevent loose, flowing ends. This often total injury can be prevented largely through public awareness and education.

References:

1. **William Ernoehazy Jr.** Hanging Injuries and strangulation. e. Medicine. Emergency Medicine.2008.
2. **Gordon 1, Shapiro H.A.** Forensic Medicine: a guide to principles, 2nd edn. New York (N.Y.) : Churchill Livingstone, 1982.
3. **Dimaio DJ, DiMaio VJM.** Forensic Pathollogy, 2nd edn. New York, NY: CRC Press, 1993.
4. **Ambade VN, Godbole HV, Dixit POG, Kukade H.G.** –Accidental ligature strangulation due to crop thrasher.J. Forensic Leg. Med.2008: 15(4) :263-5.
5. **Gowens PA, Davern port RJ, Kerr J, Sanderson RJ, Marsden AK**. Survival from accidental strangulation from a scarf resulting in laryngeal rupture and carotgid artery stenosis. The Isadera Duncan Syndrome. A Case report and review of literature, Emetrg. Med. J. 2003: 20: 391-3.
6. **Kohli A, Verma S K ,Agrawal BB**. Accidental strangulation in a rickshaw. Forensic Sci. Int. 1996, 78: 7-11.
7. **Jain V.** Dupatta: A Unique cause of cervical spine injury in females. Available at:,http:/www. 10 acess 2006.com/conference.
8. **Verma S K, NK Agrawal, A.Kohli**. Accidental ligature strangulation deaths in East Delhi (India).
9. **Kinght B.** Legal aspects of Medical Practice London: Churchill Livingstone, 1992.

Case Report

Importance of Adipocere in Determining the Cause of Death

*Mohit Gupta, **Gaurav V Jain

Abstract

Adipocere (term coined by Fourcroy in 1789) also known as *corpse wax* or *grave wax* or *mortuary* wax , derives its name 'adipo' and 'cire' meaning the affinity with both fat and wax. It is a late but sure sign of death. It becomes extremely difficult for crime investigators to determine the cause of death in bodies in an advanced stage of decomposition. In such instances, changes like the formation of adipocere and mummification help to preserve certain features and injuries that aid in the determination of identity and in determination of the cause of death of the body. This paper highlights a case in which adipocere was developed and its significance in determining the cause of death. However, decomposition changes like the formation of adipocere, helps to preserve injuries which can aid the forensic experts in opining about the cause of death and hence thereby assisting the law enforcers in administering of justice.

Key Words: Adipocere, Cause of death, Investigations, Injuries

Introduction:

Adipocere [1] (term coined by Fourcroy in 1789) also known as *corpse wax* [2] or *grave wax* [2, 3] or *mortuary* wax [2], derives its name 'adipo' and 'cire' meaning the affinity with both fat and wax. It is a late but sure sign of death. The bodies exposed to warm and humid climatic conditions with the absence of air flow undergo the formation of adipocere. In obese individuals, well nourished new born infants and females who have increased subcutaneous fat, the formation of adipocere occurs quickly.[4,5,6] Pre-existing fats such as olein undergo hydrolysis and hydrogenation into higher fatty acids which combine with calcium and ammonium ions to form insoluble soaps which being acidic inhibit the putrefactive bacteria. [7]

Hence Adipocere is relatively resistant to both bacteriologic and chemical degradation. [1, 8] Endogenous lipases and bacterial enzymes hydrolyse the fat to free fatty acids.[8] Bacterial enzymes such as *Clostridium perfringens* [1,8,] *clostridium welchii* [3] convert these free fatty acids to hydroxy fatty acids leading to the formation of greasy or waxy substances. These substances consist of palmitic, oleic and stearic fatty acids with glycerol. [1, 8]

Corresponding author:

*Senior Resident,
Deptt. of Forensic Medicine &Toxicology,
Vardhman Mahaveer Medical College & Safdarjung Hospital, New Delhi- 110029
Email: drmohitfm@gmail.com
** Associate Professor

Water is essential for the formation of adipocere as it removes the glycerine that is formed during the hydrolysis of fats. [7]

It has been demonstrated by Mant AK that the intrinsic water content of the body may be sufficient for the development of adipocere in the body kept in lead sealed coffins. [6]

Adipocere is first formed in the subcutaneous tissues of the body and then subsequently affects the various other parts and organs of the body, though sometimes the entire body may be converted into adipocere. Adipocere may persist for decades but finally it either degenerates or is removed by mechanical forces or by animals. [7] The smell of adipocere has characteristically been described by WED Evans as being earthy, cheesy and ammoniacle. [1] It is similar to the smell of rancid butter. [6, 7] Adipocere is inflammable and burns with a feebly luminant yellowish flame and melts at about 200^{o}F. [6]

Case report:

A body of a female was recovered from a shallow pond in rainy season near Gokulpuri area in Delhi. The body had been disposed in a plastic bag. Post mortem examination of the body was conducted in Guru Teg Bahadur hospital. On examination the bag was found to be intact. The body was decomposed with adipocere present all over the body [Fig 1], with strong cheesy and ammoniacle odour.

On further examination there was a cut wound present in the lower part of front of neck. The internal neck structures including the trachea, both the carotids and oesophagus had been transacted [Fig 2]. The age of the body was estimated to be 40 – 50 years by the

examination of pubic symphysis. Rest of the examination of the body yielded no significant results. The cause of death was given as cut throat injury by sharp edged weapon.

Fig 1: Adipocere

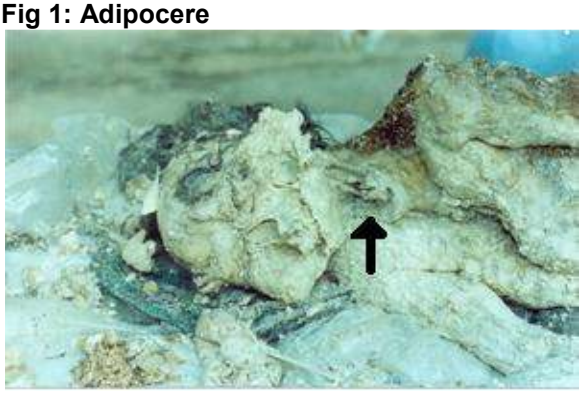


Fig 2: Cut throat wound with cut Trachea and carotids

Discussion:

Warm and moist conditions facilitate the formation of adipocere. However, not all bodies developing adipocere are found in water. For example, bodies found in plastic bags which provide a moist environment may also undergo this change. [5] Adipocere has been known to form within 3 weeks to 6 months of death though the shortest time of formation of adipocere has been reported as 3 days in India. [4]

It becomes extremely difficult to determine the cause of death in bodies in advanced stage of decomposition. The changes of decomposition such as formation of adipocere and mummification preserve the body to such an extent that it is possible to determine the wounds such as stab wounds or gunshots, present on the body and in determining the cause of death. The facial features are usually recognizable and the time since death can be estimated in adipocere. The presence of adipocere has been useful in the past to implicate people for various crimes and to determine the technique used or weapon utilized for committing the crime. In a case reported by Sigrist T. etal [9] in a human skeleton with lumps of adipocere the gunshot injuries were identified. Bullet was recovered from a lump which further allowed the identification of the weapon and the confession of a 74 year old man as the murderer. Another case was reported by Masahiko kobayashi et al [10] in which, there was two defects identified in a case of adipocere, one of a gunshot wound and the other a keyhole lesion.In a case where the adipocere was developing in the body of a female who was submerged for about three months, the mark due to a cable wire on her neck which was tied to concrete to aid in sinking of the body was clearly demonstrable. [5]

This case holds importance due to the formation of adipocere which resulted in preservation of the fatal injury and in reaching an opinion regarding the cause of death. The cut throat wound and the internal structures of neck clearly demonstrated that the injury was caused by a sharp edged weapon. Also the fact that the plastic bag containing the body was undamaged, ruled out the possibility of damage by predators or any other external influence. In this case however the facial features were not well preserved which hampered the identification of deceased.

Conclusion:

In this case the opinion regarding the cause of death was made possible only due to the preservation of injuries due to the formation of adipocere. It is extremely difficult to determine the cause of death in decomposed bodies. However, decomposition changes like the formation of adipocere, helps to preserve injuries which can aid the forensic experts in opining about the cause of death and hence thereby assisting the law enforcers in administering of justice.

References:

1. **Knight B**. Forensic Pathology. 2nd ed. Arnold. 1996. p 70-2.
2. Adipocere. http://en.wikipedia.org/wiki/Adipocere. Cited on 2011 April 22.
3. **Pillay VV**. Textbook of Forensic Medicine and Toxicology. 14th ed. Paras publication. 2004. p 106.
4. **Biswas G**. Review of Forensic Medicine and Toxicology. 1st ed Jaypee. 2010. Adipocere; p. 106.
5. **Dix J, Graham M**. Time of death, decomposition and identification. An atlas. CRC press. 2000.
6. **Vij K.** Textbook of Forensic Medicine and Toxicology. Principles and practice. 4th ed. Elsevier. 2008; p. 129,130.
7. **Reddy KSN.** The Essentials of Forensic Medicine and Toxicology. 29th ed. K. Suguna Devi. 2010; p. 154-5.
8. **Di Maio VJ, Di Maio D.** Forensic Pathology. 2nd ed. CRC Press. 2001.
9. **Sigrist T, Patscheider H, Schegg HK.** Unusual disposal of cadavers. Report on 2 cases. Arch Kriminol. 1982 Nov-Dec; 170(5-6):146-58.
10. **Kobayashia M, Sakuradaa K, Nakajimaa M, Iwasea H, Hatanakaa K, Matsudaa Y, Ikegayaa H, Takatorib T.** A keyhole lesion gunshot wound in a case of adipocere. Legal medicine. 1999 September; 1(3):p.170-173.

Case Report

Pattern of Injuries in a Fatal Small Aircraft Accident

*R Rautji, **C Behera, ***T D Dogra

Abstract

Aircraft accident investigation is divided between human and machine factors. Human factors include intoxication, cardiovascular pathology, CO Poisoning, hypoxia, vertigo, operational errors. Machine factors are focused on impact based on speed, direction of travel, angle of impact and altitude. Autopsy data from individual aviation crashes have long been used in aviation safety research. The present study examines the injury pattern in occupants of a light executive jet aircraft crashed in bad monsoon weather, while on a flight, killing all eight persons on board including the two pilots. The bodies of the victims were brought to All India Institute of Medical Sciences, New Delhi. All bodies were sufficiently intact and were easily identifiable. Detailed autopsies were performed on all the eight occupants, which yielded findings relevant to the cause of the accident. Our findings emphasize the need for autopsy on all aviation accident victims, especially pilots, as it is the only reliable method to find out the various factors contributing to an accident.

Key Words: General aviation aircraft, Pilot, Decelerative force, Head injury, Perineal tear

Introduction:

Injury data for occupants of crashed aircraft, in particular, autopsy and toxicological results on those fatally injured, have long been used in identifying safety deficiencies in aircraft design, assessing effectiveness of safety equipment and developing strategies to improve the survival of individuals in aviation crashes. Cullen and Turk [1] postulated that analyses of injuries sustained by occupants are of value in three ways: reconstructing the crash event, evaluating the safety equipment and resolving the multitude of medico legal issues.

The development of air crash investigation in commercial airliners had its origin in the mid 1920s, when after the enactment of the Air Commerce Act of 1926; the commerce dept of the United States proceeded to develop safety regulations and the earliest approaches to the investigation of accidents. Afterward, the Rockne crash, a commercial aircraft accident in Kansas in 1931, in which eight persons were killed, served as the basis for further accident investigation. [2]

Corresponding Author:

*Prof. & Head
Department of Forensic Medicine and Toxicology,
Armed Forces Medical College,
Sholapur Road, Pune 411040
E-mail: rautjiravi@hotmail.com
**Assoc. Prof., Deptt. of FMT, MAMC, New Delhi
***Prof. & Head, Deptt .of FMT, AIIMS, New Delhi

In an accident involving high-speed single engine or multiengine aircraft, the forensic pathologist has not only to identify the dismembered bodies of the passengers and to determine whether there was any natural disease or sign of drug abuse in the pilot, but also document injuries that may reflect the sequence of accident. This reports deals with the morphologic details of such high speed impact trauma, which seems worth mentioning, since very few studies all over world have investigated such lesions in so much details.

Case History:

A light executive jet aircraft (Cessna) carrying VIP personnel crashed in bad weather while on a local flight. It struck the ground (wet field) at high terminal velocity and burst into flame. All eight people including two pilots on board were killed on the spot. All bodies were brought to the All India Institute of Medical Sciences for autopsy. The aim of the autopsy was not only to find out the cause of death, but the pattern of injuries to the pilots and passengers, in order to find out the crash mechanism and to rule out any pre-existing natural diseases in the pilots.

Autopsy Findings:

All, except one body, were well preserved at the time of receipt in mortuary. (Fig. 1) One body was badly charred, rests were intact and their facial features were reasonably well preserved. Whole body pre-autopsy radiographs were taken in all cases to ascertain the nature of bony injuries and to rule out possibility of sabotage. Various injuries

sustained by the occupants of the aircraft have been summarized and tabulated. (Table.1) Injuries mentioned in serial number 1 and 2 of the said table pertain to pilot and co-pilot.

Preflight mandatory medical examination of pilot and co-pilot had been conducted. Dissection of heart including coronary arteries, lung, brain, liver, kidney and adrenals did not reveal any natural diseases in both the pilots. Toxicological examination of all the victims including pilots did not reveal any drug or alcohol intoxication.

Blood of all the victims was analyzed for the presence of carbon monoxide. It did not show presence of carboxyhaemoglobin in any of the blood samples. All burns present on the bodies of victims were post mortem in nature. Cause of death in all the cases was poly-trauma.

Discussion:

Aircraft accident investigation is divided between human and machine factors. Human factors include intoxication, cardiovascular pathology, CO Poisoning, hypoxia, vertigo, operational errors. Machine factors are focused on impact based on speed, direction of travel, angle of impact and altitude.

Mishap investigation includes demonstration of disease in the pilot, which may be causative, contributory or incidental to the mishap, circumstantial evidence and toxicological evidence. The primary goals of the medical examination are to determine the identification of the casualties, cause of death and manner of death. The autopsy is a primary tool in developing the information for answering most of the forensic questions and must be supported by extensive studies.

It is the pilot's experience of flying in bad weather and the aircraft type that counts. Though pilots get weather forecasts from the meteorological department, a lot depends on interpreting the possible climatic changes and handling them during the flight. As for the aircraft, different types, take weather differently. Pressurized passenger jets like A-320 and Boeing 747s, that have more powerful engines as compared to smaller aircrafts like ATR or King Air, handle poor weather better.

Though equipped with weather radars, wind shear detectors and other modern equipments, all aircrafts go through heavy turbulence when flying through thick cloud formations. Unpressurised aircraft such as Cessna, which fly below 10,000 feet, are more prone to the effects of bad weather. When these aircrafts enter the thick charged cloud, poor visibility, malfunctioning avionic equipments and blinding lightening can cause fatal accidents.

Few studies have been conducted on the pattern of injuries in accidents involving General aviation aircraft or light aircraft. In a study by Shkrum MJ et.al [3] in 1996, passengers sustained relatively more craniofacial fracture and abdominal/retroperitoneal trauma in the accident. Pilot error was the most frequent cause of crashes, followed by mechanical failure and adverse weather/environmental conditions. In another study by Wiegmann DA and Taneja N [4], in 2003, the most commonly occurring bony injuries were fracture of the ribs (72.3%), skull (55.1%), facial bones (49.4%), tibia (37.9%) and pelvis (36.0%).

Common organ injuries included laceration of the liver (48.1%), lung (37.6%) heart (35.6%), and spleen (30.1%), and haemorrhage of the brain (33.3%) and lung (32.9%). In a similar study by Li G and Baker SP [5] in 1997, multiple injuries were listed as the immediate cause of death in 42% of the fatalities, followed by head injury (22%); internal injury of thorax, abdomen, or pelvis (12%); burns (4%); and drowning (3%). The majority (86%) died at the scene or was dead on arrival at the hospital. Eighteen percent of the victims were reported to have sustained a single injury, with head injury being the cause of death in nearly a third of these fatalities.

In the case presented here, all occupants of the aircraft sustained severe deceleration injuries in the vertical axis i.e. from buttock upwards causing severe perineal tear and evisceration. (Fig. 1) This would mean that the ill-fated aircraft impacted the ground with substantial vertical speed. On sudden deceleration, the bodies of the passengers flailed about their seat belt and struck portions of the seat ahead. The rupture of heart and aorta in few victims could be explained by the vertical force produced by extreme flexion over the seat belt resulting in compression of the heart between the sternum and vertebral column during deceleration. Burns present on the body were post mortem in nature. (Fig. 2)

Injuries sustained by the occupants including two pilots are comparable with other studies. (Shkrum MJ et.al., 1996 Wiegmann DA, and Taneja N, 2003 Li G, and Baker SP, 1997) The predominance of Decelerative injuries, in particular head injury, in aviation related fatalities calls for more effective restrains system, such as shoulder harnesses for all occupants or improved seat design. Restraint failure or inadequacy of restraints has long been

recognized as one of the principal sources of mechanical injury in aviation crashes. [6]

Conclusion:

The cause of death in these cases was the combined effect of sudden deceleration and the high terminal velocity impact of the aircraft striking the ground. The injuries were produced by a vertical transmission of force from the buttocks upwards causing extensive visceral damage. Simultaneous deceleration force would cause rupture of heart and multiple fractures of ribs and extremities. There is a need to consider the development of a device, which may be useful in reducing flailing of body parts and extreme flexion of the body during sudden deceleration occurring in aircraft crashes.

Fig. 1- Perineal Tear

Fig.2- Post Mortem Burns

References:

1. **Cullen SA, Turk EP.** The value of postmortem examination of passengers in fatal aviation accidents. *Aviat Space Enviorn Med* 1980; 51:1071-73.
2. **Eckert WG.** The Rockne crash. *Am J Forensic Med Pathol* 1982; 3: 17-22.
3. **Shkrum MJ, Hurlbut DJ, Young JG.** Fatal light aircraft accidents in Ontario: a five year study. *J Forensic Sci.* 1996; 41(2):252-63.
4. **Wiegmann DA, Taneja N.** Analysis of injuries among pilots involved in fatal general aviation airplane accidents. *Accid Anal Prev.* 2003; 35(4):571-77.
5. **Li G, Baker SP.** Injury patterns in aviation-related fatalities. Implications for preventive strategies. *Am J Forensic Med Pathol.*1997; 18(3):265-70.
6. **Moseley HG, Zeller AF.** Relation of injury to forces and direction of deceleration in aircraft accidents. *J Aviat Med.*1958; 29:739-49

Table 1: Injuries in anatomic regions

Site	Injury	1	2	3	4	5	6	7	8
Head & Neck	Fracture vault	+	+	+	+	+	-	+	+
	Fracture base of skull	+	+	+	+	+	-	+	+
	SDH	-	-	-	+	+	+	+	+
	Laceration of brain-tissue	+	+	+	+	+	-	+	+
	Fracture cervical spine	+	+	-	-	-	-	-	-
Thorax	Ribs fracture	+	-	+	+	+	+	+	-
	Pulmonary contusion, laceration	+	+	+	+	+	+	+	-
	Cardiac laceration	+	-	-	+	+	-	+	+
	Aorta laceration	-	-	+	+	+	-	-	-
Abdomen	Liver laceration	+	+	+	+	+	+	+	+
	Spleen laceration	-	-	+	+	-	-	-	+
	Kidney laceration	-	-	-	+	+	-	-	+
	Intestine contusion	-	+	+	-	-	-	-	+
	Urinary bladder rupture	+	-	-	-	+	-	+	+
	Lumbar/Thoracic spine fracture	+	+	-	-	-	-	-	-
	Perineal lacerations/tears	+	+	-	-	-	+	+	+
Extremities	Upper limbs fractures	+	+	+	+	+	+	+	+
	Lower Limbs fractures	+	+	+	+	+	+	+	+
	Pelvic Fracture	+	+	-	-	+	+	+	+

Case Report

Positional Asphyxia: An Opinion of Exclusion

*Abhishek Yadav, *Mohit Gupta, **Manish Kumath, ***Mamta Panwar, ****Upender Kishore

Abstract

The process of normal respiration depends upon three vital components i.e. a patent airway, an intact surface for gas exchange and a normally working ventilatory apparatus. The positional asphyxia has been defined as asphyxia caused due to unusual position of the body which interferes with the breathing and thus pulmonary ventilation. We are reporting a case of an adult female, who under the influence of alcohol positioned herself in such a way which led her to death due to positional asphyxia. The internal and external findings were non-specific. Therefore the exclusion criteria were used to conclude that the death was due to positional asphyxia. The cases of positional asphyxia are difficult to diagnose because of the absence of any specific external findings. The internal findings found in such cases are also non-specific and can be found in any case of an asphyxial death

Key words: Positional asphyxia, petechial hemorrhage, alcoholism

Introduction:

The process of normal respiration depends upon three vital components i.e. a patent airway, an intact surface for gas exchange and a normally working ventilatory apparatus. [1, 2] Respiratory failure occurs when either of the above three components is not functioning properly. Positional asphyxia has been defined as asphyxia caused due to unusual position of the body, leading to the inability to expand the chest wall, which interferes with pulmonary ventilation, [3] hence leading to respiratory failure.

Case History:

A 26 year old female was found dead on 11/1/09 at 3:30 pm in a room which had a single entry and a single window with a grill. It was a single room accommodation where she was living with her boyfriend. According to the history given by him, he came home the previous night at about 11:00 pm and knocked on the door, but when she didn't respond, he went away thinking that she might have got drunk and fallen asleep.

Corresponding Author:

*Senior Demonstrator,
Deptt. of Forensic Medicine and toxicology, Vardhman Mahaveer Medical College & Safdarjung Hospital, New Delhi-110029
** Assistant Professor,
*** Assistant Professor,
Deptt. Of Anesthesiology, Sports Injury Center,
** Associate Professor,
Deptt. Of Forensic Medicine and toxicology

On enquiring he revealed that such incidences had often occurred in the past.

That night he slept in the bus in which he was working as staff. He came back in morning but again failed to get in. After finishing his work he went back to his room at 3:30 pm, but once again she didn't open the door. At this time, he got suspicious and forced open the window panes, where he found her lying in prone position on bed. The landlady was called and they tried to wake her up by throwing water upon her thinking that she was unconscious due to drunkenness. Subsequently they informed the police. The police personnel broke open the door of the room and discovered her dead body lying in prone position on the quilt. An empty half-bottle of whisky and an empty glass was also found near the bed.

History revealed that the deceased was a healthy female and was not suffering from any major illness or disease.

Photo 1: Single window of the door with grill

Photo 2: Bolt of the door broken by the police

Photo 3: Position of the body from outside the room

Photo 4: Position of the body from inside the room

Autopsy Findings:

On external examination, the dead body was of an adult female wearing maroon color full sleeves t-shirt with a black color bra, jeans, lower thermal inner, underwear and socks. The clothes were clean and intact without presence of any blood stains, vomitus etc. Rigor mortis had passed off. Post mortem staining was present over face, chest, abdomen and arms. Petechial hemorrhages were found on examination of the conjunctiva. No external injuries were present over the body.

On internal examination, there was no extravasation of blood seen under sub-scalp and the cranium and meninges were intact. The brain was edematous and showed petechial hemorrhages in white matter. The spine didn't show any abnormality. The chest wall was normal. The lungs were edematous and petechial hemorrhages were found in the interlobar fissures and on the surface of both lungs. The heart also showed petechial hemorrhages, but coronaries did not reveal any macroscopic abnormality. All internal organs were found to be congested. Uterus was empty and no products of conception were present. The stomach contained about 200 ml of semi-digested food material with smell of alcohol. The viscera preserved in concentrated solution of common salt, sample of blood in sodium fluoride and they were handed over to investigating officer for toxicological analysis.

The cause of death in this case was determined as asphyxia due to abnormal position of the body and the manner was decided to be accidental.

Discussion:

The case of positional asphyxia can be diagnosed by using the following criteria: [4, 5]

1. The dead body of a person should be discovered in such a body position which makes the normal breathing impossible and interferes with pulmonary gas exchange.
2. There should be evidence that the person has placed himself in that position without the interference of some other person.
3. There should be proper reason like intoxication, unconsciousness etc. due to which the person was unable to free himself from that position.
4. There should not be any other cause of death which has to be excluded by autopsy.

In our case the female was lying with face downwards in such a position that interferes with the normal breathing. The distribution of the postmortem staining was also consistent with the position of the body.

The door was locked from inside and was broken down in the presence of police. Thus, the circumstantial evidence also indicates that there was no interference from any other person and that the position of the deceased was not manipulated by anyone else.

The smell of alcohol in gastric contents and the recovery of empty bottle of alcohol indicated that the victim had consumed alcohol and as she was unable to free herself from that position it could be concluded that she was under the influence of alcohol, as any other

restraint which could have put her in such a position, was absent.

No other significant autopsy findings were present which could lead us to conclude any other cause of death. The petechial hemorrhages present in the conjunctiva, lungs and heart are indicative of an asphyxial mode of death. [6] In past also similar cases have been reported like Padosch et al [7] reported the death of an inebriated youth due to positional asphyxia. Bell et al [4] also reported that most of the victims in their study were found in a position leading to upper airway obstruction, due to face lying downwards on a suffocating object and alcohol intoxication was found to be a major factor which resulted in the inability of the subjects to change their body position. In India, a similar case has been reported where a child died due to getting stuck between the bed and the wall of the room. [8]

Conclusion:

The cases of positional asphyxia are difficult to diagnose because of the absence of any specific external findings. The internal findings found in such cases are also non-specific and can be found in any case of an asphyxial death. The intoxication due to inebriant substance like alcohol is usually sufficient to paralyze the victim, due to which they are unable to free themselves from that position.

The case reported by us also indicates all the above mentioned factors, hence declared as a case of positional asphyxia, triggered by influence of alcohol and prone position of the body.

References:

1. **Roussos C, Macklem PT.** The respiratory muscles. *N Engl J Med*, 1982; 307:786.
2. **Ward M, Macklem PT**. The act of breathing and how it fails. *Chest*, 1990; 97: 36S.
3. **Belviso M, De Donno A, Vitale L, Introna F.** Positional asphyxia: Reflection on 2 cases. *Am J For Med Pathol*, 2003; 24: 292-207.
4. **Bell MD, Rao VJ, Wetli CV, Rodriguez RN.** Positional asphyxiation in adults. A series of 30 Cases from the Dade and Broward County Florida Medical Examiner Offices from 1982 to 1990. *Am J For Med pathol*, 1992; 13: 101-107.
5. **Swann H, Brugger M.** The cardiorespiratory and biochemical events during rapid anoxic death-obstructive asphyxia. *Tex Rep Biol Med*, 1949; 7: 593-603.
6. **Reddy KSN.** The essentials of forensic medicine and toxicology. K. Sunguna Devi, 25th ed:117-121.
7. **Padosch SA, Schmidt PH, Kroner LU, Madea B.** Death due to positional asphyxia under severe alcoholisation: pathophysiologic and forensic consideration. *For Sci Int*, 2005; 149: 67-73.
8. **Lal S, Verma SK.** Accidental Positional asphyxia in a child. *IIJFMT*, 2005; 3(3).

Case Report

Cardiac Tamponade: A Small case series

*Mathur Indubala, *Bohra Bhavesh, ** Sharma K.D., ***Nag Jaya, ****O.P. Saini, *****Q Fatima

Abstract

The term cardiac tamponade describes a condition in which the heart is compressed by an excess of fluid in the pericardial space, with resulting abnormalities of cardiac function. Cardiac tamponade is a rare cause of sudden death. It is difficult to diagnose both in living and dead. In dead diagnosis is difficult at autopsy in absences of external visible injury & in living person the symptoms of cardiac tamponade are non specific. The symptoms relate principally to the secondary circulatory embarrassment. We present the series of cases with cause of death as cardiac tamponade due to diseases & trauma. These cases demonstrate that focus should always to be given to entire vital organs like heart and possibility of tamponade should be kept in mind.

Key words: Haemopericadium, Cardiac Temponade, Trauma, Cardiac

Introduction:

The term cardiac tamponade describes a condition in which the heart is compressed by an excess of fluid in the pericardial space, with resulting abnormalities of cardiac function. The essential physiological basis of these conditions is an elevation in pressure within the pericardial space.The pericardial cavity is a potential space between the parietal pericardium and the visceral pericardium. [1] The pericardial sac normally contains 5 to 30 ml of clear fluid which lubricates the heart and permits to contract with minimal friction. [2]

The pressure in the pericardial space normally is essentially the same as that in the pleural space, negative in inspiration and slightly positive in expiration, with a mean pressure very close to zero or atmospheric pressure. When fluid is added to the pericardial space, the pressure rises, slowly at first when the pericardium is slack, and then steeply when the pericardium becomes tense. When the volume of fluid increase slowly, the pericardium stretches gradually, and may not reaches its limit of distensiblity until a very large effusion, such as 2000 ml or more has developed. On the other hand when fluid accumulates rapidly the pericardium has very little opportunity to stretch; it reaches its limit of dispensability with effusion as small as 100 ml.

Corresponding Author:

*- Resident, Department of FMT,
S.P. Medical College Bikaner .
** Senior Resident, Department ofSurgery
*** J.R. Santokba Durlabji Hospital, Jaipur
**** Assistant Professor, FMT, SPMC, Bikaner
***** Associate Professor, Pathology, SPMC, Bikaner

Thus, the effect of increases pericardial fluid on the pericardial pressure depends not only on the amount of fluid, but also on dispensability of the pericardium, which varies greatly with the rate of accumulations of fluid. [3]

Case No 1:

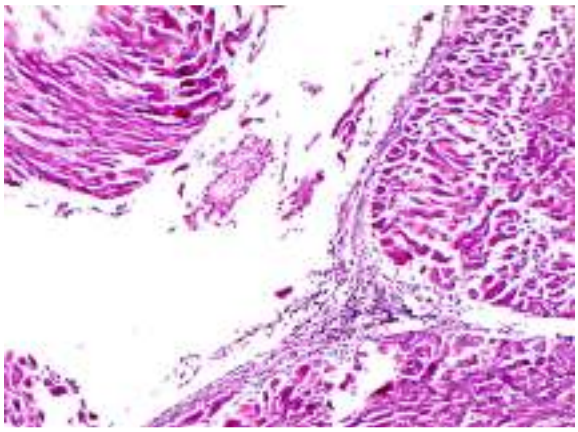
A convict Hindu male aged 71 years brought dead to casualty of A.G. of hospitals, Bikaner on 20.12.2010. The deceased was convict, and hence inquest was carried out by magistrate. According to investigation officer, there were no injuries on body and cause of death was heart attack. The post mortem was conducted by board of medical jurist & surgeon who before start of postmortem, enquired from guards of Jail who informed that he suddenly fell on ground while standing. The post mortem was conducted on 21.12.2010 with following observations:

External Examination:

The deceased was averagely built and nourished. Postmortem staining was present on back & rigormortis all over the body. All natural orifices were normal & there was no orifices evidenced of external injury.

Photograph showing cardiac tamponade

Hispathological Slide of Case No. 1: Torn cardiac muscles fiber



Internal Examination:

The pericardium was intact & pericardial cavity contains about 580 ml of blood with clots. There was a tear in left ventricle of size 1cm x 0.5 cavity deep. Coronaries & aorta shows marked atherosclerosis. Rests of the organs were healthy and pale.

Cases No. 2:

A Hindu male aged 37 years was brought to casualty of A.G. of hospitals Bikaner on 02.03.2011 with history of overturning of a vehicle who expired few minute after his arrival. The post morterm was conducted on 03.03.2011 and following observations were made.

External Examination:

The deceased was averagely built and poorly nourished with faint postmortem staining on back and rigormorties all over the body. Lacerated wounds were present on occipital region and chin with abrasion on right foot.

Internal Examination:

There were fractures of 2nd to 5th ribs on both sides. The pericardiam was intact and pericardial cavity contains about 150 ml of blood. There was a tear of size 0.5cm x0.5cm x cavity deep on heart in left ventricle.

There was also fracture of left occipital bone with thin layer of subdural hemorrhage and a tiny contusion on frontal lobe. Brain was found pale. Rest all organs were healthy & pale.

Case No. 3:

An unknown Hindu male aged about 45-50 years was brought dead by police to mortuary of A.G. of hospital Bikaner on 22.03.2011. The dead body was kept in cold mortuary. The dead body was found in supine position under a tree in a park. The police tried to identify the deceased but could not succeed. The postmortem was conducted on 28.03.2011 by a board of medical Jurist and a surgeon. As per inquest papers there were no injuries on the body of deceased.

External examination:

The deceased was averagely built and nourished with faint post mortem staining on back and rigormortis allover the body. All natural orifices were normal & there was no evidence of external injury.

Internal examination:

The internal examination revealed that there was aneurysm of ascending aorta with a tiny tear. The pericardium was intact and pericardial cavity contains about 540 ml of blood with clots.

Rests of the organs were healthy & pale.

The viscera's were preserved for chemical and histopathological examination in case No. 1 and 3.

Discussion:

Trauma usually from a penetrating knife wound or gunshot causes acute haemopericardium and secondary tamponade. Trauma from cardiac catheterization and pacemaker electrode perforation also causes haemoparicardium and tamponade. Haemopericardium in the post operative cardiac surgery patient is an additional important etiology.

Leaking aneurysm or dissection of ascending aorta, acute myocardial infarction, complications of anticoagulation therapy, neoplasm, radiation pericarditis, purulent pericarditis, tuberculosis pericarditis, viral or idiopathic acute pericarditis, connective tissue disease, particularly rehumatoid arthritis and occasionally in uremic pericarditis are non traumatic causes of haemo pericardium. [3]

Traumatic rupture of heart is often associated with fracture ribs and sternum; sometimes there may not be any external evidence of injury or fracture. [4,5] The chest wall injury always remains fetal i.e. about 80% of patients die at the scene and on the way to the hospital occasionally patients reached to casualty but the physician fails to diagnose tamponade. Most of the cases of tamponade are due to rupture /injury to right atrium. [6]

The blunt trauma to heart may result in small area of petechia to full thickness myocardial contusion, and rupture of free cardiac wall, ventricular septum, cardiac muscles & cardiac valves. [7]

Cardiac rupture after blunt trauma is usually fetal. The severity and extent of damage depends upon the phase of cardiac cycle at the time of injury. Late systole or early systole are periods of increased vulnerability

because the chambers are full and the valves are closed, rapid compression of the heart during these periods can results in rupture of one or more chambers, laceration or perforation of ventricular septum or injury to mitral or aortic valve. Ventricular rupture is usually fatal because the pressure within the ventricles is higher than that in atrium, resulting in more rapid exsanguinations of development of cardiac tamponade. Therefore these patients survive long enough to reach the hospital usually will have atrial injury. [3]

Diagnosis of cardiac tamponade is difficult, the three principal features of tamponade (Beck's triad) are hypotension, soft or absent heart sounds and Jugular venous distension with a prominent 'x' descent but an absent 'y' descent. Since immediate treatment of cardiac tamponade may be life saving, prompt measures to establish diagnosis by echocardiography should be undertaken. Low ECG voltage and electrical alternant may be present. [9]

Conclusion:

In cardiac tamponade due to trauma the blood accumulates rapidly and the pericardium has very little time to stretch to the extent of distensiblity. Hence sudden death occurs. In view of findings of histopathology report (H.P. report No 93/11) in first case cause of rupture of heart and subsequent cardiac tamponade is acute myocardial ischemia. The cause of rupture of heart & subsequent cardiac tamponade in case No. 2 is trauma. The deceased could be brought to Hospitals as tear was of small size. The rupture appears to be the result of direct blow to chest wall.

In third cases the cause of cardiac tamponade is tear in aneurysm of ascending aorta. Report of histopathology awaited. These cases demonstrate that focus should always to be given to entire vital organs like heart and possibility of tamponade should be kept in mind.

References:

1. **B.D. Chaurasia**. Human anatomy Regional and applied; IIIrd volume 214,2002.
2. **Wiliam F. Ganong**. Review of medical physiology; I edition, 568.
3. **E. William Hancock.** Medical clinics of North America Vol 63 No. 1, Jan 1979-223.
4. **B.V. Subrahmanyam.** Modi's medical Jurisprudence and Toxicology: 22nd ed 424-434.
5. **Nabachandra H, Meera TH and C.L. Lyngdol.** Death due to cardiac tamponade in traumatic rupture of heart. J Indian Acad forensic Med 2002; 24 (3) :102-104.
6. **Smith JM, III Grover F.L., Marcos J.J. Arun K.V. and Trinkle J.K.;** Blunt traumatic rupture of aorta. J Thorac cardiovas surgeon 1976: 71-617-670.
7. **Symbas P.N.** Cardiac Trauma; Am Heart J. 1976:92; 387-396.
8. **Sheikh MI, Prajapati Pranav & Kaushik Vijay.** J Indian Acad Forensic Med. 30 (3)-153-156.
9. **Harrison's** principles of internal medicine; 17 Ed Vol. 11-2008.

Case Report

A Drop of Saliva De-Codes the Mystery of Hanging Body

*P. K. Paliwal, **Basant Lal Sirohiwal, **Vijay Pal Khanagwal, Professor, ***Hitesh Chawla

Abstract

A Forensic Expert sometimes asked to provide his opinion from the documents alone, particularly when the allegations were raised on the investigations, and the postmortem. Spot examinations were carried out by other doctor(s) and Forensic Scientists respectively. In the instant case there were allegations made on the fellow sports student, coach, and the investigating agencies all in connivance to pronounce the death as of suicidal hanging instead of murder. It is well known that the criminals first kill the person and then hang him to simulate it as hanging. Whenever, alcohol is detected in the blood than it creates a lot of doubts, which result into allegations from the relatives. Beside the examination of clothes, the injuries like ligature mark, their shape, size and location etc., thorough reviewing of documents & photographs plays a pivotal role in reconstructing the scene of crime. This has an importance in forming a conclusive opinion as to the cause and manner of death.

In this paper, opinion regarding cause and manner of death to be of ante-mortem hanging was ascertained on reviewing the post-mortem report, photographs showing dribbling of saliva and Forensic Science Laboratory reports.

Key Words: Ligature mark, Hanging, dribbling of saliva

Introduction:

Hanging is a form of death, produced by suspending the body with a ligature around the neck, the constricting force being the weight of the body or a part of the body weight. [1, 3-5] It is not uncommon to kill a victim and then to suspend the body to avert the suspicion. [1] Virtually all hangings are suicidal, accidental hanging is uncommon and homicidal hanging is rare. [2] While giving final opinion regarding the ante mortem hanging, it is necessary to give special attention to the details of the scene and their accurate interpretation, the place, the posture of the body, and the manner in which its clothes should also be noticed. [3]

Whether or not the pathologist has been to the scene of a death, he should take notice of the clothing and other property of the body upon which autopsy is to be carried out. [4] Here, we would like to share with readers, how a drop of saliva solves the mystery of a hanging body.

Corresponding Author:

*Dr. P. K. Paliwal,
Senior Professor & Head,
Department of Forensic Medicine,
10/9J, Medical Campus,
Pt. B.D. Sharma Postgraduate Institution of Medical Sciences,
Rohtak, Haryana, 124001, India
Email- drpramodpaliwal@gmail.com
** Professor
***Resident

Brief History:

The deceased was a coming up famous sportsman living in the hostel along with the coach and other members of the team. One day there was a party; he went to attend it and consumed alcohol. Next day he was found hanging in his hostel room. The news of his death was the head lines of many local as well as national newspapers. His relatives alleged that the coach and other members of the team who were jealous of his success have first killed him and subsequently hanged him to the ceiling fan, in his own room.

The post-mortem examination of the body was carried out at periphery hospital by a board. It gave the cause of death as asphyxia due to hanging and ligature mark was ante-mortem in nature. Considering the allegations of the relatives and media reports the investigation was handed over to State Crime Branch. Then case was referred to Deptt. of Forensic Medicine for analysis and to ascertain whether this was an ante-mortem hanging or not.

Observations:

The following documents were supplied for analysis and reporting:

A. **First Information Report (FIR):**

Initially on the information of death of their son the relatives thought it as a hanging but later on after knowing all the details of investigations and consequences many allegation like that their son was done to death

and hanged, was made by them, not only against his fellow students, who were his competitors, with connivance of coach but also had put suspicion on the role of involvement of police.

B.**Post-mortem report:**

Dead body was wearing one blue colour jean pant, black baniyan, and blue rubber band on right forearm, shoes with socks. All the cloths were in situ and not disordered. Rigor mortis was present on the body. Eyes were semi open. Mouth was semi open with tongue protruding out. Stools were passed. The external injuries were in the form of a ligature mark of size ½ inches in width up to the uppermost part of the neck. Two divisions of the ligature mark on the right side and on posterior aspect of neck no ligature mark seen.

On internal examination extravasations of blood and ecchymosis in subcutaneous tissues with bruises were found present. On further dissection hyoid bone was found intact. Stomach was healthy which was containing semi-digested food material. All the organs were healthy and congested. Board of autopsy surgeons opined that "the death was due to asphyxia due to hanging. Ligature mark was ante-mortem in nature. The time between death and post-mortem examination was within 24 hours."

C.**Report of the State Forensic Science Laboratory:**

Chemical analysis report reveals that ethyl alcohol was estimated: 80.5 mg%.

D.**Report of scene of crime examination:**

The forensic scientist stated that on the type of knots i.e. single knot around the fan and neck and position of body in the photograph, possibilities of foul play could not be ruled out.

E.Photographs of the scene of crime:

Picture 1: The ligature material i.e. a skipping rope, clothing is in order, the blood is seen trickling from right nostril, the drop of saliva is seen slightly right to the mid line over lower lip .i.e. the dependent part of the mouth

Picture 2: One tilted bench or stool like structure was seen behind the body; the walls of the room all-around are having posters of boxer, females and few cloths were hanging

Picture 3: Single slippery knot is visible along with the handle of rope. Loss of continuity of ligature mark is also visible on the posterior aspect of neck. Head is drooping downwards

Picture 4: lying on the bed in kneeling (semi sitting) position. Left leg is bent at the level of knee while the Right leg is partially bent. Both hands are resting over the bed

Analysis and Discussion:

Following points were taken into consideration for critical analysis to ascertain whether it is a suicidal hanging or otherwise.

a) The body was found in partial hanging from the ceiling fan with the head drooping downwards acting as a constricting force;
b) The clothes were in order and well maintained and in situ buttons, shoes etc., without any mark of struggle both on the body as well as surroundings in the room;
c) The presence of saliva in form of a drop signifies that hanging was ante mortem.
d) Chemical analysis report revealed 80.5mg% of alcohol in blood which indicates that the deceased has consumed alcohol prior to his death;
e) The Post mortem report was depicting the findings suggestive of ante mortem hanging.

The allegations made by the relatives could only be resolved when the answer to the question whether the deceased hanged him-self or was hanged by some-one-else is given.

Hanging is one of the most commonly used methods for suicide worldwide. In England and a number of other countries, its incidence has increased over the last 30 years. [5] In India, It is a common practice to kill a victim and then suspend the dead body to simulate suicidal hanging. It is, therefore, necessary to find out if hanging was actually the cause of death in a suspended body. [1]

Death by hanging usually results, either from arrest of the arterial blood supply to the brain or obstruction of venous return from it. [9] To make an opinion whether death was caused by hanging, one can safely say that death was due to hanging, if, in addition to cord mark, there was dribbling of saliva, ecchymosis present around the ligature mark, post-mortem signs of asphyxia, besides if there are no evidence of a struggle, fatal injuries or poisoning. [1]

Probably the opinion of the scene of the crime created a doubt in the mind of relatives about the manner of hanging. In fact, in hanging a simple slipknot type of noose is typically used. In the majority of suicidal hangings, the noose consists of a single loop. [3] Study speaks that students who drink or use drugs are much more likely to have suicidal tendencies than those who do not use substances. **Suicidal behavior among college students is lower where the price of beer is higher. [6]** "Kessler and his associates confirmed the link between alcoholism and suicide in their study: alcoholics were found to be more than three times as likely

to try to kill themselves as people who don't drink. [8]

Many text book of forensic medicine states that the dribbling of saliva is surest sign of hanging having taken place during life, as the secretion of saliva being a vital function can't occur after death. [1] This is due to increased salivation before death due to stimulation of salivary glands by the ligature. And salivation is increased by stimulation of pterygopalatine ganglion. [10] Saliva is often found dribbling from the angle of mouth, opposite to the side of the knot. This may be due to stimulation of salivary glands or congestive hypoxia. Salivation may not occur when the death is due to vagal inhibition or injury to the spinal cord.

Evidence of dried marks of dribbling of saliva is suggestive of ante-mortem hanging but its absence alone will not suggest that the body was suspended after death. Moreover, it is more likely to be noticed at the scene of suspension rather than the autopsy table. [11]

So from the presence of saliva it is clear that it was ante-mortem hanging (Picture-1). When the point of suspension is taken into consideration it is a typical hanging (Picture-3) and kneeling position suggests incomplete hanging (Picture-4).

Suicidal hangings in a sitting, kneeling or even lying position are common. [12]

Conclusion:

The deceased was found partially hanging from the ceiling fan in his own hostel room; without any evidence of struggle. The presence of saliva in the form of a drop which was missed by not only the medical officers but also by the forensic scientists' reports signifies that hanging was ante mortem. The Post mortem report was also suggestive of ante mortem hanging. Chemical analysis revealed that the deceased has consumed alcohol prior to his death. All these circumstances are going in favor of suicidal hanging.

This is how the investigative and reconstructive forensic medicine helped to de-codify the mystery of death of a famous sportsperson (boxer) by saliva found in the form of a drop over the lower lip as observed in the photographs taken from the scene of crime.

References:

1. **Mathiharan K, Patnaik AK.** Modi's medical jurisprudence and toxicology. 23rd ed. New Delhi: LexisNexis Butterworths; 2006. p. 565-90.
2. **DiMaio VJ, DiMaio D.** Forensic pathology. 2nd ed. Boca Raton: CRC Press; 2001. p. 258-75.
3. **Polson CJ, Gee DJ, Knight B.** The essentials of forensic medicine. 4th ed. Oxford: Pergamon Press; 1985. p. 357-88
4. **Saukko P, Knight B.** Knight's forensic pathology. 3rd ed. London: Arnold; 2004. p. 4-9, 383.
5. **Gordin I, Shapiro HA, Berson SD.** Forensic medicine A guide to principles. 3rd edition. Churchill livingstone: Edinburgh; 1988. P 110.
6. In: http://www.ncbi.nlm.nih.gov/pubmed/15659471
7. In: http://www.nber.org/digest/aug02/w8810.html
8. In:http://www.depressioncell.com/article.asp?articleid=21469&Alcohol-Fuels-Suicide-Tendencies
9. **Spitz WU, Fisher RS**. Medicolegal investigations of death. Second printing. USA: Charles C Thomas. Springfield Illinois; 1977. p. 270.
10. **Reddy KSN.** The essentials of forensic medicine & toxicology. 28th edition. Om sai graphics: Naraynaguda Hyderabad; 2009. P 300-01.
11. **Vij K.** Textbook of forensic medicine & toxicology. 5th edition. Elsevier; 2011. P 123.
12. **Camps GE, Robinson AE, Lucas BGB.** Gradwhol's Legal Medicine. 3rd edition. Bristol; Great Britain: 1976. P 331

Picture 1: Deceased

Picture 2: Body hanging from o the ceiling fan

Picture 3: Position of ligature mark near the occipital protuberance

Picture 4: Body was partially hanging