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



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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.]

Journal of Indian Academy of Forensic Medicine

Volume 32



Number 3



July-September 2010

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From Editor's Desk

JIAFM

A Quarterly Publication

Volume 32, Number 3, July to Sept., 2010

I feel immense pleasure to present before you the third issue of 2010. I assure you about the quality of research papers and quality of printing in future issues. Your valuable suggestions are always encouraging to me and I heartily welcome for future suggestions. On behalf of Executive Committee of IAFM for the years 2010-2011, I took resolution to further improve the quality and status of our Journal to match the international standards. We always learn from mistakes and try to improve upon these. I am thankful to the advertisers who have provided additional financial resources for improving the quality of this issue.

Dr. Mukesh Yadav

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Editor, JIAFM

Editorial

Unethical advertisements and role of IMA

Some rights clearly do conflicts, and a hierarchy must be established at some point. In the West, National Constitutions have sometimes been defined so that freedom of speech includes freedom of Advertisement by Corporations. On the other hand, there is some National Law and now an International law, a Right to adequate health. Indian Constitution in Article 19 protects Fundamental Right to speech and expression which includes Right to Advertisement also.

Advertisement is a public notice offering or asking for goods, services etc. it includes any notice, circular, label, wrapper, or any other document including Advertisement through internet or any other media in electronic or print form and also includes any visible representation made by means of any hoarding, wall painting, signal, light, sound, smoke or gas.

As per point 6.1, Chapter 6 of the Indian Medical Council (Professional Conducts, Ethics & Etiquette) Regulations 2002, advertisement has been defined under Unethical Acts. No medical Professional is allowed to advertise in any way which invites attention to his professional position, skill, associations, affiliations, honors or such character that would ordinarily result in his self aggrandizements. One cannot print his self photograph.

In the past **“IMA calls for ban on TV Ads for prescription-only drugs”** concerned over a television ad that urges people to take prescription drugs without mentioning the risks, the **Indian Medical Association (IMA)** had short off a letter to the Drug Controller of Delhi, asking him **to stop the misleading advertisement**.

The dug being illegally promoted was **Disclowin Plus**, which is a **scheduled H drug** that **can only be sold on a doctor's prescription**. The **advertisement promote Disclowin Plus as a cure for pain and head ache**, even though its active ingredient **Diclofenac Sodium** is **approved to treat only arthritis and gout**.

Disclowin Plus is a **Non Steroidal Anti Inflammatory Drug (NSAID)**, with side effects and it is **not recommended for asthmatic, pregnant women**, people who are **allergic for Aspirin** and those at the **risk of peptic ulcer or of gastro intestinal bleeding**. **"The advertisement is misleading and makes the people believe it is a safe pain killer for Head ache relief"**.

Side effect of Diclofenac include Headache, rash, flatulence, heart failure, blood disorders, diarrhoea, nausea, abdominal pain, ulcers in stomach or intestine, decreased kidney function, inflammation of liver and severe blistering skin reaction affecting the tissues of the eyes, mouth, throat and genitals.

But this time IMA with more than 200000 members itself accused of “unethical advertisement”. The Medical Council of India (MCI), the statutory body regulating medical education and practice, has found unethical the Indian Medical Association's endorsement of two food products and barred such endorsements. The MCI would ask IMA, to stop endorsements.

The issue is the IMA's Rs 2.25-crore contract with Pepsico to allow Tropicana fruit juice and Quaker oats to use the IMA logo on their packs for three years ending 2011. The controversy has been raging for two years after Dr K V Babu, an IMA central committee member, complained to MCI on June 6, 2008, that the endorsement violated medical ethics. After protracted proceedings, the National Human Rights Commission served a notice on the association on June 30, 2010.

After some confusion on its own powers over IMA, MCI on August 18 declared that IMA came under its jurisdiction and served a show-cause notice to the IMA "for endorsing the

product in violation of the provisions of the Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002." In its reply of August 30, 2010 IMA argued it had not endorsed the products, but only entered into a MoU with Pepsico for a 'nutritional awareness programme.'

MCI found this explanation unsatisfactory and summoned IMA Honorary Secretary- General for a personal hearing and inspection of the MoU. "Now it is clear that IMA was at fault by endorsing the products. If the endorsements have not yet been stopped, they have to be, soon".

Stand of MCI:

Board of Governors, presently in-charge of MCI's current affairs has decided to ask IMA to stop such endorsements forthwith. Penal action, if any, will be decided by the MCI ethics committee at its meeting. The decision will then have to be ratified by the Board of Directors within a week".

IMA's Stand:

Earlier, IMA office bearers had said the decision to endorse the products was a mistake, but it was unable to get out of the contract as the settlement amount would be too big.

Global Scenario:

It is claimed that in a similar case in 1988, the American Medical Association (AMA) had to pay \$9.9 million (Rs 45 crore) to withdraw from a contract it signed with Sunbeam Corporation. While that was an endorsement of medical equipment, IMA became the first professional body of doctors in the world to endorse a food product. In fact, IMA has endorsement contracts with health and hygiene products including Dettol, Lizol (sanitizers), Aquaguard (water purifier), Pampers (napkins) and Odomos (mosquito repellent).

It is the right time for IMA's present leadership to save its honour as well as of nobility of medical profession. IMA should be model torch bearer of medical ethics as the largest body of medical fraternity. It is not expected by them to act irresponsibly and unethically by becoming or to be part of any unethical advertisement just for the sake of financial benefit.

Is there Need for amendment on this issue?

Executive Committee Report 2006 at Page No. 103, 104, Item No. 217, Advertising on Starting Practice (F.No.330/2006) mentioned as follows:

The MCI approved the following recommendations of the Executive Committee/ Adhoc Committee:

"The members of the Adhoc Committee appointed by the Hon'ble Supreme Court and of the Executive Committee of the Council considered the letter dated 7.4.2006 from Dr. Saurabh Dani together with the following recommendation of the Ethics Committee dated 23rd & 24th August, 2006 with regard to amendment in the Code of Ethics Regulations 2002 Chapter 6 Sub Chapter 1, **advertising is allowed on starting practice and decided to place the matter before the General Body of the Council:**

"The Ethics Committee considered the letter dated 07.04.2006 from Dr. Saurabh Dani and decided to inform him that as per **Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002** as amended from time to time – the word press is defined as **"Print Media only"**.

The Ethics Committee is of the opinion that in today's scenario, there is every reason to think the word press may include some media other than the print media also. However, that needs amendment of the present Regulations, 2002."

The Ethics Committee was of the opinion that in today's scenario, there is every reason to think the word press may include some media other than the print media also. However, that needs amendment of the present Regulations, 2002."

Most prevalent unethical practice among medical profession in India, which can be easily proved as evidence are in record form, is related to issue of "unethical advertisement" and it needs attention of all the sections of the society including MCI and IMA in larger public interest.

*Mukesh Yadav, Editor***Original research paper****Trends of Poisoning in Rural Area of South-West, Punjab**

*Dr. Vishal Garg, **Dr. S.K. Verma,

Abstract

The study consists of poisoning cases admitted in the emergency department of Adesh Institute of Medical Sciences and Research (AIMSR), Bathinda, situated in rural area of South-West Punjab. Out of all 784 medico-legal cases admitted during the study period of two years (Apr 1st, 2007 to Mar 31st, 2009), 95 (12.1 %) cases were that of poisoning. The cases were then analyzed on various parameters to find the trends and other significant feature of poisoning in this region of Punjab.

There were 76 male and 19 female victims involved in this study and maximum cases belonged to second and third decade of life (21.1% and 43.2% respectively). Most common manner of poisoning was suicidal and their attempts (65.3%). Maximum incidences took place at home (64.2%). Most incidences of poisoning occurred between 0801-2000 hours (73.7%) and in the month of August (29.5%). Aluminium phosphide was the leading cause of poisoning (36.8%) followed by insecticides (31.6%). Maximum suicidal/attempts were reported with aluminium phosphide (56.5%) and accidental poisoning with insecticides (48.5%). Out of all 95 cases admitted 70.5% were discharged in a clinically satisfactory condition, 27.4% died and 2.1% were LAMA.

Key Words: Poisoning, Rural Area, Medico-legal**Introduction:**

Since the origin of the mankind in this world, poisoning always remained associated with it; though it was mostly accidental in nature in the earlier times [1]. In spite of advanced medical treatment and awareness, the fatal outcome from exposure (inhalation, skin contacts and ingestion) to the chemicals of agricultural and domestic use is increasing day by day [2]. Easy availability, extensive use and low cost of the chemicals, all make the population more vulnerable for accidental as well as suicidal poisoning [3]. The present study is an attempt to find out pattern and other significant features of poisoning.

Methods:

The study was retrospective analysis from Apr 1st, 2007 to Mar 31st, 2009 of all poisoning cases admitted in the emergency department of AIMSR, Bathinda. Information regarding age, gender, demography, manner, time of occurrence, stay in hospital and patient outcome was confirmed from the hospital records, victim's attendants and police.

**Professor

The collected data were analyzed, observations discussed and compared with other studies.

Observations:

Table 1
Gender & Age Wise Distribution

Age Group (In Years)	Male	Female	Total	%Age
0-10	5	1	6	6.3
11-20	13	7	20	21.1
21-30	33	8	41	43.2
31-40	10	1	11	11.6
41-50	8	2	10	10.5
51-60	4	0	4	4.2
>60	3	0	3	3.2
Total	76 (80%)	19 (20%)	95	100

Table 1 depict poisoning more common among males (80.0%) than females (20.0%) and maximum number of cases were from the age group 21-30 years (43.2%) followed by 11-20 years (21.1%).

Fig 1 Area Wise Distribution**Corresponding Author:**

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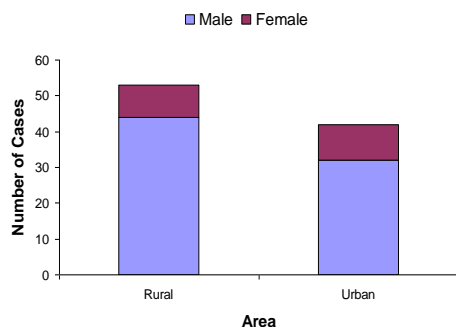


Fig 1 depicts poisoning more common in rural area (53, 55.8 %) as compared to urban area (42, 44.2%).

Fig 2 – Gender and Manner of Poisoning

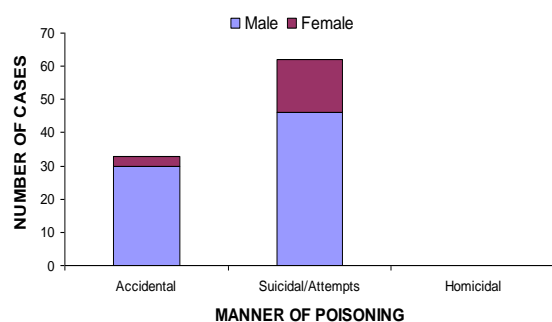


Fig 2 depicts suicidal/attempts (62, 65.3%) make major part of the study than accidental cases (33, 34.7%) in both the genders. No case of homicidal poisoning reported.

Fig 3 – Manner and Place of Incidence of Poisoning

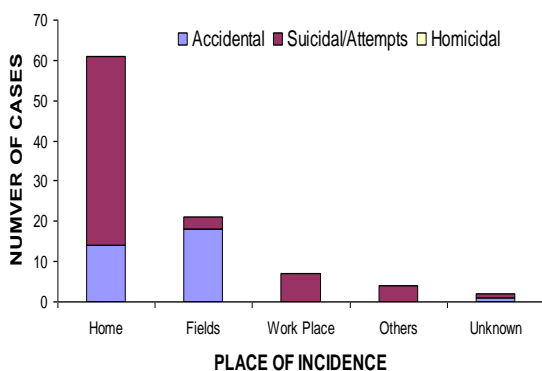


Fig 3 depicts that maximum incidences of all poisoning cases took place at home (61, 64.2%). Out of all 62 suicidal/attempts, 47 (75.8%) occurred at home and out of total 33 accidental cases, 18 (54.6%) occurred in fields. It is quite significant that all seven incidences occurred at work place were suicidal in nature. Others include 2 incidences in hostel, 1 in park and 1 outside home; all suicidal.

Table 2

Manner and Time of Incidence of Poisoning

Time (Hours)	Accidental	Suicidal/Attempts	Homicidal	Total (%)
0000-0400	4	4	0	8 (8.4)
0401-0800	1	4	0	5 (5.3)
0801-1200	6	15	0	21 (22.1)
1201-1600	13	12	0	25 (26.3)
1601-2000	7	17	0	24 (25.3)
2001-2400	2	10	0	12 (12.6)
Total	33	62	0	95 (100)

Table 2 depicts maximum incidences of all poisoning cases occur between 0801-2000 hours (73.7%). Most of the suicidal/attempts (27.4%) occur between 1601-2000 hours and accidental poisoning (39.4%) between 1201-1600 hours.

Table 3

Manner and Month of Poisoning

Month	Accidental	Suicidal/Attempts	Homicidal	Total (%)
Jan	1	1	0	2 (2.1)
Feb	1	2	0	3 (3.2)
Mar	0	1	0	1 (1.1)
Apr	0	1	0	1 (1.1)
May	2	3	0	5 (5.3)
Jun	3	7	0	10 (10.5)
Jul	1	11	0	12 (12.6)
Aug	17	11	0	28 (29.5)
Sep	5	4	0	9 (9.5)
Oct	1	10	0	11 (11.6)
Nov	1	5	0	6 (6.3)
Dec	1	6	0	7 (7.4)
Total	33	62	0	95 (100)

Table 3 depicts maximum cases of accidental poisoning were admitted in the month of August (51.5%) while that of suicidal/attempts in July and August (17.8% each).

Table 4

Gender and Type of Poison

Poison	Male	Female	Total (%)
Aluminium phosphide	31	4	35 (36.8)
Insecticides	25	5	30 (31.6)
Snake Bite	6	1	7 (7.4)
Benzodiazepines	3	3	6 (6.3)
Food poisoning	5	1	6 (6.3)
Phenyl	0	2	2 (2.1)
Cyanide	1	0	1 (1.1)
Opium	1	0	1 (1.1)
Copper Sulphate	0	1	1 (1.1)
Chlorpheniramine maleate	0	1	1 (1.1)
Paracetamol	0	1	1 (1.1)
Spasmoproxyvon	1	0	1 (1.1)

Unknown	3	0	3 (3.2)
Total	76	19	95 (100)

Table 4 depicts aluminium phosphide is responsible for (36.8%) of cases followed by insecticides (31.6%). The most common cause of poisoning among males was aluminium phosphide (40.8%) followed by insecticides (32.9%); and in females, insecticides (26.3%) and aluminium phosphide (21.1%).

Table 5
Type of Poison and the Manner

Poison	Acci-Dental	Suicidal/Attempts	Homi-Cidal	Total (%)
Aluminium phosphide	0	35	0	35 (36.8)
Insecticides	16	14	0	30 (31.6)
Snake Bite	7	0	0	7 (7.4)
Benzo-diazepines	2	4	0	6 (6.3)
Food	6	0	0	6 (6.3)
Phenyl	0	2	0	2 (2.1)
Cyanide	0	1	0	1 (1.1)
Opium	1	0	0	1 (1.1)
CuSO ₄	0	1	0	1 (1.1)
Chlorpheniramine maleate	0	1	0	1 (1.1)
Paracetamol	0	1	0	1 (1.1)
Spasmo-proxyvon	0	1	0	1 (1.1)
Unknown	1	2	0	3 (3.2)
Total	33	62	0	95 (100)

Table 5 depicts maximum suicidal/attempts were with aluminium phosphide (56.5%) and accidental poisoning with insecticides (48.5%).

Table 6 depicts the stay in hospital of 34.7% cases remained less than 24 hours with an average stay of 3 days for all cases.

Table 7 depicts 70.5% cases discharged, 27.4% cases died and 2.1% cases were LAMA. Most of the deaths were due to aluminium phosphide (92.3%).

Discussion:

The incidence of poisoning in the present study remained in 95 (12.1%) cases out of all 784 medico-legal cases admitted in the emergency department of AIMS, Bathinda; which is comparable to other studies [4-9]. Poisoning cases among males (76, 80.0%) dominated over females (19, 20.0%) in the ratio of 4:1 and is consistent with others [1-9]. Maximum cases belonged to second and third decade of life (20, 21.1% and 41, 43.2% respectively), as found by others [1, 2, 10, & 11]. Poisoning cases were more common in rural area (53,

55.5 %), because of farming background, a similar demographic data as in other studies [1, 4, 5, 6, & 9].

Most common manner of poisoning was suicidal and their attempts (62, 65.3%), the majority being male victims (46, 74.2%); in accordance with Unnikrishnan et al [3].

Maximum incidences of all poisoning cases took place at home (61, 64.2%). Out of all 62 suicidal/attempts cases, 47 (75.8%) occurred at home and out of total 33 accidental cases, 18 (54.6%) occurred at fields. It is quite significant that all seven incidences occurred at work place were suicidal in nature. Others include 2 incidences in hostel, 1 in park and 1 outside home; all reported suicidal attempts.

Most incidences of poisoning occur between 0801-2000 hours (70, 73.7%). Maximum suicidal/attempts (17, 27.4%) occur between 1601-2000 hours and accidental poisoning (13, 39.4%) between 1201-1600 hours. Maximum cases of accidental poisoning were admitted in the month of August (17, 51.5%) due to cotton cultivation in this region; while suicidal/attempts in the months of July and August (11, 17.8% each). All 35 cases of aluminium phosphide poisoning were suicidal and out of all 30 insecticide poisoning, 16 (53.2%) were of suicidal/attempts and 14 (46.7%) of accidental poisoning.

Aluminium phosphide was the leading cause of poisoning (35, 36.8%), which is used to preserve plenty of stored grains for longer periods [9]; followed by insecticides (28, 31.6%) due to farming background [1]. Out of all 76 incidences among males, aluminium phosphide alone was responsible for 32 (40.8%) cases; and out of all 19 incidences among females, aluminium phosphide & insecticides in 5 (21.1%) and 4 (15.8%) cases respectively.

Maximum suicidal/attempts were reported with aluminium phosphide (35, 56.5%) and accidental poisoning with insecticides (16, 48.5%).

Stay in hospital of 24 (34.7%) cases remained less than 24 hours with an average stay of 3 days for all cases.

Out of all 95 cases admitted, 67 (70.5%) were discharged in a clinically satisfactory condition, 26 (27.4%) died and 2 (2.1%) were LAMA. Out of 26 victims of death, 24 (92.3%) died on day one; and 24 (92.3%) died of aluminium phosphide poisoning. 23 cases of aluminium phosphide and one of insecticide poisoning died within one day.

Conclusions and Recommendations:

Pattern of poisoning cases in present study is almost similar to that of many other studies. Out of all poisoning cases, maximum casualties were reported due to agricultural and domestic use of chemicals like organo-phosphorus compounds and aluminium phosphide. Easy availability of deadly

chemicals, lack of knowledge how to handle them, delay in hospitalization and deficient emergency facilities in hospital setups in rural area; all contribute to maximum fatalities. In view of the above, I sincerely recommend the following to prevent and manage the poisoning cases:

1. There should be registered centers authorized by government to provide free services regarding spray of pesticides in fields to save crops and using insecticides to preserve food grains at home, with all safety measures.
2. The availability of deadly chemicals to anyone from open market should be constrained by prior approval for the use of such chemicals from authorized centers and keeping proper records of their sale by the retailers.
3. The various household products and the medicines should be kept under the supervision of an elderly, physically and mentally healthy person and away from the reach of children and young adults.
4. Educational counseling on the ground of humanity should be carried out among all groups of people to let them understand the meaning of valuable life given by almighty; and not to do any of the violent activities.
5. The setup of toxicological lab should be authorized least at the level of community health centers and all teaching medical institutes, to analyze the prevailing poisons like common pesticides, insecticides and drugs.
6. The hospitals should be added with the facilities required for immediate management including antidotes and resuscitation.

Acknowledgement: I am very thankful to the staff of medical record section, especially Mr. Rajwinder Singh, for their esteemed co-operation.

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Table 6
Type of Poison and Hospital Stay

Poison	Within 24 hrs	2 nd Day	3 rd Day	4 th day	5 th day	6 th day	7 th day	2 nd Week	3 rd Week	4 th Week	>4 Week	Avrg Stay
Aluminium phosphide	24	1	2	4	2	1	1	0	0	0	0	2.0
Insecticides	2	6	4	6	2	4	2	3	1	0	0	5.0
Snake Bite	3	1	2	1	0	0	0	0	0	0	0	2.1
Benzodiazepines	1	5	0	0	0	0	0	0	0	0	0	1.8
Food	0	6	0	0	0	0	0	0	0	0	0	2.0
Phenyl	1	1	0	0	0	0	0	0	0	0	0	1.5
Cyanide	0	1	0	0	0	0	0	0	0	0	0	2.0
Opium	1	0	0	0	0	0	0	0	0	0	0	2.0
CuSO ₄	0	0	0	0	0	1	0	0	0	0	0	6.0
Chlorpheniramine maleate	0	1	0	0	0	0	0	0	0	0	0	2.0
Paracetamol	0	1	0	0	0	0	0	0	0	0	0	2.0
Spasmoproxyvon	1	0	0	0	0	0	0	0	0	0	0	1.0

Unknown	0	1	2	0	0	0	0	0	0	0	0	2.7
Total	33	24	10	11	4	6	3	3	1	0	0	3.0
(%Age)	34.7	25.3	10.5	11.6	4.2	6.3	3.2	3.2	1.1	0.0	0.0	

Table 7
Type of Poison and their Outcome

Poison	Discharge	Referred	LAMA	Death	Total	%age
Aluminium phosphide	10	0	1	24	35	36.8
Insecticides	28	0	0	2	30	31.6
Snake Bite	7	0	0	0	7	7.4
Benzodiazepines	6	0	0	0	6	6.3
Food	6	0	0	0	6	6.3
Phenyl	2	0	0	0	2	2.1
Cyanide	1	0	0	0	1	1.1
Opium	1	0	0	0	1	1.1
CuSO ₄	1	0	0	0	1	1.1
Chlorpheniramine maleate	1	0	0	0	1	1.1
Paracetamol	1	0	0	0	1	1.1
Spasmoproxyvon	0	0	1	0	1	1.1
Unknown	3	0	0	0	3	3.2
Total	67 (70.5%)	0 (00.0%)	2 (2.1%)	26 (27.4%)	95 (100%)	

Corrigendum

Research Publication entitled “Correlation of Odontometric measures in Sex determination” published in **J Indian Acad Forensic Med, Issue No. 32, Vol. No.1**, due to error in communication and typing error missed names of some co-authors, in addition to the **1st Author Dr. P. C. Srivastava**, their name as **2nd, 3rd, & 4th Author** may kindly be read on **page No. 56** in the published manuscript as follows:

2. Dr. B. C. Shivakumar, M.D.

Associate Professor
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Rohilkhand Medical College & Hospital
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3. Dr. S. K. Roy Chaudhary, M.D.

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Secondly: In Table-4, Column-2, Page No. 61:

Rao et al[8], Muller et al[14], Kaushal et al[11], Reddy et al[10] may kindly be read as Rao et al[5], Muller et al[11], Kaushal et al [8], Reddy et al[7] respectively.

Original research paper

Pattern of Homicidal Deaths

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Abstract

Killing of an individual is the highest level of aggression found in all cultures. Incidence of Homicide is on the rise worldwide and pattern is also changing except for the motive v.i.z. lust for money, women and land. The present prospective study from Oct 2005 to Sep 2007 for a period of 2 years in the Dept of Forensic Medicine, MS Ramaiah Medical College, Bangalore revealed that homicidal deaths accounted for 4.32% of autopsies and victims in the age group 20-29 years constituted 49.25% of cases. In 12.25 % of cases Police did not suspect homicide prior to autopsy. Maximum homicides took place at victim's residence (31.5%) and street (29.75%). Acquaintances were involved in 47% of cases. The main motive was revenge (26.5%). Sharp weapon injuries (33.25%) were the commonest pattern followed by blunt weapon injuries (28%) and 82.5 % of victims died on the spot.

Key Words: Homicidal Death, Pattern, Motive, Acquaintance

Introduction:

Homicide is the most serious crime as old as civilization and reported as early as in the Bible. [1] Homicide is defined as killing of one human being by another human being and is one of the leading causes of unnatural deaths. [2] Killing of an individual is the highest level of aggression found in all the cultures. Since ages the very reason or motive for these killings has remained the same v.i.z. lust for money, women and land. To commit murder, two elements ("Mens-rea" which means preplanning or afore thought and "Actus reus" which means the actual execution) should work together to constitute the crime. [3] The various patterns of homicidal deaths include assault by sharp weapon, blunt weapon, firearms, strangulation, homicidal hanging, smothering, drowning, burns, poisoning etc.

The incidence of homicide is increasing world wide and the pattern is also changing because of population explosion, changing life style, modern needs of the man and easy availability of various type of weapons.

Every day, the news papers scream headlines about the rising incidence of these most horrific crimes taking place in different parts of the country especially in metropolitan cities. Murder apparently shows no partiality in Bangalore. The city's reputation that ones earned it the sobriquet 'Pensioner's paradise' has taken a severe beating and has been turned on its head. It is now on the verge of being called the Murder capital of the state. [4] In view of the magnitude and frequency of such deaths and its impact on the society, the present study is undertaken so as to find out the most vulnerable age group, sex incidence, motive, pattern of homicide, place of occurrence of crime, period of survival, and an attempt is also made to throw light on cases which were brought with history of suicidal, accidental or natural deaths but which were registered later as homicidal deaths by the police based on autopsy report and investigation during the study period.

Material and Methods:

The present prospective study was conducted in the department of Forensic Medicine M.S.Ramaiah Medical College Bangalore during the period from Oct 2005 to September 2007, a period of two years. All the cases brought to the dept for medico legal autopsy with alleged history of homicide and also the cases which were later registered as homicide were studied and cases subjected for autopsy with alleged history of homicide but which were later registered as non homicidal based on the autopsy findings, circumstantial evidence and investigation by the police were excluded. Ethical clearance was obtained. Detailed information regarding the circumstances of crime was sought from the police,

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victim's relatives and friends, visits to the scene of occurrence or deduced by the photographs of the scene of occurrence. Post mortem examination of the case was carried out as per the standards.

Results:

Table No. 1: Distribution of victims based on age and sex

Sr. No.	Age group (yrs)	No. of Males (%)	No. of Female (%)	Total No. (%)
1	0-9	4 (7)	4 (7)	8 (14)
2	10-19	1 (1.75)	1 (1.75)	2 (3.5)
3	20-29	20 (35)	8 (14.25)	28 (49.25)
4	30-39	6 (10.5)	1 (1.75)	7 (12.25)
5	40-49	4 (7)	0 (0)	4 (7)
6	50-59	4 (7)	1 (1.75)	5 (8.75)
7	60 and above	2 (3.5)	1 (1.75)	3 (5.25)
	Total	41 (71.75)	16 (28.25)	57 (100)

Table No. 2: Distribution of homicides according to the alleged history

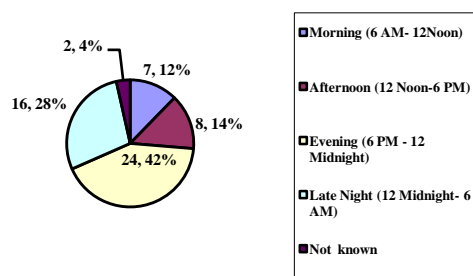
Sr. No.	Alleged History	No. (%)
1	Homicidal deaths	43 (75.5)
2	Accidental deaths	5 (8.75)
3	Natural deaths	2 (3.5)
4	Suicidal deaths	0 (0)
5	Suspicious deaths	7 (12.25)
	Total	57 (100)

Table No 3: Distribution of homicides according to place of occurrence of crime

Sr. No.	Place of Occurrence	No. (%)
1	Victim's house	16 (31.5)
2	Assailant's house	1 (1.75)
3	Victim's + Assailant's shared residence	7 (12.25)
4	Work place	3 (5.25)
5	Street	17 (29.75)
6	Remote place	0 (0)
7	Others	5 (8.75)
8	Unknown	6 (10.25)
	Total	57 (100)

Chart No. 1

Distribution of homicides according to time of occurrence of crime



Descriptive statistics for qualitative type of data was summarized using frequency and percentage along with 95 % confidence interval.

Table No. 4: Distribution of homicides based on motive

Sr. No.	Motive	No. (%)
1	Argument	8 (14)
2	Revenge	15 (26.5)
3	Financial Conflicts	10 (17.5)
4	Property gain	2 (3.5)
5	Mental illness of offender	0 (0)
6	Infidelity	2 (3.5)
7	Others	11 (19.25)
8	Not known	9 (15.75)
	Total	57 (100)

Table No. 5: Distribution of Cases according to pattern of homicide

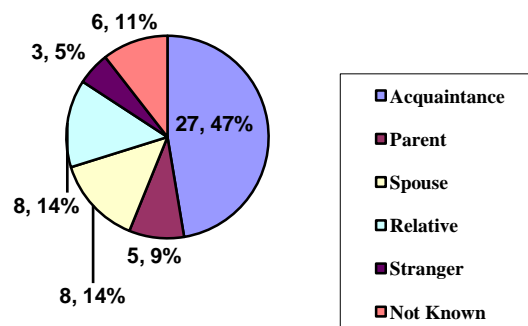
Sr. No.	Pattern of Homicide	No. (%)
1	Sharp weapon injuries	19 (33.25)
2	Blunt weapon injuries	16 (28)
3	Sharp and Blunt weapon injuries	6 (10.5)
4	Asphyxial deaths a) Strangulation (4) b) Throttling (1) c) Drowning (2) d) Hanging (4) e) Smothering (1)	12 (21)
5	Asphyxiation + Sharp weapon injuries	1 (1.75)
6	Firearm	1 (1.75)
7	Burns (Vitriolage)	1 (1.75)
8	Not Known	1 (1.75)
	Total	57 (100)

Table No. 6: Distribution of victims based on survival period

Sr. No.	Survival Period	No. of Cases (%)
1	Spot death (<1/2 hr)	47 (82.5)
2	½ hr-1 day	6 (10.5)
3	1-7 days	2 (3.5)
4	>7 days	3 (3.5)
	Total	57 (100)

Chart No. 2

Distribution of Homicides based on Victim-Offender Relationship



Discussion:

During the study period, from October 2005 to September 2007, 1319 medico-legal autopsies were conducted, of which homicidal deaths constituted 57 cases (4.32%). The factors contributing for highest incidents in the 20-29 age groups were due to marital disputes, unsuccessful romantic disputes, and infidelity, and related to dowry in females and gang rivalry, unemployment, arguments were the reasons in males. Majority of victims in the age group 0-9 years were part of pedicide - *suicide* events committed by their parents because of socio-economic reason or stress of being a single parent due to loss of spouse or estrangement. Similar findings were observed in the studies conducted by the Scott K.W.M. [5] In Gupta Avnesh [1] and Mohanty M.K.'s [6] studies the most of the victims belonged to the age group 21-30 years and is in contrast to the observation made by Wahlsten P. [7] where most of the victims belonged to 31-40 years, by Kominato Y's [8] belonged to 36-45 years, by Henderson J.P. [9] belonged to 30-39 years and by Saint Martin P [10] where most of the victims belonged to 50-59 years.

Males constituted more than $\frac{2}{3}$ rd (71.75%) of the victims which can be attributed to the aggressive nature of males than females. Similar observation made by Alan Fox [11], Rygol K. [12], Mohanty M.K. [6, 13], but in a study conducted by Kominato Y. [8] male to female ratio of the victims was 1:1.

Of the 57 cases in the study, 43 cases (75.50%) were registered as homicides at the time of autopsy. Five cases (8.75%) were registered as accidental deaths as the victims were found dead by the road side or by the railway tracks with injuries and in two cases the reasons were the history of natural disease and absence of external injuries lead them to register it as natural death and in seven cases the investigating officer suspecting foul play based on the alleged history by the deceased relatives or the injuries present on the body but later upon autopsy were registered as homicides, which highlights the emphasis/importance of visit to scene of occurrence by the autopsy surgeon prior to autopsy. In a study done by Wahlsten P. [7] police did not suspect homicide prior to autopsy 4% of the cases.

Maximum number of victim (31.5%) were done to death at their residence only, which implies that these homicides were mostly premeditated as the assailants were aware of the victim's whereabouts and motive being financial dispute or murder for gain, followed by street in 29.75% of cases which were due to gang rivalry, revenge murders and arguments arising while under the

influence of alcohol followed by those in shared residence which were mostly pedicide- suicide and infidelity related. Other places in the study mean Railway Station, playground and auditoriums etc. This study is similar to the study conducted by Kominato Y [8] and is in contrast with Vougiouklakis T. [14], where in deserted area or place close to agricultural side was place of occurrence in majority of homicides accounting for 46.2% and Mohanty M.K. [13] majority of homicides took place out doors.

In 9 cases (15.75%) the dead body was moved from the scene of the crime and attempts were made by the assailants to obliterate the identity and as well as the evidence of crime in the form of burying the body in a drain and covering with the slab, by burning or putting them by the railway tracks or in forest clearings. The presence or absence of viz. blood stains, signs of struggle/disturbance at the spot of recovery of body were taken into account for the above inference, by visiting the scene, observing the spot photographs and information furnished by the police. In a study conducted by Mohanty M.K. [13], the body was disposed in different spot in 14.7% of cases.

Maximum number of the homicides took place in the evening (42.25%) and late night (28%) which can be attributed to the factors like night fall or in darkness the chances of assailant being recognized is reduced, after a days hard work the chances of victims and assailant engaging in arguments be it domestic, financial are high when they meet up after work and as revealed in the study, most of the victims belonged to low socio-economic status and further alcohol has been a major contributory factor. A similar observation made in studies conducted by Wahlsten P. [7] and Gupta Avnesh [1] where as in study conducted by Vougiouklakis T. [14] maximum number of cases (26.9%) occurred during noon.

In most of the homicides (26.50%) the motive was revenge which included the real estate enmity, gang rivalry, business contracts etc. Financial conflicts were responsible for the 17.5% of homicides, most of them occurring in the domestic homicides and dowry related. In the present study other reasons mean marital discord, socio-economic stress, sexual jealousy, and terrorist activity etc all together constituting 19.25% of the cases. Similar observations were made by Vougiouklakis T. [14], where in the main motives were conflicts (23.1%) and revenge (23.1%) Mohanty M.K. [13], where in the revenge (29.2%) was the commonest motive followed by argument (17.1%) and is in contrast to studies conducted by James Alan Fox [11], where in the argument was the most frequent cited circumstance among those that were known.

In 30 cases the offenders were identified

prior to autopsy and in another 20 cases the offenders were identified after the autopsy. In most of the homicides offenders were acquaintance i.e. acquaintance is a person whom one knows or recognizes but does not know well or intimately. In the present study acquaintance includes friend, neighbor, employee and enemy etc. In all eight spousal homicides the offender was the male. Least number of homicides was committed by strangers (5.50%) for the monetary gain or argument. This is similar to observations made by Mohanty M.K. [13] 87% of the perpetrators who were identifiable were usually an acquaintance of the victims and is in contrast to Wahlsten P. [7], Henderson J.P. [9], where in the stranger committed maximum number of homicides.

Death due to sharp weapon injuries (33.25%) was the commonest pattern followed by blunt weapon injuries (28%) which can be attributed to the easy availability of various sharp weapons in the city. In one case the assailant used sharp weapon to cause fatal injury and made it sure by strangulating his wife. In another case the pattern could not be made out as the body was almost charred (Post mortem burns) which was found in a gunny bag. Most of the sharp weapon injuries were pre-meditated and mainly involved gang rivalry where as most of the blunt weapon injuries were unpremeditated and assailants used the blunt weapon available at the scene of occurrence. Only one case was due to fire arm injury as the law in India is strict as compared to western countries where gun licensing is relaxed. This study is similar to the studies conducted by P. Wahlsten [7] where in sharp weapon injury was the most common cause of death (39%), Gupta Avnesh, [1] where in sharp weapon injuries accounted for 57.4% of homicides and is in contrast to the studies by Preti A [15], Alan Fox [11], where in Firearms were the most common means used for homicides.

Most of the victims (82.5%) died on the spot. This could be attributed to the lethality of weapon used and determination on the part of assailant to kill the victim, since most of these cases were premeditated.

Conclusion:

- Homicidal deaths constituted 4.32% of autopsies conducted.
- Maximum number of homicides occurred in the age group 20-29 years in both sexes constituting 49.25 %.
- 12.25% of the cases were registered as homicides after the opinion of the autopsy surgeon, which were brought as accidental or natural deaths and another 12.25% of the cases were also registered as homicides after the autopsy where the investigating officer was suspecting a foul play.

- Maximum homicide took place at the victim's residence (31.5%) and street (29.75%).
- Most of the homicides took place in the evening (42.25%) and late night (28%).
- The main motive behind the homicide was revenge (26.5%).
- Maximum numbers of homicides were committed by acquaintances (47%).
- Sharp weapon injuries (33.25%) were the commonest pattern followed by blunt weapon (28%).
- Most of victims (82.5%) died on the spot.

Limitations:

1. Study was confined to a particular area.
2. The information about the victims, and the circumstances was based on the history provided by the police, victim's relatives and friends and only in few cases scene of occurrence was visited and the photograph of scene of occurrence were taken.

Recommendations:

1. As most of the victims and offenders were in 20-29 years age group the problems of this age group like unemployment should be addressed by the Government, marital disputes and family problems should be addressed by referring the parties to an appropriate agency or counselor. Police should be trained to recognize social problems likely to lead to violence at home.
2. Strict enforcement of law on possession of dangerous weapons like sharp heavy cutting weapons/firearms.
3. As most of the homicides took place either in evening or late night under the influence of alcohol, even though some step have been taken already like closure of bar at 11:30 PM, night vigilance by the police but strict enforcement has to be done and awareness about the hazards of alcohol to be conveyed to the public.
4. In the Indian scenario the investigating officer, the forensic pathologist and the judiciary system work independently and not in tandem as in the western countries where the homicide unit is constituted who share their knowledge in solving a crime. Hence investigating officer should work/co-ordinate with the forensic pathologist in solving homicides.

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Fig No. 1(a): Homicide-suicide [P.M No. 707 & 708/05]. The husband strangled his wife and after a time interval of 8-12 hours hung himself using the same rope. (Reason- Infidelity)



Fig No 1(b): Homicide-suicide [P.M No. 707/05] Note the marbling of veins, ligature mark and blood stained fluid over mouth and nostrils, in the same victim hence the time interval could be deduced between the act of homicide and suicide.



Fig No. 2: Multiple chop wounds over the back of head and neck and stab injuries over the back of chest caused by the curved end of a heavy cutting weapon (long). Motive: Gang rivalry



Fig No. 3: Scene photograph of the victim a businessman who was smothered with a pillow. Note the disturbance in the room, application of binding plaster around the mouth & peculiar fashion of binding the limbs (Motive-monetary gain)



Fig No. 4: [P.M No 574/-05] The victim an unknown female bore a cut throat injury and the body was placed in a drain and covered with stone slab to conceal the crime, was identified later. (Accused-Husband, Motive-Infidelity)

Original research paper

Animal study of silicosis in respect of morbidity and mortality

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Abstract

Silica activates release of biochemical substances in lungs. To evaluate duration dependent toxic effects of silica by biochemical changes in Broncho Alveolar Lavage Fluid (BALF) and by post-mortem findings we developed a series of rat silicosis. Based on duration of exposures, single intratracheal injection of quartz dust in saline to acute models (n=3) and inhalation of quartz dust with air to chronic models (n=3) were administered. Control rats received vehicle only. Group wise BALF was collected on completion of exposure periods. Post-mortem examination was performed. Protein, hydroxyproline, elastase and Elastase Inhibitory Capacity (EIC) in BALF were measured. Post-mortem examination revealed progressive fibro-nodular changes in lungs. Biochemical parameters excepting EIC in both models showed significant ($p < 0.001$) gradual rise. Duration dependent biochemical changes in BALF due to silica were found responsible for progressive morbidity and may be considered as early markers for diagnosis, thereby, preventing increasing morbidity and death.

Key Words: Silicosis, Post-Mortem Findings, Early Biochemical Markers, BALF

Introduction:

Silicosis is an inflammatory and fibronodular occupational lung disease of the workers exposed to quartz dust (silica, SiO_2) leading to compromised pulmonary function. Death is almost the rule in rapidly progressing silicosis. Concentration, particle size and duration of exposure of free silica determine the attack rate, latency period, incidence, rate of progression and the acute or chronic type of the disease.

In spite of protective measures including Laws, SiO_2 is still a major occupational hazard. Diagnosis of silicosis is usually confirmed by lung radiography. But Broncho Alveolar Lavage Fluid (BALF) is becoming an important tool for confirmation of diagnosis by estimating silica level along with some biochemical parameters.

Release of various biochemical substances and reactive oxygen species from inflammatory cells obtained in BALF of silicotic animals are well documented. Investigations regarding biochemical changes involving lipids, protein, hydroxyproline and enzymes in lungs of experimental animals exposed to quartz dust revealed responsibility of silica for toxic lung injury. [1, 2] Therefore, the present study was carried out aiming to evaluate duration dependent toxic effects of silica by measuring certain biochemical parameters in BALF and by observing post-mortem findings of lungs after developing silicosis in rats.

Materials and Methods:

Two experimental models of pulmonary silicosis were included in this study. Acute model for documentation of early changes by single intratracheal injection of quartz, and chronic model for documentation of late changes by quartz inhalation were produced. Commercial silica (SiO_2) in the form of granules (0.2-0.8 mm in size) was supplied by LOBA CHEMIE, India. This granular silica was then ground into fine powder in the laboratory to achieve quartz dust. A total of 120 healthy wistar rats of both sex weighing between 150-200gm were housed in a room with temperature 25°C and 50% relative humidity, feeding food and water ad libitum. Rats were divided into two halves for acute and chronic models containing 60 rats each. Rats of each model were again divided into 3 groups (n = 10 / gr.) taking control vs treated (quartz exposed) according to the durations of exposures (chronic) and post exposure periods (acute).

Acute model: Method of Dauber et al [3] was followed. Rats were anaesthetised with sodium

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pentobarbitone (50mg/kg, i. p.). Treatment groups received 10mg quartz suspended in 0.05ml saline, while control groups received only 0.05 ml saline by single intratracheal injection (24 size needle) after exposing trachea by a midline incision in neck. Closing the wound rats were kept for different durations. Effects were observed on day 3, 5 and 7 of post exposure in both treated and control groups, and accordingly those 3 groups were divided.

Chronic model: Inhalation method of Vallyathan et al [4] was modified and followed. Rats of inhalation (treatment) groups received quartz dust along with air flow in a simulation chamber for 6 hrs a day, 6 days a week. The chamber was maintained with concentration of quartz 40mg/m³, with air flow 5L/hr, humidity 50 ± 10% and temperature 22° ± 2°C. Only fresh air was administered to the control groups under the simulatory conditions. Inhalation was given for 2, 4 and 8 weeks and accordingly those 3 groups were divided.

Collection of BALF: On completion of silica exposures, rats of both models were anaesthetised with urethane (1.5 gm/kg, i.p.) for lavage procedure. Introducing an appropriate plastic cannula, exposed trachea was lavaged with phosphate buffer saline in 2 ml aliquot for five times with a syringe. Lavagates were aspirated gently each time until slight negative pressure was felt on the syringe plunger. Thus, average 6-7ml of BALF was recovered from each rat.

Post-mortem examination : After the collection of BALF, rats were sacrificed and post-mortem examination of lungs was performed under broad light.

Biochemical studies on BALF: Following biochemical parameters were studied in the supernatant fluid of BALF after centrifugation:

1. Protein estimation in BALF was carried out spectrophotometrically against the standard, bovine serum albumin (1mg/ml), according to method of Lowry et al. [5] Results were expressed as mg/ml of BALF.
2. Hydroxyproline content in BALF was estimated against the standard (hydroxyproline of concentration 1 mg/ml) according to modified method of Reddy et al. [6] Results were expressed as µg/ml of BALF.
3. Elastase and EIC were estimated by the modified method of Beatty et al [7] against the standard pancreatic elastase (100µg/ml). EIC was calculated by measuring activity differences between enzyme solution alone and the same solution to which alpha₁-proteinase inhibitor (α₁PI) or BALF had been added, i.e. measuring the enzymatic activity remaining after pre-incubation of inhibitor. Here 20 µl of α₁PI or BALF were used to measure EIC. Elastase estimation was expressed as µg/ml of BALF and

EIC was expressed as µg of elastase inhibited per ml of BALF.

Statistical analysis:

Results of biochemical measurements were evaluated statistically by Student's *t* test. All data were reported as means and standard errors (mean ± SE). The means of experimental values were compared to their corresponding control values for each time point. When *p* < 0.05, results were accepted as statistically significant.

Results:

Post-mortem findings of lungs in silicotic rats are as follows:

Acute models: No change was observed in outer as well as cut surfaces of lungs and hilar region in comparison to control groups.

Chronic models: First group (2 weeks): Pleura and hilar region appeared to be normal. Lungs were felt firmer than normal (control groups). Macroscopic appearance of cut surface of lungs was also apparently normal. Second group (4 weeks): Adhesion in apical region of lungs was found in four cases. Pleura appeared to be normal. Lungs were felt firmer than control groups. Cut surfaces of silica exposed lungs showed very minute scattered nodules which were white or grayish in appearance. Third group (8 weeks): In silica exposed rats adhesions of lungs were found. Pleura to some extent thickened. Lungs became more firm and shrunken and were nodular in feelings. Hilar region was felt shotty. There was development of several small nodules which were white or grayish in colour and found on cut surfaces of lungs. These features were not found in the control groups. Biochemical estimations in BALF are as follows:

Protein content in BALF was significantly elevated (*p* < 0.001) in all the treated groups as compared to controls. Results are given in Table 1. There was no difference of estimated amount between two quartz exposed models.

Rats showed highly significant (*p* < 0.001) increase in hydroxyproline content in BALF as compared to controls (Table 2). Intratracheal injection groups showed higher values than inhalationally treated groups.

Elastase estimation in BALF showed differences between the controls and the treated rats which were highly significant (*p* < 0.001) in the inhalation groups than the intratracheal injection groups (*p* < 0.05). In the 3rd day intratracheal injection group slight change in elastase content was observed, which was not statistically significant. Results are summarized in Table 3. No difference between the control and the quartz exposed rats was observed in respect of EIC (values are given in Table 4).

Discussion:

Public health workers are largely concerned with different aspects of vast problem of quartz dust in industry. Long exposure to silica dust in different mining, metal and stone grinding works usually leads to pulmonary nodular fibrosis, compromised lung function and ultimately death of the workers. Formerly death in silicosis was thought to be due to pulmonary phthisis or more acute respiratory infection as silica may predispose to pulmonary tuberculosis. Nowadays death is thought to be due to cor pulmonale.

Post-mortem examination reveals several findings which are responsible for increasing morbidity and death. Adhesions are common and pleura may show some thickening. Lungs become firmer than normal and shrunken. There is occurrence of fibrous nodules which give shotty feelings to the lungs and stand out on cut surface. Small scattered nodules throughout the lungs may enlarge to form up to 1 cm. Silicotic nodules are developed in lymphoid tissue of lungs and hilar lymph nodes. Hilar nodules may be larger still. These nodules are composed of whorled collagen and white or grayish or black in colour according to admixture with carbon dust. Tubercle bacilli may play a part in silicotic nodule formation. [8, 9]

The post-mortem findings of our study were in a progressive manner following the dose-response fashion. Findings of third group (8 weeks) of chronic model almost corroborated with the features of above mentioned findings as it was a long and chronic exposure. The dose-response fashion of this study is supporting the toxic role of silica in progressive pulmonary fibrosis leading to chronic morbidity and death.

Bronchoalveolar lavage has been emerged as an important clinical tool for study, diagnosis and treatment of pulmonary interstitial disorders. It provides an opportunity to sample and examine repetitively soluble constituents and cells of the injured and inflamed lung. [10]

Silicolipoproteinosis may improve rapidly after removal of free silica from the lung by bronchopulmonary lavage. [1] Many investigators used this technique for biochemical and cellular studies in experimental silicosis. In this study biochemical changes in BALF in respect of protein, hydroxyproline, elastase and EIC were evaluated after exposure of quartz dust for different durations.

The increasing changes observed in protein content in BALF during the course of this study were highly significant in all the quartz exposed groups of both models. Increased protein content may be an indicator of altered pulmonary epithelium (proteolytic destruction of lung tissue) and increased capillary permeability leading to protein exudation

following an inflammatory tissue reaction to suspended particulate matter.

Hydroxyproline is accepted as the chemical index for collagen deposition. Collagen accumulation in tissue may result from enhanced synthesis, diminished degradation, or a combination of these mechanisms. Ingestion of silica by alveolar macrophages and other phagocytic cells leads to release of various factors that influence the growth of fibroblasts and deposition of collagen. [1, 2, 3] In the present study significantly high content of hydroxyproline in BALF of quartz exposed animals was observed on 3rd day of intratracheal exposure, which further increased on 5th and 7th day. Levels were significantly more in inhalation model showing gradual rise (duration dependent). Findings of the present study corroborate with the observation of other experimental studies suggesting increased collagen deposition in lungs.

Elastase, a proteinase secreted from neutrophils and macrophages, degrades lung & arterial wall elastin, the connective tissue leading to emphysema. In healthy lung, leukocyte elastase activity is inhibited by binding to α_1 PI. Free elastase is related to the evolution of disease, and α_1 PI reflects lung defence against proteolytic injury. [11] Proteinolytic destruction of lung can result if inhibitors are reduced or proteinase activity is increased. Free elastase like activity detected in our study in quartz exposed rats was significantly higher than the controls throughout the inhalation periods and on the 5th and 7th day of intratracheal exposure showing a duration dependent change. The inflammatory changes as indicated by protein exudation could be the result of altered permeability due to increased degradation of lung and vascular wall elastin by elastase corroborating with the findings of other investigators.

There was no significant difference in elastase activity remaining after inhibition per ml of BALF by α_1 PI between control and quartz exposed rats in both models suggesting that levels of inhibitor (α_1 PI) must be same in this study. It has been reported that increased generation of free oxygen radicals inactivates antiproteases, thereby enhancing the proteolytic activity of proteinase (elastase). [12] Thus, there must be relative deficiency of inhibitor, normally present in the lungs, to combat high level of elastase in the silicotic rats of the present study. Therefore, EIC was relatively reduced in the exposed rats than the controls resulting in high levels of elastase leading to increased permeability.

Exposure to nanoparticles has been greatly increased recently due to industrial revolution. Nanoparticles constitute a part of particulate matter, which provides potentially toxicological developments and contributes to respiratory and cardiovascular morbidity and mortality. [13] Lin et al

investigated a time-dependent cytotoxicity and oxidative stress response by silica nanoparticles in human lung cancer cells. [14] The duration dependent cytotoxicity of the present study can be correlated with the time-dependent cytotoxicity of the above mentioned study leading to increasing morbidity. Production of free radicals from inflammatory cells activated by silica as well as from freshly fractured quartz [4] exerts toxic effects on lung tissue.

Investigations for biochemical parameters in BALF are possible for industrial workers. But histopathology of lung tissue is near to impossible in silicotic individual to assess progress of the disease. Radiology is the only diagnostic pathway for nodulofibrotic changes. Autopsy of silicotic victims obviously does not confer any help in diagnosis or prevention of silicosis.

In conclusion, duration dependent increasing biochemical changes in BALF were suggestive of increasing progressive toxic damage of lung by silica which was found responsible for initiation and progression of pulmonary silicosis. Protein, hydroxyproline and elastase content in BALF were significantly increased on acute exposure, whereas post-mortem findings on morphological changes of lungs was observed in chronic exposure cases, thereby suggesting that biochemical changes occur earlier than the changes in lung tissue. Significantly raised levels of BALF biochemical constituents in acute model may give a signal of initiation of silicosis and can be considered as early markers for its diagnosis. Therefore, along with estimation of silica content in BALF these early markers may help in diagnosis of silicosis much earlier than radiological findings (fibrotic changes) in the quartz exposed subjects. Thus, early diagnosed cases can be treated with anti-inflammatory and antioxidant drugs along with other preventive measures including Laws to check further progression of disease in respect of morbidity and mortality.

Acknowledgement:

The authors are acknowledging the intense support and guidance of Dr. S B Lall, formerly Additional Professor of Pharmacology, AIIMS, New

Delhi, India. We are indebted to the Departments of Pharmacology and Ophthalmology, AIIMS, New Delhi, India, for providing facilities during this work.

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Table 1
Protein content in BALF

	Control	Silica Exposed	
Intratracheal injection groups (Acute model)	Mean \pm SE (mg/ml of BALF)		p value
3 rd Day	0.64 \pm 0.03	0.97 \pm 0.10	< 0.05
5 th Day	0.64 \pm 0.03	1.18 \pm 0.09	< 0.001
7 th Day	0.66 \pm 0.05	1.20 \pm 0.05	< 0.001
Inhalation groups (Chronic model)			
2 weeks	0.73 \pm 0.04	1.20 \pm 0.05	< 0.001
4 weeks	0.67 \pm 0.04	1.21 \pm 0.07	< 0.001
8 weeks	0.70 \pm 0.07	1.41 \pm 0.04	< 0.001

Table 2
Hydroxyproline content in BALF

	Control	Silica Exposed	
Intratracheal injection groups (Acute model)	Mean \pm SE (μ g/ml of BALF)		p value
3 rd Day	2.01 \pm 0.40	07.50 \pm 0.10	< 0.001
5 th Day	1.95 \pm 0.20	11.00 \pm 2.10	< 0.001
7 th Day	2.01 \pm 0.30	16.90 \pm 2.00	< 0.001
Inhalation groups (Chronic model)			
2 weeks	2.27 \pm 0.30	05.60 \pm 0.40	< 0.001
4 weeks	1.66 \pm 0.40	08.80 \pm 1.10	< 0.001
8 weeks	2.90 \pm 0.40	13.10 \pm 2.30	< 0.001

Table 3
Elastase content in BALF

	Control	Silica Exposed	
Intratracheal injection groups (Acute model)	Mean \pm SE (μ g/ml of BALF)		p value
3 rd Day	4.50 \pm 0.50	05.90 \pm 1.00	> 0.05
5 th Day	4.40 \pm 0.50	06.90 \pm 0.90	< 0.05
7 th Day	4.50 \pm 0.50	07.70 \pm 0.90	< 0.05
Inhalation groups (Chronic model)			
2 weeks	5.60 \pm 0.60	18.80 \pm 0.50	< 0.001
4 weeks	4.90 \pm 0.60	20.80 \pm 0.60	< 0.001
8 weeks	5.50 \pm 0.70	21.30 \pm 0.70	< 0.001

Table 4
EIC in BALF

	Control	Silica Exposed	
Intratracheal injection groups (Acute model)	Mean \pm SE (μ g of elastase inhibited /ml of BALF)		p value
3 rd Day	1.63 \pm 0.06	1.48 \pm 0.07	> 0.05
5 th Day	1.57 \pm 0.06	1.47 \pm 0.07	> 0.05
7 th Day	1.65 \pm 0.04	1.77 \pm 0.10	> 0.05
Inhalation groups (Chronic model)			
2 weeks	2.40 \pm 0.04	2.10 \pm 0.04	> 0.05
4 weeks	2.50 \pm 0.06	2.23 \pm 0.03	> 0.05
8 weeks	2.45 \pm 0.10	2.37 \pm 0.05	> 0.05

Original research paper

Correlation between Maximum Femoral Length and Epicondylar Breadth and Its Application in Stature Estimation: A Population Specific Study in Indian Bengali Males

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Abstract

Stature is an important data for identification. Stature of an individual can be estimated from measurement of long bones with the help of established formulae. This method is in practice since 1899. Estimation of stature from bones has anthropological and forensic importance. Changes in the pattern of crime and steady increase in the number of homicides have made these works important and valuable for the administration of law. Excavation of graves, mass casualties and cases where grossly mutilated skeletal remains are found, become difficult and challenging for both the forensic pathologist and physical anthropologist. In India, exposed and unidentified dead bodes are often mutilated by wild animals gnawing the skeletal remains. Bone fragments, often with ends destroyed, are brought for forensic examination. Further, those formulae for long bones are population specific, and also depend on the condition of the available bones. The present study makes an attempt to establish the correlation between epicondylar breadth and maximum femoral length and subsequently its application in stature estimation in Indian Bengali population.

Key Words: Identification, Correlation, Epicondylar Breadth, Femoral Length, Regression, Stature, Indian Bengali

Introduction:

Physical anthropologists and forensic pathologists have given utmost importance to the methods of stature estimation from long bones. The bones of the lower extremity namely the femur and tibia have yielded consistent and good results. Works of Pearson [1] and thereafter Trotter and Glessner [2] have been monumental and invoked subsequent research on the subject. Morphological difference in the selected bone, due to regional and racial factors, have made it necessary to work out separate regression equations for separate groups.

Researchers have clearly indicated that population specific formulae are appropriate and produce more accurate results. Several such works have been documented. Works on Turkish population by Pelin [3] and South Africans of European descent by Chibba [4] and Bidmos are remarkable.

Again in 2008 Bidmos [5] used six variables measured on each femur that included the vertical neck diameter, upper breadth of femur, epicondylar breadth, bicondylar breadth, lateral condyle length, and medial condyle length. Regression equations for the estimation of stature were presented. The range of standard error of estimate for these equations was slightly higher than those obtained for intact long bones. The said study suggested that in the absence of intact femur, regression equations could provide a reliable estimate of adult stature.

Even group specific works were done by Duyar Izzet et al [6] to further reduce the error of estimate. As a long bone of the lower extremity, the femur has drawn considerable attention of workers like Steele G.G. et al [7] since days of Trotter and Glessner. [2] Even earlier works from India by Pan [9] on Hindus of Bengal, Bihar and Orissa are noteworthy. Fragments of femur were also used by some studies on European and African population.

In India, studies [9, 10] have been reported on regression equation of fragment of other bones (radius, humerus and tibia) using collection from the different regions of the country. In another work Shroff et al [11] calculated the percentile length of each segment and compared to total length. The regression equations were calculated to estimate total length of femur from its segments. They observed that regression coefficient in each case was highly significant. The length of femur was estimated by the equation was fairly accurate with a possible error of

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0.5 to 1 cm. Height could be calculated with the help of a small fragment of femur.

In both archeological and forensic practice, fragments of long bones (because of injury, mutilation, destruction, or post mortem gnawing by wild animals) are often presented as the only available source to establish identity. Estimation of stature becomes the most important job in such a setting. Absence of entire skeleton or availability of long bone (without intact ends) is indeed a serious problem of stature estimation. This can be overcome by applying the method (derived formula) to the available fragment of bone. This will help to solve medico-legal problems giving due consideration to regional factors.

Aims and Objective:

The present study was designed to (1) examine the correlation between maximum length (M.L) of femur and the epicondylar breadth (E.B) in male dry bones (2) derive a population specific formula (regression equation) to estimate stature from epicondylar breadth of male femur obtained from a collection of Bengali population of the state of West Bengal of India.

Material and Method:

Sixty five (65) dried and completely ossified adult specimen of male human femur were taken from the collection of the Osteology sections of the departments of Anatomy and Forensic and State Medicine, Burdwan Medical College, Burdwan, West Bengal, India. 23 were from the right side and 42 were from the left. Bones with any injury, deformity or artifact were discarded. The dried bones were from the collections of the osteology division. The source of the majority of the specimen were the prepared bones from cadaver (donated bodies) in the Department of Anatomy, obtained from the surrounding area and belonged to the local Bengali population of West Bengal State of India. The collections of the Department of forensic medicine were for the teaching programme (museum specimen) also belonging to the same population.

Measurements were taken using anthropometric set consisting of osteometric board and calipers. The four authors took four readings, and mean of the four readings were recorded to minimize the inter-observer variations. Record was in centimeter (cm.) and the measurement was up to one decimal place (nearest millimeter).

Measurements of femur:

Maximum Length: distance from the most superior point on the head of the femur to the most inferior point on the distal condyles using osteometric board. The medial condyle was placed against the vertical endboard while applying the movable upright to the femoral head.

Epicondylar Breadth: distance between the two most laterally projecting points on the epicondyles.

The measurements obtained were analyzed using SPSS Statistical software for windows version 10.0. Metric data was reported as mean standard deviation, median and 95% confidence interval. P value of <0.05 was taken as significant Pearson's correlation was used to examine the association between maximum femoral length and the epicondylar breadth. Paired sample T- test was used to compare the means between the observed and predicted length in the 20 randomly selected bones.

Observation / Results:

The summary statistics of the maximum length and epicondylar breadth in the sample are shown in Table 1. The mean value of femoral length and the epicondylar breadth were 41.82 and 7.16 respectively. The correlation was made between the epicondylar breadth and the maximum femoral length. Regression equation with the epicondylar breadth as the independent variable and the maximum length of femur as dependant variable was obtained using the total sample (N=65). Subsequently formula for estimation of stature was obtained from combining the result of the regression equation with earlier population specific method of estimation of stature. The method of Pan for the estimation of stature from male femur was applied to our equation from the present study. Multiplying factor of 3.82 was used after suitable conversion of the units (from cm to feet) of measurement to get the stature in feet from the maximum length of femur (derived by our regression equation)

The Pearson's coefficient of correlation was 0.85.

The following Regression equation obtained: $y = 7.02 + 4.83x$

Where "x" is the Epicondylar breadth (in cm.) and "y" is the maximum femoral length. The standard error of estimate was 1.68. The value of R squared was 0.722 (Figure 1)

From the equation the values were obtained for 20 randomly selected bones. These were compared with the observed length of those (n=20) and test of significance was done. It was seen that the results were consistent and accurate. The difference between mean of estimated and observed values of the total length was by chance (P value greater than .05 indicating the validity of the regression equation.). Since the present work was contemplated on Bengali population the multiplying factor of 3.82 (when measure in feet) was applied.

The combined formula works out to:

$$Y = (7.20 + 4.83 x) * 0.125$$

Where Y is the estimated stature in feet and x is the measured epicondylar of femur breadth in centimeters.

Discussion:

In the present series, only one parameter was used to correlate with the maximum length of femur. From the measurements it was seen that the maximum length of the femur correlates well with the Epicondylar breadth. Pearson's coefficient was 0.85. The correlation was statistically significant at 0.01 levels. (Two tailed)

The measurements of both sides (Left and right) were grouped and noted separately but the results pooled to obtain the regression equation. This was done because no significant difference in measurement was found between the left and right side femora in the sample of 65 male femora. The important factors like age and nutritional status could not be considered in the study. These shortcomings are accepted, which can be overcome in future works to further increase the accuracy. Contrary to earlier works of Steel [7] where prehistoric specimen were used, the present series estimated on a modern sample of Bengali Indians from the state of West Bengal to calculate the total length from where we can estimate stature by using appropriate formula. (Multiplying factor) Since the present work was contemplated on Bengali population, the method of Pan [8] was applied with the multiplying factor of 3.82 (when measured in feet)

One important shortcoming of the present series is that stature calculation by this approach was based on combining two separate formulae (the regression equation obtained in the study and a multiplying factor [8] obtained by an earlier worker) thereby compounding the error. The sample size was small of only 65 male femora. We could not afford digital calipers. The precision of measurements could have been increased by such instrumentation.

The present investigation is a preliminary work. It can be considered as a pilot study in obtaining the regression equation to estimate maximum length of femur from the epicondylar breadth in a sex and population specific sample. Being population specific, it can be applied in case studies pertaining to the local problem of identification of human remains when fragment of bone or grossly mutilated bodies are subjected to forensic autopsy.

The principle can also be used to measure those dimensions in living subject after making necessary allowance for soft tissue thereby adding on to the corpus of data on anthropometric studies in large population. The results are reliable, but further works need to be designed to get more accurate estimates in population considering the age factor as well.

The present work shows that it is possible to estimate stature of an individual from the epicondylar width with reasonable accuracy by the regression

equation. Necessary correction for soft tissue can be made to obtain the living stature in practical cases of forensic interest in a population specific geographic area.

Table 1
Summary Statistics

	MAXIMUM FEMORAL LENGTH (CM)	EPICONDYLAR BREADTH (CM)
MEAN	41.82	7.16
VARIANCE	9.95	.308
MEDIAN	41.8	7.40
STD. DEVIATION	3.05	.56
95 % C.I	41.03-42.6	7.03-7.30
MINIMUM	35.8	6.2
MAXIMUM	46.8	8.1

Table 2
Correlations between Maximum Femoral Length and Epicondylar Breadth

		Maximum Femoral Length	Epicondylar Breadth
Maximum Femoral Length	Pearson Correlation	1.000	.850(**)
	Sig. (2-tailed)		.000
	N	65	65
Epicondylar Breadth	Pearson Correlation	.850(**)	1.000
	Sig. (2-tailed)	.000	.
	N	65	65

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

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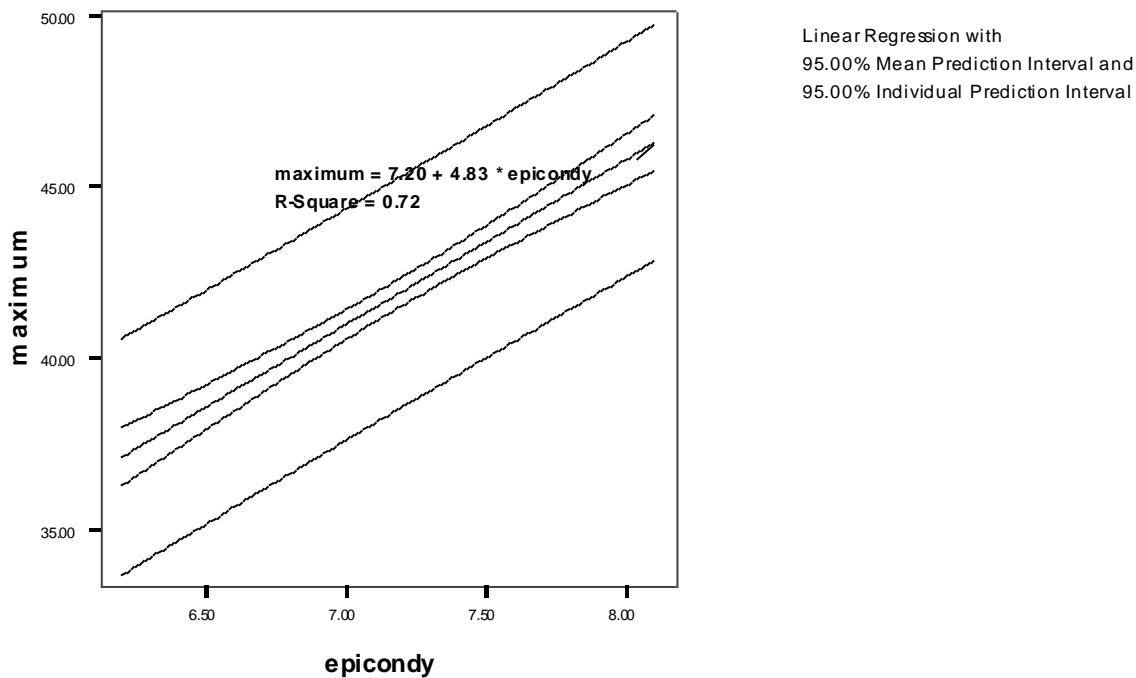
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Fig. 1

The regression line of maximum femoral length against Epicondylar width

regression line of total femoral length versus epicondylar breadth



Original research paper

Correlation of CT Scan with Postmortem findings of Acute Head Trauma cases at SMS Hospital, Jaipur

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Abstract

Epidemiological information is of great importance in the allocation of resources for the treatment and in formulating policy designed to reduce the incidence, morbidity and mortality of head injuries. In our country much epidemiological data regarding head injuries are not available, hard to find or inaccurate. The reasons for this are several there is no centrally run health care system in the country and head injury cases are managed by a wide variety of Government, Municipal and Private hospitals. The National Health Statistics compiled in the vital statistics in our country give incomplete information regarding head injuries while it is possible to determine mortality from cancer or heart diseases or number of other illness from vital statistics but same is not true for head injuries. Accidental deaths are catalogued as to etiology (for example, death from falls, motor vehicle etc.) and there is no information available as to the part of the body injured.

The present study is an attempt to analyse epidemiological aspects of acute head trauma and evaluate the correlation of finding by various diagnostic modalities.

Key Words: Acute Head Trauma, CT Scan, Postmortem Findings

Introduction:

Among all the regional injuries, the injury to the head and neck are most common and important in Forensic practice. As Head accommodates one of “the most vital organs of the body- The brain”. The external injury on the head and the face may or may not be representative of internal injury and the extent of danger of the impact. A thorough interpretation from the external and internal injuries to skull and its contents in light of the modern non invasive/ diagnostic tools available at hand with the treating surgeon is necessary and the findings recorded and evaluated after these non invasive diagnostic procedures (conventional radiography, USG, C.T. scan, MRI), it is essential to corroborate and correlate the findings, if death of the injured occurs, at the time of autopsy.

A sound practical understanding of the neuropathological trauma is more essential to forensic pathologist than other aspects of this subject because head injuries provide the major contribution to the death due to assaults, falls and transportation accidents. The ability of CT scanning to rapidly demonstrate a surgically correctable lesion, fracture and subarachnoid haemorrhage make it a modality of choice in evaluation of acute head injury.

Aims and Objectives:

- To evaluate the correlation of the findings of C.T. scans plain (head) with postmortem examination in acute head trauma.
- To find out the possible reasons of indiscrepancy if observed on C.T. scan examination.
- Epidemiological aspects of acute head trauma.

Material and Methods:

A total of 140 cases of Acute Head Trauma admitted in the Neurosurgery Department of the S.M.S. Hospital, Jaipur, were studied.

Procedure:

A detailed history pertaining to time, manner, and manifestations of head injury were recorded in the specially designed Performa. The detail of the course of the patient after hospitalization in addition to laboratory

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investigation, X-Ray, C.T. Scan (Head) and surgical intervention findings were recorded.

Exclusion Criteria:

All those cases that have sustained head injuries and died at spot i.e. received dead in mortuary. The cases who were not subjected to CT Scan examination. The cases associated with metabolic, endocrinal, hypertensive and cardiac disorders.

Table 1
Age and Gender Wise Distribution of Cases

Age in Years	Male No. (%)	Female No. (%)	Total No. (%)
> 10	21(17.2)	9 (50.0)	30 (21.4)
11-20	12(9.8)	-	12 (8.5)
21-30	27(22.1)	1 (5.5)	28 (20)
31-40	26 (21.3)	2 (11.1)	28 (20)
41-50	19 (15.5)	1 (5.5)	20 (14.2)
51-60	10 (8.2)	3 (16.6)	13 (9.2)
61-70	6 (4.9)	1 (5.5)	7 (5)
70 <	1 (0.8)	1 (5.5)	2 (14)
Total	122 (100)	18 (100)	140 (100)

Among male majority was in the age group 21-30 yrs (22.1%) and in females >10 yrs (50%).

Table 2
Manner of Injury in Acute Head Trauma

Manner of Injury	No. (%)	Male	Female
		No. (%)	No. (%)
Traffic Acc.	87 (62.1)	81 (66.3)	6 (33.3)
Fall	43 (30.7)	32 (26.2)	11 (61.1)
Assault	7 (5)	6 (4.9)	1 (5.5)
Unknown	2 (1.4)	2 (1.6)	-
Misc	1 (0.7)	1 (0.8)	-
Total	140 (100)	122 (100)	18 (100)

Main cause of injury was Traffic accident (62%). Among males it is 66% and in females it is 33%. Leading cause of injury among females was fall from height 61%.

Among Traffic accident category normal CT Scan were 33% and abnormal were 67% with majority showing Linear fractures. In fall category normal CT Scans were 26% and abnormal were 74% with majority showing linear fracture. In assault category 57% presented with depressed fractures. (Table 3) Majority of fractures were localised in parietal bone 43% on Left and 40% on Right. Temporal region was least affected on left and frontal region on right side. (Table 4)

Out of 140 cases 16% doesn't have bony injury while 84% presented with fractures of skull. Fracture of skull were detected in 118 (84%) cases fracture of the skull of various types v.i.z. linear (77) cases, depressed (13) cases, Comminuted (7) cases and base of skull (21) cases. (Table 5)

In CT Scan (head) no bony injury was reported in 58 cases, contrary to the autopsy findings

where the skull bones were found intact only in 22 cases out of total 140 cases. (Table 6)

Discussion:

The present study entitled "The correlation of C. T. Scan (Head) vis-à-vis postmortem findings in cases of acute head trauma (A prospective study)" was undertaken on the cases of Acute Head Trauma brought for postmortem examination in the department of Forensic Medicine and Toxicology through department of Neurosurgery of S.M.S. Medical College, and Associated Hospital, Jaipur.

A total of 140 cases of acute head trauma who had been treated in the Department of Neurosurgery and X-ray, CT Scan (Head) and/or surgical intervention has been done and subsequently died and autopsy was performed.

In the present study the total of 140 cases within a range of 8 months to 72 years of age has been studied. It has studied 1000 patient who had both CT of the head and conventional skull series of the radiograph, in 25% of the cases the radiographs were abnormal, in 6.4% cases diagnostically significant abnormality at radiography were not detected by CT. They further reported that in 25 patient the vault fracture were not detected by CT because of their position near the mid line in high parietal lesion[1]. Our findings are also consistent with Alker George J. [2], Zimmerman A. Robert[3], De Campo J. [4]

All the 140 cases of this study shows that there is significant absence of correlation of the findings of the injuries to meninges and brain in CT scan, and autopsy findings

To find out the cause of absence of this correlation, on review of the literature following are the possibilities:

In the present study edema of the brain was detected at autopsy in 09 cases out of them edema was detected in 5 cases during first CT scan and in 2 cases on repeat CT scan which may be due to development of edema of the brain as response to the injury to the brain. Acute massive cerebral swelling with in 30 minutes after close head injury is documented by a computer tomography, which rapidly resolved by steroid treatment Waga S. [5], Clifton G. N. [6], French and Dublin [7] has pointed out that in over 70% of the patients undergoing CT within the first 24 hours following trauma were considered to have a contusion, where as over 80% of the patients whose CT's were performed after 24 hours had apparent edema on CT scan.

In the present study contusion of the brain stem was found in 16 cases at autopsy where as they were detected directly or indirectly in 5 cases on CT scanning. When large the haemorrhagic lesion may get detected by widely used first and second generation CT scanner but smaller one may not be seen on CT because of the artifacts in the posterior

fossa image Tsai F. Y. [8] has reported less than 20% of the brain stem lesion as hemorrhagic on CT, the presence of haemorrhage in sub arachnoid spaces around the brain stem on CT may be the only evidence of the brain stem injury. The recognition of the brain stem injury has important implication as patient with CT documented brain stem injury have a poor outcome. 80% of the patients dying of the injury resulting from the trauma had mid brain lesion at autopsy that were not visualized by CT Rosen Blum W. Y. [9] Similar observation and explanations are also possible in this study.

Contusions and laceration of the brain may be single or multiple and usually occur at anterior, frontal and temporal lobe Cooper Paul R[10] in this study too the contusion and laceration of the frontal and temporal lobe are more in number as compared to the other locations and they are detected by CT scanning almost equivocally to autopsy. The contusions and laceration of the inferior aspects of the temporal and frontal lobes are not readily visualize in CT scan because of beam hardening artifact which is a well documented limitation of the CT scan procedure.

In the present study in 9 cases the injuries to the cerebellum as contusions and lacerations are detected at autopsy but only in 2 cases they were detected on CT scan. The failure of the CT scan to detect these lesions may be due to the technical fault while planning the CT scanning.

The accident form a major public health problem, which cannot be seen from mortality figure, compiled in the vital statistics figures of our country. According to World Health Organization, about 3.5 million people die all over the world due to the injuries while about 700000 die due to road accident. The head injury is more frequent in male, has been universally noted. Male predominance varies from 81% reported in England to low of 59% in USA reported by Kraus. [11] All studies shows that in absolute number, head injuries are more frequent in younger age group. The age specific morbidity and mortality rates, however, are higher in elderly. They speculate that associated medical disease may be reason for the higher death rate.

In the present study the total of 140 cases within a range of 8 months to 72 years of age has

been studied, males 122 (87.1%) out numbered females 18 (12.8%). Maximum numbers of the cases were within the age group of 21-40 years, 56 cases (40%) followed by below 10-year age group 30 cases (30.4%). The manner of injury in acute head trauma was due to road traffic accident 87 (62.1%) followed by fall from height 43 (30.7%) cases and remaining number of the cases were due to assault 7 (5%) and other causes 3 (2.1%). The maximum numbers of cases has sustained injuries in road traffic accident and were in the age group of 21-40 years with male preponderance this is due to fact that males are more prone to road traffic accident being their outdoor working schedule as compared to the females. The age group below 10 years sustained acute head trauma in 17.8% of cases of this age group, which was due to accidental fall from height. Our findings are consistent with Kraus. [11]

Conclusion:

The CT scan cannot accurately detect the lacerations of the various lobes of the brain, particularly when they are located on the inferior or medial aspects of the temporal and fronto-parietal lobes respectively. The recognition of contusion and lacerations of cerebellum on CT scan are dependent upon the planning of CT scan and the thickness of the CT slices.

The possible reasons for indiscrepancy observed on CT Scan examination were:

Mass effect of the various types of the intra cranial lesions is not developed in initial stages of acute head trauma. The CT scan mostly fails to detect the anatomical location of the lesion precisely. Appearance of the various intra cranial injuries on CT scanning depends upon the globin content of the extravasated haemoglobin.

Beam hardening artifact and partial volume effect, which are the inherent technical limitations of the CT scan systems also appears responsible for the failure to visualize.

The age group of 21-40 years with male predominance is more vulnerable for road traffic accidents; the age group of below 10 years is more prone to sustain head injury due to accidental fall from height.

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Table 3
CT Scan (Head), Bony Cage Finding in Each Presenting Category

Manner of Injury	No of Cases	Normal CT Scan	%	Abnormal CT Scan			Total	%
				Lin #	Dep #	Com #		
Traffic Acc	87	38	32.8	39	9	1	49	67.1
Fall	43	17	25.7	20	6		26	74.2
Assault	7	-	-	3	4		7	100
Unknown	2	-	-	2			2	100
Misc	1	-	-	1			1	100
Total	140	55	39.2	65	19	1	85	60.7

Table 4
Site of Fracture of Skull in CT Scan

Site of #	Fracture Side			Lin #	Dep #	Comm #
	Left	Right	B/L			
Frontal	16(34.8)	9(23.7)	1	19	7	-
Parietal	20(43.4)	15(39.5)	-	26	9	-
Temporal	10(21.8)	14(36.8)	-	20	3	1
Occipital	-	-	-	-	-	-
Ant Fossa	-	-	-	-	-	-
Middle Fossa	-	-	-	-	-	-
Post Fossa	-	-	-	-	-	-
Total (85 cases)	46	38	1	65	19	1

Note: Figures in parenthesis indicates percentage

Table 5
Bony Cage Finding Detected at Autopsy

Manner of Injury	No of Cases	No bony injury	Fractures of skull				Total
			Lin#	Dep #	Comm #	Base of skull	
Traffic Accident	87	14(16)	45	6	4	18	73(84)
Fall	43	8(19)	26	4	2	3	35(81)
Assault	7	-	3	3	1	-	7(100)
Unknown	2	-	2	-	-	-	2(100)
Miscellaneous	1	-	1	-	-	-	1(100)
Total	140	22(16)	77	13	7	21	118(84)

Note: Figures in parenthesis indicates percentage

Table 6
Critical Evaluation of Bony Trauma (Head) findings of Acute Head Trauma

Manner of Injury	Number	CT Scan (head)		Autopsy	
		No bone injury	Fracture Skull	No bone injury	Fracture Skull
Traffic Accident	87	38	49	14	73
Fall	43	17	26	8	35
Assault	7	-	7	-	7
Unknown	2	-	2	-	2
Miscellaneous	1	-	1	-	1
Total	140	58	82	22	118

Original research paper

Risk Factors for Low Birth Weight (LBW) Babies and its Medico-Legal Significance

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Abstract:

Birth weight is the most important factor that affects infant and child mortality. This one year study was conducted in a cohort of pregnant women to study the proportion of low birth weight babies and to find out the socio-economic and maternal risk factors affecting the birth weight of newborns and its medico-legal significance. Information regarding socio-economic status, obstetric history and present pregnancy was collected. These women were followed up till their delivery and birth weight was recorded with 24 hours of delivery. Birth weight was available for 256 births. The overall prevalence of low birth weight was 34.37%. Overall mean birth weight was found to be 2.64 ± 0.444 with 95% confidence interval of 2.59-2.69. Primigravida mothers showed the highest prevalence of low birth weight (30.86%, $p < 0.001$). The main factors which were significantly associated with LBW were maternal education, stature, age at delivery; short inter pregnancy interval, inadequate antenatal care, and per capita income of family.

Key words: Low Birth Weight (LBW), Risk Factors, Body Mass Index (BMI), Medico-legal Significance

Introduction:

Birth weight is the single most important criterion for determining the neonatal and infant survival. Low Birth Weight (LBW) is a sensitive indicator of the socio-economic conditions and indirectly measures the health of the mother and the child. Babies with a birth weight of less than 2500 g irrespective of the period of their gestation are termed as Low Birth Weight (LBW) babies [1]. In India 30-35% babies are LBW and more than half of these LBW newborns are full term babies [2]. A cross-sectional hospital based study done in Western Developmental Region of Nepal showed 29.8% of infants were born with a low birth weight [3].

LBW being one of the global indicators of community health, it is imperative that periodic monitoring be undertaken to evaluate the impact of preventive health services.

During past decade, several intervention programmes including Safe Motherhood and Reproductive Health, have been launched all over to improve the health status of mothers and children. It was in this context, the present study was designed to find out the effect of various socio-economic and maternal risk factors on the birth weight of institutionally delivered newborns and its medico-legal significance.

Material and Methods:

The present study was conducted in the Department of Community Medicine, Manipal College of Medical Sciences, Pokhara, Nepal from January 2006 to December 2006. The research reported in the paper was approved by the Research Ethics Committee of Manipal College of Medical Sciences. Approval was granted prior to the commencement of data collection by questionnaire. The study population comprised of mothers along with newborns in randomly selected 5 sub-health posts (alternate health post was selected from total 10 health posts under the college) of population varying from 1500 to 2000 and birth rate 30.98 [4]. Verbal consent was obtained from each mother recruited for this study. A prospective cross-sectional study design was adopted. All pregnant women in these health posts are enrolled without any exclusion criteria in the first survey, their height and weight were recorded. These women were followed up till their

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delivery. Mothers were interviewed next day of delivery and the available health records were reviewed. A pretested schedule was used to record the information regarding mothers. Information on mother included: height, weight, literacy status, occupation, percapita income of family, past obstetrical history, birth interval, antenatal care, along with age at delivery. Birth weight was taken within 24 hrs of the birth and sex of the new born was recorded.

Statistical Analysis:

The data was tabulated according to the various socio-economic and maternal factors included in the study and was analyzed using statistical software SPSS 10.0 for windows (SPSS Inc., Chicago, IL, USA). In order to test for association between two variables, a Chi-square and Normal test for proportion were applied.

Results:

Overall mean birth weight was found to be 2.64 ± 0.444 kg with 95% confidence interval (CI) of 2.59 -2.69. Out of total 34.37% newborns were weighing less than 2.50 kg and 95% CI for the prevalence of LBW was 28.58-40.22 (Table I).

Maternal education ($\chi^2=8.78$, $p<0.005$), occupation ($\chi^2=8.14$, $p<0.02$) and percapita income of the family per month ($\chi^2=22.02$, $p<0.001$) were found to be significantly associated with birth weight of the newborn (Table II).

Utilization of antenatal care was adequate (≥ 3 antenatal visits) in 58.20% mothers. There was significant association between birth weight and utilization of antenatal care by mothers ($\chi^2=26.01$, $p<0.001$) (Table III).

Out of 177 births birth interval in relation to previous birth was found to be less than 3 years in 74.01% mothers. Here the birth weight was found to be significantly associated with birth interval in relation to previous birth (Table IV).

Maternal age ($\chi^2=10.19$, $p<0.01$), parity ($\chi^2=13.4$, $p<0.01$) and BMI ($\chi^2=17.57$, $p<0.001$) were found to be significantly associated with LBW (Table V). Out of the total, 65 (25.39%) mothers had history of past adverse outcome of which 56.92% delivered LBW newborns. History of past adverse outcome was found to be significantly associated with LBW ($Z=4.36$, $p<0.001$) (Table VI).

Discussion:

Based on the observations of the present study, it was found that out of a total of 256 newborns, 88 (34.37%) had birth weight less than 2.5 kg. Overall mean birth weight was 2.64 ± 0.444 kg (confidence interval 2.59 – 2.69). It is more than what observed in hospital based study (29.8%) done in Western Region Hospital, Pokhara, Nepal [3] and Kathmandu [5, 6].

It was observed that 38.67% mothers were illiterate and 45.45% of them delivered LBW babies,

it was in conformity with earlier reports [7, 8]. This may be explained by increased awareness of educated women regarding health services.

The proportion of LBW was maximum (43.94%) in mothers who were labourers by occupation; same observation was documented in earlier studies [7, 8]. The proportion of LBW babies decreased with increase in the percapita income of the family. These finding are in accordance with other studies [7,8].

The present study showed that birth weight was significantly associated with level of utilization of antenatal care ($\chi^2=26.01$, $p<0.001$). Out of 73 (28.52%) mothers who did not receive proper antenatal care, 46.57% of them delivered LBW babies and of 34 (13.28%) who did not receive any antenatal care 61.76% of them delivered LBW babies. Anand K et al [8] in there study observed that LBW was 50% in un-booked mothers.

It was observed that in 131 (74.01%) mothers, the birth interval between present and previous pregnancy was less than 3 years and 42.75% of them gave birth to LBW babies. These finding were supported by Deswal et al [9] and Mavalankar et al [10].

Results of the present study also show that young mothers (< 20 years) have more number of LBW babies (53.45%), in accordance with similar findings from other studies. [3, 11] Primiparous women in this study also had more number (29.11%) of LBW babies as found in other studies [6-9, 12]. An increase in LBW was found after fourth parity (51.28%). Makhija et al [12] documented 39.7% LBW after 4th parity.

Present study showed that there is significant association between BMI of mother and LBW ($\chi^2=17.57$, $p<0.001$). These finding are in accordance with other studies. [9, 10]

Past history of adverse pregnancy outcome was found to be significantly associated with LBW in present pregnancy ($Z=4.36$, $p<0.001$). Kayastha [6] and Deswal et al [9] have reported similar findings.

Medico-legal Significance:

Approximately half of “neonatal deaths” take place within first two days of life and it very closely associated with pre-maturity- a premature infants being defined as one with a birth weight of less than 2.5 kg (5.5 lb) [12]. Morbidity and mortality among LBW infants are well documented in the literatures. In a study from South Africa, neonatal death rates for various weight categories was reported to be highest among neonates weighing 1000-1499 g and lowest in >2499 g [13]. In our study, we found 78 low birth weight babies out of total 256. It has a great medico-legal significance as it is this phase that child murder (infanticide) is most probable. Also, filicide i.e. the killing of a child by its parents may be a challenge for medico-legal experts in deciding cause of death and

motive behind it as low birth weight itself makes infants vulnerable to multifactorial causation of death. Deliberate starvation or lack of care of an infant/child also has got its implications while dealing with the cases of child abuse.

Statistics on births and abortion in Monroe County, New York were analyzed for the years 1967 to 1978 with special to the proportion of infants born weighing less than 2.5 kg to mothers less 14 years of age that showed an overall increase in low birth weight infants 12.5% to 16.2% of life births [14]. This study also shows increase incidence of low birth weight babies (53.45%, $\chi^2=8.35$, $p<0.005$) in mothers below 20 years of age. Despite of having legislation regarding age of marriage (16 years with guardian's permission and 18 years without it) in Nepal, the marriages below 16 years are still common.

Conclusion:

Age at delivery, short birth interval, inadequate antenatal care, poor maternal nutrition, high parity, history of abortion, still birth and low birth weight babies in previous deliveries; come out as major factors associated with LBW in newborns. The present study suggests that improvement in maternal nutrition during pregnancy, avoiding close birth spacing, delayed child bearing in young females (<20 years), universal coverage of adequate antenatal care, are essential for reducing the LBW in newborns. This can be achieved by including health education component for adolescents (both males and females) and pregnant mothers in Maternal and Child health related program, especially in rural areas where literacy rate is very low by utilizing grass route level health workers already existing in community.

To minimize the ethical and medico-legal problems in LBW babies, a multi-prong approach is needed:

1. Public education and awareness on how to carry on a healthy pregnancy.

2. Improve the health of the mother.
3. Provide the adequate antenatal care.
4. Detect high risk pregnancy early and make preparations.
5. Awareness for protection of rights of the innocent baby.

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Table I
Distribution of birth weight according to sex of newborn

Birth weight (in kg)	Male (%)	Female (%)	Total
< 1.00	00 (0)	01 (0.83)	01 (0.39)
1.00-1.49	02 (1.48)	01 (0.83)	03 (1.17)
1.50-1.99	07 (5.19)	06 (4.96)	13 (5.08)
2.00-2.49	35 (25.92)	36 (29.75)	71 (27.73)
2.50-2.99	67 (49.63)	56 (46.28)	123(48.05)
3.00-3.49	23 (17.04)	19 (15.70)	42 (16.41)
> 3.50	01 (0.74)	02 (1.65)	03 (1.17)
Total	135 (100)	121(100)	256(100)
Mean \pm SD	2.638 \pm 0.434	2.617 \pm 0.464	2.64 \pm 0.444

Z=0.38, p> 0.05

Table II
Relationship of socio-economic factors with LBW

Socio-economic factors	LBW (%) N=88	Odds Ratio	95% CI	Total (%) N=256	Significance Test
Maternal education					
Illiterate	45 (45.45)	2.21	1.26-3.38	99(38.67)	$\chi^2=8.78$, df=1 p<0.005
Primary	43 (27.39)	1		157 (61.33)	
Maternal occupation					$\chi^2=8.14$, df= 2p<0.02
House wife	52(34.90)	2.6	1.04 – 7.42	149(58.20)	$\chi^2=3.98$, df= 1 p<0.05
Labourer	29(43.94)	3.81	1.36 – 11.02	66(25.78)	$\chi^2=7.02$,df=1p<0.01
Service	07(21.16)	1		41(16.02)	
Per-capita income (INR)					$\chi^2=22.02$, df=3p< 0.001
<150	41(52.56)	7.54	2.52 – 26.85	78(30.47)	$\chi^2=15.59$, df=1p<0.001
150-299	29(34.12)	3.52	1.18 – 12.66	85(33.20)	$\chi^2=5.07$, df=1p<0.05
300-499	13(24.07)	2.16	0.63 – 7.78	54(21.09)	$\chi^2=1.19$, df=1p=0.274, NS*
≥ 500	05(12.82)	1		39(15.23)	

df= degree of freedom *Not Significant

Table III
Association of birth weight with utilization of antenatal care by mothers

Utilization of Antenatal Care	LBW (%)	Odds Ratio	95% CI	Total (%)	Significance Test
Nil (0)	21(61.76)	5.68	2.4 -13.56	34(13.28)	$\chi^2=20.89$,df=1 p<0.001
Inadequate(1-2)	34(46.57)	3.06	1.61- 5.35	73(28.52)	$\chi^2=13.87$, df=1p<0.001
Adequate(≥3)	33(22.15)	1		149(58.20)	
Total	88			256	

$\chi^2=26.01$, df = 2, p<0.001

Table IV
Association of birth weight with birth interval

Birth interval(in years)	LBW (%)	Odds Ratio	95% CI	Total (%)	Significance Test
< 3	56(42.75)	3.07	1.29 – 7.48	131(74.01)	$\chi^2=7.86$, df=1 p<0.001
≥ 3	09(19.57)	1		46(25.99)	
Total	65			177*	

*79 primipare have been excluded from the total.

Table V
Relationship of maternal factors with LBW

Factors	LBW (%)	Odds Ratio	95% CI	Total (%)	Significance Test
Maternal Age (in years)					$\chi^2=13.11$, df=3, p<0.01
≤ 20	31(53.45)	2.61	1.28 – 5.33	58(22.66)	$\chi^2=8.35$,df=1, p<0.005
21-24	33(30.55)	1		108(42.19)	
25-29	18(24.66)	0.74	0.36 – 1.53	73(28.51)	$\chi^2=0.49$,df=1,p=0.49, NS
≥ 30	06(35.29)	1.24	0.37 – 4.04	17(6.64)	$\chi^2=0.01$,df=1,p=0.91, NS
Parity					$\chi^2=13.4$,df= 3, p<0.01
P1	23(29.11)	1.34	0.62 – 2.89	79(30.86)	$\chi^2=0.4$,df=1,p=0.53, NS
P2	19(23.46)	1		81(31.64)	
P3	26(45.61)	2.74	1.24 – 6.09	57(22.27)	$\chi^2=7.47$, df=1, p<0.01
≥ P4	20(51.28)	3.43	1.42 – 8.40	39(15.23)	$\chi^2=9.29$,df=1, p<0.005
BMI(kg/m²)					$\chi^2=17.57$,df=2, p<0.001
≤20	43(47.25)	4.80	2.11 – 11.12	91(35.55)	$\chi^2=17.66$,df=1, p<0.001
21- 24	34(35.79)	2.99	1.31 – 6.95	95(37.11)	$\chi^2=8.19$,df=1, p<0.005
≥25	11(15.71)	1		70(27.34)	
Total	88			256	

Table VI
Relationship between past adverse pregnancy outcome and birth weight

Past adverse Outcome	No. of Newborns	LBW (%)	Odds Ratio	Significance Test
Abortion	19	17(89.47)	23.33	$\chi^2=28.30$,df=1, p<0.001
Still Birth	07	05(71.43)	6.86	$\chi^2=4.64$, df=1, p<0.05
Neonatal Death	11	06(54.55)	3.29	$\chi^2=2.43$, df=1, p=0.99, NS
Previous LBW deliveries	28	19(67.86)	5.80	$\chi^2=17.17$, df=1, p<0.001
Normal	191	51(26.7)	1	
Total	256	88		

Z=4.36, p< 0.001

Original research paper

A Review of Second Medical Opinion Cases and Its Attribute to Medical Negligence- A Retrospective Study

*Dr.S.Janani, **Dr.Deepali Pathak, ***Dr.Shiv Kochar, ****Dr.B.C.Temani

Abstract

Today the number of cases of medical litigation is increasing and already it has become a great problem for surgeons, anaesthetists and obstetricians. The general practitioners and physicians are also facing the problem and in coming years the profession may turn into a nightmare. SMS Medical College is the biggest and oldest medical teaching institution in Rajasthan. The department of Forensic Medicine handles all types of medico legal works and there is a separate established Medical Board under the chairmanship of the Head of the department. Here we receive second opinion cases from different law enforcing agencies including the hospital and public administration. In this paper we have reviewed the second opinion cases with a primary focus on medical negligence cases in the time period of 2005 to 2009. Total 55 cases were identified out of which 42 were dead and 13 were alive. Maximum numbers of cases were observed in the age group of 21-30 years. The number of female cases outnumbered the number of males. Maximum numbers of cases were related to surgical practice (OG-21, Surgery-8, Ortho-6, Neurosurgery-3, ENT-2, Ophthal-1 and Urology-1)

Key words: Medical negligence, Malpractice, Consumer protection Act

Introduction:

SMS Medical College is the biggest and oldest medical teaching institution in the state of Rajasthan and it is conducting undergraduate and postgraduate and super speciality medical courses in almost all the specialities. This medical college is rendering its services to the 35 lac plus, population of Jaipur city and its surrounding semi-urban and rural areas. The department of Forensic Medicine of this college is imparting Postgraduate Degree and Diploma in Forensic Medicine since last two decades. All types of medico- legal works like injury report, age estimation, sexual assault examination, and post-mortems are being carried out by the routine functioning of its outdoor, indoor and mortuary services. There is a separate established Medical Board under the Chairmanship of the Head of the department. Here we receive second opinion cases from different law enforcing agencies including the hospital and public administration.

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In this paper we have reviewed the second opinion cases with a primary focus on medical negligence in the time period of 2005 to 2009.

Methodology and Observations:

In this study, maximum number of cases were observed in the age group of 21-30 (20) years followed by 31-40 (14) years. The number of female cases (28) outnumbered the number of males (27). In both the age groups, the cases of urban (50) origin were more than that of rural (5) origin. Almost all the cases were brought for second opinion by police (47) followed by directives from Court (7). Most of the cases were related to various provisions of Indian Penal Code such as U/S 18, 19, 34, 120B, 170, 179, 254, 304, 304A, 307, 312, 324, 326, 226, 337, 338, 376, 420, and 427.

The frequency of distribution of cases among different broad specialities is in the order of: O & G 21, Medicine 9, Surgery 8 and Ortho 6. The number of cases referred from private hospitals (38) outnumbered the government hospitals (17). In 42 cases, the opinion on a dead person was sought; the remaining 13 persons were alive. Again, in the highly vulnerable age group 21-30 yrs followed by 31-40 yrs, mortality was high. The two extremes of age 0-10 and 51-60 yrs were also opined. Out of 6 cases of death in paediatric age group, 1 case was related to emergency services and other 5 cases were related jointly to O&G and paediatric neonatal practice. On evaluation of all cases under the Chairmanship of Forensic Expert, along with board members of concerned speciality, in 4 cases

negligence was detected. Three cases belonged to O&G and one case belonged to Emergency services.

Tabulated Profile Of Second Opinion Cases:

Table 1- Year Wise Distributions

Year	Number of cases
2005	13
2006	10
2007	15
2008	11
2009	6
Total	55

Table 2 – Referral Authority

Police	47
Court	7
Hospital Administration	1
Public Administration	-
Medical council of India	-
Sections of IPC	18, 19, 34, 120B, 170, 179, 254, 304, 304-A, 307, 312, 324, 326, 336, 337, 338, 376, 420, 427.
Total	55

Table 3- Age and Habitat Wise Distributions

Age	Male	Female	Urban	Rural
0-10	5	2	6	1
11-20	2	2	4	-
21-30	7	13	17	3
31-40	8	6	13	1
41-50	2	1	3	-
51-60	2	2	4	-
61-70	1	2	3	-
Total	27	28	50	5

Table 4 – Speciality Wise Distributions of Cases

Speciality	No. of cases
O &G	21
Medicine	9
Surgery	8
Ortho	6
Miscellaneous	4
• Cardiology	2
• BUMS	1
• Urology	1
Neurosurgery	3
ENT	2
Ophthalmology	1
Emergency services	1
Paediatrics	-
ICU	-
Anaesthesia	-
Total	55

Table 5-Government / Private Hospital

Government hospital	17
Private hospital	38
Total	55

Table 6- Gross Negligence Detected/ Not Detected

Detected	4
Not detected	51
Total	55

Discussion:

The concept of medical negligence is not new in India. It is there for a long time but since the last 2 decades, medical negligence and legal aspects of medicine have acquired great significance.

Today the number of cases of medical litigation is increasing and already it has become a great problem especially for surgeons, anaesthetists, obstetricians and gynaecologists. The general practitioners and physicians are also facing the problem to a great extent and in coming years the profession of medicine may turn into a nightmare as in the western countries. The increase in negligence suit is not only confined to the developed countries but it is spreading throughout the world. The threat of litigation has increased to a great extent after the inclusion of medical services under the preview of Consumer Protection Act 1986 and 2002.[4]

The present study reveals that, the number of cases submitted for second opinions were larger from urban origin (50) as compared to the rural origin (5). This is probably due to the level of education and awareness to the issues through the impact of media or may be a simple demographic distribution variation.

Among all the cases brought for second opinion, most of the cases were brought by police (47cases) under various provisions of Indian Penal Code such as U/S 18, 19, 34, 120B, 170, 179, 254, 304, 304A, 307, 312, 324, 326, 326, 337, 338, 376, 420 and 427. None of the case was directly related to the filing of the case for monetary compensation as per the provision of Consumer Protection Act 1986.[5] In 4 cases, Medical Negligence was detected. Three cases belonged to O&G and one belonged to emergency services. In one case the uterus was punctured while doing D&C for DUB.

The other cases was of obstructed labour where the accepted procedure for conducting delivery in obstructed labour was not followed i.e. episiotomy procedure was done and vaginal delivery was attempted which resulted in traumatic Post partum haemorrhage originated from rupture of uterus and the female died due to iatrogenic hemorrhagic shock. In the third case, the medical officer has terminated the pregnancy of a victim (minor) of sexual assault (U/S 376 IPC) without taking the consent from the

guardians and informing the concerned SHO police, not only that the medical officer had not preserved the product of conception for further investigations which were essential for the court procedures to establish the identity of the accused. In one case, a 10 year old boy was brought to the emergency services after sustaining electrocution, and was declared dead too hastily who subsequently on the way, regained consciousness and body movements were observed. Subsequently he was readmitted in the ICU which had attracted the attention of the media and resulted in medical negligence suit. (Example of Res-ipsa loquitor)

The impact of medical litigation on the doctor is a matter of great concern. Medical litigation gets extensive media coverage irrespective of the nature of the matter that shatters the doctor emotionally and professionally. Surgeons wield enormous power over their patients. They have the power to deliberately cut their patients, draw blood, cause pain and disrupt his daily life. [5] This power is for cure of his patient but also can kill or disable him. This power has brought several ethical and medico-legal problems. In this study, out of the 55 cases 44 cases belong to the surgical aspect of medical practice. Out of these, the maximum number of cases was observed in O&G practice (21).

This study again confirms with the other studies carried out in different parts of the world. Professional liability survey conducted by the American college of Obstetricians and Gynaecologists in 1993 revealed that 78 percent of Obstetricians and Gynaecologists in USA have been sued at least once and 37 percent have been sued thrice or more.[1] The survey also revealed that 62 percent of American obstetricians have stopped their practice before the age of 55yrs.[1] In UK 85 percent of consultant obstetricians have been sued at least once.[2]

The overall picture by studying retrospectively the cases of second opinion, it is revealed that legally, the acts of commission and omission may be done by a doctor due to which, he may run into litigations. None of the patient or his relatives visit to a doctor with a pre mediated thought to sue him. It is only the lack of good counselling efforts and we find that, physicians spend most of his time in treating the patients rather than counselling and hence the physical part of the disease may get cured, but the psychological or emotional aspect of the disease remains as it is. This results in dissatisfaction and is a cause of increase in medico-legal problems today.

Good counselling offers a lot of emotional support to the patient and hence may ground for a compassionate as well as a scientific treatment. The very important part of counselling is listening to the problem patiently and the most important component

for effective listening is empathy, which is the ability to experience the feeling of the patient, hence, it is the most important element in formation and maintenance of a strong Doctor Patient Relationship (DPR). However today, the medical students, paramedical staff, physicians do not have adequate knowledge about counselling as it is not a part of undergraduate or postgraduate curriculum.

Respect of autonomy of patient is ethical and moral duty of the surgeon that goes much beyond just protecting the life of his patient. Hence it is important for a surgeon to keep this fact in mind, respect patients' autonomy and include him in planning for his treatment. [5]

In all the cases, of this retrospective study the efforts to complete the case sheet were very poor, illegible and incomplete. Therefore, it is emphasised that Doctor should make medical record whenever he examines a patient. Every detail of history, examination findings, investigation reports and treatment given must be written clearly in case sheet. The day to day progress of patient must be written and signature must be affixed on the case sheet. The date and time of the examination must be clearly written. Details of invasive or invasive procedures carried out after obtaining a written consent, blood transfusion notes etc, must be written on case sheet with date and time.

A well maintained record is one of the most important documentary evidence of defence of a doctor in court. In spite of shortage of time in OPD at least few words must be written about history, examination findings and treatment. Often it is seen that only treatment is written on OPD card, which is a very weak defence for a doctor. The habit of writing history and notes starts during the undergraduate training but with passage of time the habit is lost. In absence of a well- maintained record it becomes almost impossible for a physician to defend himself in a medical negligence case. It must always be kept in mind that fabrication or tampering with records should never be done. [5]

A doctor is not negligent if he is acting in accordance with a practice accepted as proper by a responsible body of medical men skilled in that particular art.(Bolam test)[3]

The media plays a big role and it makes the patients aware of the latest technological advancement in the field of medical science. Most of the time it helps in making the patients knowledgeable about the diseases and their treatment modalities, but sometimes it does not carry the whole picture. The result is undue expectation from the physician and when these expectations are not fulfilled they move to the court against the doctors. Similarly the patients have become very much knowledgeable about the Consumer Forum, the

Rights of Consumers etc. this also has resulted in increase in the number of litigation against doctors.

Today, the cases of medical negligence are highlighted due to the dynamics of the society whereas, in the mind of patient or his relatives, they expect assured recovery and results. The patients are well informed and they're paying for their services. Previously, that is before 1984, the patients didn't have many options for the remedy of his ailment, because he totally trusted his doctor and this still exists in our country. But, now the changing concept is, the doctor has to put various options available for treatment and the patient has to choose one of them.

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Original research paper

The Study of Un-Natural Female Deaths in Vadodara City

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Abstract:

Death is a tragedy in whatever form, at whatever time and in whatever way it comes. In India, killing of the newborn female child has been practiced from time immemorial for a variety of reasons. A female may be compelled to end her life at the alter of dowry or may be killed by a midwife or a doctor who is supposed to help her come into this world. The illegal use of ultrasonography techniques had emerged as a tool for killing of female fetus even inside the uterus. That is why it is said that “womb to tomb female is in danger”. To know the magnitude and pattern of Unnatural female deaths in Vadodara City of Gujarat, we have conducted an autopsy based retrospective study on 480 cases of female deaths in the department of Forensic Medicine during the year of 2008. All the data related to age, religion, marital status and cause of death with its manner were recorded with detailed autopsy examination and subsequently analyzed. We reached at a conclusion that majority of the victims were Hindu married females of younger age group between 20-30 years who died because of an extensive accidental burns.

Key-words: Female death, Burn, Dowry and Autopsy

Introduction:

Unnatural deaths are known to claim a substantial number of lives all over the world. A rapid increase in unnatural deaths in females, especially in the first few years of their married life was observed in our society for last few decades. This drew the attention of people and forced the socio-political system to investigate and develop preventive measures [1-3]. The high incidence of unnatural deaths in newly married females within first few years of their marriage is a dark spot on the noble tradition of our society.

The most obvious reason behind such deaths are unending demands of dowry (cash/kinds) by their husbands &/or in laws, for which they sometimes kill or torture the bride in such a way that she commits suicide [4]. Beside this, family quarrels due to ill-treatment by in-laws, rash & negligent behavior or extra marital affairs of husband and maladjustment & infertility in wives are other reasons behind such deaths. Burning is the most common cause of such deaths. Hanging, poisoning, strangulation or jumping from the terrace is also used by few to end the lives. [5].

In Gujarat violence against women has been addressed from early 30s. In fact the first rescue centre was established in Ahmedabad City (Gujarat) in 1934 and first shelter was established in the same city in 1937. By the end of the eighties 52 Counseling Centers, 96 Legal Aid Centers and nine Shelters for women were established in Gujarat. Despite all that the number of unnatural deaths increased every year.

An NGO “Ahmedabad Women’s Action Group” (AWAG) is monitoring the data recorded by the police of unnatural deaths of women and studied the persistence of unnatural deaths of young women once in 1985 and then in 1995-1999. The study in 1985 had concentrated on the causes of such deaths and it shows that the number of unnatural deaths and the number of complaints of domestic violence have increased every year [6] hence this study was undertaken to know epidemiological aspects, pattern and medico legal aspects of unnatural deaths of female in Vadodara city of Gujarat, and to compare with the observations of various authors by scientific discussion.

Materials & Methods:

The present study was conducted during the period of one year from January 2008 to December 2008 in the Department of Forensic Medicine & Toxicology, Government Medical College and SSG Hospital, Vadodara, which is a tertiary care center of Gujarat. Total 1712 medico legal autopsies were conducted during this period of one year and out of them 480 (28.04%) cases of female deaths were selected for the present study. All the relevant information regarding epidemiological characteristics and their medico legal aspects were obtained from the relatives/friends of the deceased, hospital records

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and the concerned investigating agencies. In all cases the cause of death was decided after detailed autopsy examination and relevant reports of chemical analysis. The reports of relevant samples preserved during autopsy and subjected to histopathological examination to arrive at a conclusion regarding the cause of death due to a disease process, but under suspicious circumstances were also taken into consideration. The comparison was made between these findings and conclusions were drawn after comparing and discussing with similar type of the work carried out by foreign and Indian authors.

Results:

In present study we have compared the incidences of female deaths during the last three years as shown in Table-1. Out of all autopsies conducted, incidences of female deaths were observed in 19.87% cases in year of 2006, 21.70% cases in year of 2007 and 28.03% in year of 2008 making an average of total 23.31%. It shows that the incidences of female deaths are increasing continually. Total 1712 autopsies were performed during the period of one year from 1st January 2008 to 31st December 2008 and out of them 480 cases (28.03%) of female deaths were studied in detail during present study. Age wise distribution of female death shows that most of the incidences (35%) of female deaths were noticed in their 3rd decade of life as compared to both extremes of life.

The youngest victim in this study was a child of 7 months age who died due to septicemia following respiratory infections, while the oldest victim being an 84 year old who died due to accidental burns at her home. In present study 75.63% females were married and 20.2% females were Un-Married, while the marital status could not be ascertained in 4.17% cases because of Un-identification. Hindus (82.91%) comprised the single largest category followed by Muslims and then Sikhs. No female belonging to the Christian religion died within one year of this study. The distribution of cases according to cause of death in present study shows that burns is the leading cause of death in female victims in 45% cases followed by death due to injuries in 20.2% cases, which were caused either due to road traffic accidents or due to assault or due to fall from height or fall of heavy weight over the body.

Poisoning was concluded as a cause of death on the basis of FSL report in 17.08% cases. Hanging was found as a cause of death in 5.63% cases while drowning was found only in 1.67% cases and electrocution in 1.46% cases. In 8.96% cases the cause of death was concluded as a result of pathology in one of the major system of the body. As per history, circumstantial evidences and post-mortem findings it was noticed that in most of the victims the

manner of death was accidental in 56.46% cases followed by suicidal in 29.37% cases and homicidal in only 5.21% cases. Natural deaths were also observed in 8.96% cases.

Table-1

Incidence of Female Deaths in Vadodara

Year	Number of Autopsy Performed	Number of Female Deaths (%)
2006	1540	306 (19.87%)
2007	1728	375 (21.7%)
2008	1712	480 (28.03%)
Total	4980	1161 (23.31%)

Table-2

Age Wise Distribution of Female Deaths

Age Group (In Years)	Number of Female Deaths (Percentage)
0 – 09	14 (2.91%)
10 – 19	72 (15.0%)
20 – 29	168 (35.0%)
30 – 39	94 (19.58%)
40 – 49	76 (15.83%)
50 – 59	30 (6.26%)
60-69	12 (2.5%)
70 -79	11 (2.29%)
80 & Above	03 (0.63%)
Total	480 (100%)

Table-3

Distribution of Cases according to Marital Status

Marital Status	Number of Female
Married	363 (75.63%)
Un-Married	97 (20.2%)
Un-Identified	20 (4.17%)
Total	480 (100%)

Table-4

Religion Wise Distribution of Female Deaths

Religion	Number of cases
Hindu	398 (82.91%)
Muslim	61 (12.71%)
Sikh	01 (0.20%)
Christian	00 (00%)
Total	480 (100%)

Table-5

Distribution of Cases according to Cause of Death

Cause of Death	Number of Cases
Burns	216 (45.0%)
Poisoning	82 (17.08%)
Hanging	27 (5.63%)
Injuries	97 (20.2%)
Drowning	08 (1.67%)
Electrocution	07 (1.46%)
Pathological Cause	43 (8.96%)
Total	480 (100%)

Table-6

Distribution of Cases according to Manner of Death

Mode of Death	Number of Cases
Accidental	271 (56.46%)
Suicidal	141 (29.37%)
Homicidal	25 (5.21%)
Natural	43 (8.96%)
Total	480 (100%)

Discussion:

Gujarat state, situated on the west coast of India, accounts for 6% of the area of the country and 5% (51 million) of the population of India making it rank tenth in the country. The decadal population growth rate (1991-2001) of the state has been 22.6%, which is higher than that of India (21.5%). Female literacy is low (59%) as compared to male literacy (81%) in Gujarat. Although Gujarat has a higher female literacy rate than the national average, the sex ratio is more adverse for females. This indicates son preference and low status of women in society. [7] In present study we have tried to compare the incidences of female deaths in Vadodara during the last three years, which shows that the incidences of female deaths are increasing continually.

Similar findings were also found in the study of the "Ahmedabad Women's Action Group" (an NGO), who monitored the data from 1995-2004, recorded by police regarding the unnatural deaths of women registered under heads like, murder, dowry-death, abetment of suicide, accidental death and suicide. [6] Age wise incidences of female deaths were maximum (35%) in their 3rd decade of life in our study as compared to both extremes of life, which is consistent with other authors. [5, 8, 9, 10, 11, 12] This might be due to the involvement of dowry deaths which are more common in newly married females of this age group as well as accidental deaths of females in this age due to kitchen accidents. Our study shows that the unnatural deaths are more common in married females (75.63%) as compared to unmarried females (20.20%) similar to others. [1, 4, 11, 12]

We could not ascertain marital status in 4.17% cases as the victims were not identified till the date of this study. Religion wise distribution of cases shows that the most of the victims belonged to Hindu (82.91%) community, followed by Muslims in 12.71% cases. Only one victim belonged to Sikh religion in our study while no victim belonged to Christian community. Kulshrestha et al [8] had also observed in their study that 88% affected females belonged to Hindus, followed by 10.25% Muslims and 1.7% Sikhs. Sinha et al [10] found 94.9% Hindus, 4.22% Muslims, 0.53% Sikhs and 0.35% Christians in their study. Unnatural deaths of females are less commonly observed in Muslim community due to simple rituals and practice of "Mahr" instead of evil practice of "dowry".

The incidences of cause of death in female shows that in maximum cases (45%) the victims had died due to burns, followed by injuries produced either by RTA or by assault or by fall from height or due to fall of heavy weight over the body in 20.2% cases. Burns as a major cause of death in females was also concluded by other authors in their study.

[1, 4, 5, 7, 8, 9, 10, 11, 12] In present study poisoning was confirmed as a cause of death after receiving FSL report in 17.08% cases, which was also observed by Kulshrestha et al in 13.67% cases, Srivastava et al in 12.59% cases, Sinha et al in 14.59% cases and Sharma et al in 21% cases. Hanging was concluded as a cause of death in 5.63% victims, almost similar to Sharma et al (3.81% cases) and Sinha et al (4.22%) while Kulshrestha et al noticed hanging as a cause of death in 11.96% cases and Srivastava et al in 29.37% cases.

Drowning was found as a cause of death in 1.67% cases, which was also noticed by Sharma et al in 1.0% cases and Srivastava et al in 0.7% cases. In present study natural cause of death was detected by autopsy and histopathology examination in 8.96% cases, which is well supported by others also. [8, 9] As per history, circumstantial evidences and post-mortem findings it was noticed that in most of the female victims (56.46% cases) manner of death was accidental in nature, followed by suicidal in 29.37% cases and homicidal in only 5.21% cases, while the rest 8.96% cases were of natural deaths. In our study accidental deaths are almost double to suicidal deaths that may be because of more numbers of deaths due to kitchen accidents and inclusion of RTA in the study. Almost similar findings were observed by Kulshrestha et al. [8] Sharma et al [9] has observed accidental deaths in 49.6% cases, suicidal deaths in 38.5% cases, homicidal in 4.4% cases and natural deaths in 7.4% cases, while Srivastava et al [5] has observed more suicidal deaths (50.35%) in their study as compared to accidental deaths (23.08%) and homicidal deaths (25.17%).

Conclusion:

India has come a long way in improving the health indicators since independence, but progress in reducing the female mortality has been slow and largely unmeasured or documented. Gujarat is suffering from one of the worst outcomes of gender based discrimination, i.e. declining male-female sex ratio. The state average of child sex ratio (0-6 years) declined dramatically from 928 in 1991 to 878 in 2001. To address this issue various efforts are being made, one of the major being the 'Beti Bachao Campaign' that was launched by Honorable Chief Minister on the occasion of World Women's Day in 2005.

Gender Resource centre, an autonomous body, was an active partner of the campaign who was involved in documentation and publications with a realization that it could play a vital role in changing the perception of the society in general on such important issue and due to these joint efforts by state government and various NGOs the sex ratio has improved in Gujarat from 844 in 2002 to 898 in 2008. Although the sex ratio is improving yet the

incidence of female deaths is continuously increasing therefore this issue should also be taken care of and looked at priority basis

The purpose of the present study was to analyze the present situation of unnatural female deaths in Gujarat as compared to that in India and to find out the possibilities of decreasing the incidences of unnatural female deaths in the state. Distribution and causes of unnatural female deaths in present study are more or less similar to the pattern found in most of the other Indian studies. This similarity is there in almost all parameters used in this study. Most of the victims in our study were Hindu, married females of younger age group who died due to accidental burns.

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Original research paper

Epidemiology of Cobra bite in Manipal, Southern India

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Abstract

Envenomation by poisonous snakes is considered as an occupational hazard. Cobra bite is commonly encountered in the South Asian countries. The prospective research was conducted in the Department of Forensic Medicine, Kasturba Medical College, Manipal to study the epidemiology, manifestations and treatment of cobra snakebite cases admitted to Kasturba Hospital, Manipal during August 2003 and November 2005. Twenty cases of cobra bite were reported during the study period. The victims of cobra bite predominantly were females. Mean age of victims was 41.9 years. Maximum cases occurred during the summer and pre-monsoon months, during daytime and involved the upper limbs. Ptosis was the chief neurotoxic feature followed by dysarthria. Cellulitis as a complication was observed in most of the cases. Polyvalent Anti Snake Venom (ASV) vials were used as specific treatment. No mortality was reported during the study period.

Keywords: Snakebite; Cobra; Epidemiology; Manipal, Southern India

Introduction:

World population of snakes is comprised of about 2,800 species of which 375 are venomous. Of this vast number of faunal spectrum of snakes only 242 species of snakes have been known from the Indian region of which only 57 species are poisonous or harmful [1]. Poisonous snakebites are a serious health challenge in tropical regions due to their incidence, morbidity and mortality [2]. More than 200,000 cases of snake bite are reported in India each year. Envenomation by poisonous snakes is an occupational hazard for the farmers and farm laborers, plantation workers, herders and hunters in tropical and subtropical countries [3-12]. The actual incidence of snake bites may be much higher as majority of cases occurring in rural population go unreported.

The four common venomous land snakes which are found in this region include the Common cobra (*Naja naja*), the Common krait (*Bangarus caeruleus*), the Russell's viper (*Vipera russelli*) and the Saw scaled viper (*Echis carinatus*) [12, 13]. The principal effects of envenomation are on the nervous system, kidneys, heart, blood coagulability, vascular endothelium, and locally at the site of bite. [11, 12, 14] Envenomation due to cobra and krait bites causes paralysis of the ocular, bulbar, and limb girdle muscles where as viper bites mainly cause bleeding from muco-cutaneous sites, hemolysis, acute renal failure, and occasionally shock. [14]

Although venomous snake bite is a life threatening emergency, it is rarely considered as a priority for health research in developing countries like India. This hospital based prospective research is aimed to study the clinico-epidemiological features of cobra bite envenomation.

Material and Methods:

The prospective research was conducted in the Department of Forensic Medicine, Kasturba Medical College (KMC), Manipal during August-2003 and November-2005. Manipal is a rural township located in the Udupi district of coastal Karnataka. Udupi and its adjoining districts comprise of hilly terrain, forests and agricultural areas. Kasturba Hospital (KH) Manipal is a tertiary care center and teaching hospital of KMC, and the main referral center for cases of snakebite in the region

All the patients admitted to KH Manipal with history of snakebite were followed up from the time of admission throughout their stay in hospital. Snakes were identified based on the description given by the patients/ relatives/ bystanders and by correlating the clinical manifestations. All the cases

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of cobra bite (n=20) were included in the study. Case details including age, sex and occupation of the victims, the site of bite, time of bite, delay in admission to the hospital, clinical manifestations, specific treatment, complications and outcome were obtained from patients, their relatives and hospital records. The demographic and clinical details of each patient were registered and analysed using Statistical Package for Social Sciences (SPSS) version 10.0 and a clinico-epidemiological profile was made.

Results:

During the study period 20 cases of confirmed cobra snake-bite were admitted to KH. Maximum number of victims were females (n=12, 60%), male-female ratio being 1: 1.5 (Figure 1). The victims were aged between 18 years and 70 years. Mean age of victims was 41.9 years (40.6 years in males and 42.8 years in females). Age distribution of the victims in decades was observed to be uniform (Figure 2). Most of the victims in our study were bitten during the day time (n=16, 80.0%) and in outdoors settings (n=11, 55.0%). Upper limbs were involved in maximum number of cases (n=11, 55.0%) followed by lower limbs (n=8, 40.0%) and trunk (n=1, 5.0%). Most of the patients (n=16, 80.0%) were involved in farming related activities. Definitive fang marks were observed in 19 patients of cobra bite. Double punctured (fang) marks were present in the majority of cases (n=14, 70.0%). Detailed victim profile of cobra bite cases is presented in Table 1. Half of the cobra bite cases were reported during April and June. Monthly distribution of cases is shown in Figure 3.

Most of the patients were brought to the hospital within the first twelve hours of cobra bite (n=18, 90.0%). Fifty five percent received first aid measures prior to hospitalization. Local and/ or systemic signs of envenomation were evident in ninety five percent victims. A case where fang marks could not be appreciated showed signs of envenomation while one case with scratches did not show any signs of envenomation. Local pain and swelling, vomiting, confusion, and difficulty in breathing were the presenting complaints at the time of admission. Systemic manifestations observed in cases of cobra bite included blurring of vision, ptosis, ophthalmoplegia, dysarthria, muscular weakness and respiratory embarrassment (Figure 4). Ptosis was the chief neurotoxic feature followed by dysarthria. Cellulitis as a complication was observed in 15 cases. As a specific treatment, a number of polyvalent Anti Snake Venom (ASV) vials were used during treatment. The number ASV vials administered to each patient of cobra bite ranged from 0 to 26 vials, at an average of 12.4 ASV vials per patient. No fatalities were reported from cobra bites during the study period. Seventeen victims completely

recovered in the hospital while the other three left the hospital against medical advice. Victim details of hospitalization and clinical manifestations in cobra bite cases are presented in Table 2.

Discussion:

Age distribution of the victims of snakebite in our study was fairly uniform after the first decade. The more ambulant population involved in farming is at increased risk of snakebite. Age group of thirty to fifty years with a peak incidence of the victims in their third decade has been observed in the earlier studies in India and SEAR [15-19]. Mean age of victims in our study was comparatively higher than that reported in earlier studies. A male preponderance among snake bite victims with a male to female ratio 2:1 is frequently observed [15]. In our study snakebite victims were predominantly females. In India, female preponderance in Himachal Pradesh [13] and Maharashtra [20] and a male preponderance in Davangere [12], Jammu [21] and Haryana [22] is reported.

Most of the victims were involved in farming related activities. Farming community is increasingly prone for accidental contact with the snakes while working in the fields. The maximum victims of snakebite in our study are reported during daytime corresponding to the period of their outdoor activities. A study conducted at Davangere [22] and Maharashtra [23] also reported high incidence during daytime. Upper limbs were involved in maximum number of cases. Bites on the lower limbs occur usually due to the accidental stamping of a snake while working, while bites on the upper limbs occur because of accidental contact with snakes while trying to hold the grass during harvesting. Victims bitten on the trunk was sleeping at the time of the incident.

Fangs of cobra are fixed and immobile [24]. Definitive fang marks were observed in all but one victims of cobra bite and double punctured (fang) marks were present in the majority of the cases. A victim of snakebite who had only scratch marks and another with unappreciable fang marks also showed signs of envenomation. This suggests the importance of keeping the patient under observation in all the alleged cases of snakebite irrespective of the presence or absence of fang marks.

Second quarter of the year (April to June) witnessed half of the cobra bite cases. This time of the year corresponds to the summer and pre-monsoon months in the region. During the summer months, snakes usually come out of their burrows due to the heat in search of cooler places, thereby increasing the risk of accidental contact with humans. During the harvesting season, abundant vegetation attracts the rodents to the fields and the snakes come out of their burrows in search of their prey. Thus harvesting

season with busy agricultural activity creates an ideal atmosphere for snakebites.

Most of the patients were brought to the hospital within the first twelve hours of cobra bite and more than half of the victims had received first aid measures prior to hospitalization. Most of the victims showed local and/ or systemic signs of envenomation. Ptosis remained the chief neurotoxic feature followed by dysarthria. Ptosis has remained a commonly observed manifestation in neurotoxic envenomed patients in the earlier studies. [12, 25, 26] Polyvalent Anti Snake Venom (ASV) vials were used during specific treatment of cobra bites. No fatalities were reported from cobra bites during the study period that may be attributed to the early arrival in the tertiary care center and prompt initiation of specific therapy.

Conclusions:

- All age groups were just about equally involved. Females are affected more often than males; male to female ratio being 1:1.5.
- Half of the cases occurred during the months of April to June coinciding with end of summer and start of rainy season.
- Maximum snakebites occurred in outdoor settings to farming related occupations inferring this to be an occupational hazard.
- Maximum incidence of cobra bites during the daytime corresponds to the period of outdoor activities and the fact that cobra being active diurnally.
- Envenomation was observed even when fang marks were unappreciable, suggesting the importance of keeping the victim under observation in all the alleged snakebite cases even in the absence of fang marks.
- Ptosis was observed as the major neurotoxic feature in envenomed victims.
- Cellulitis was observed as a common complication of bite due to cobra.
- Prompt hospitalization and specific treatment and prior first aid measures may be responsible for preventing systemic envenomation and reducing the mortality.

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Figure 1
Sex Distribution of Cobra Bite Cases

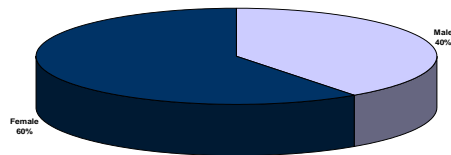


Fig 2
Age Distribution of Cobra Bite Cases

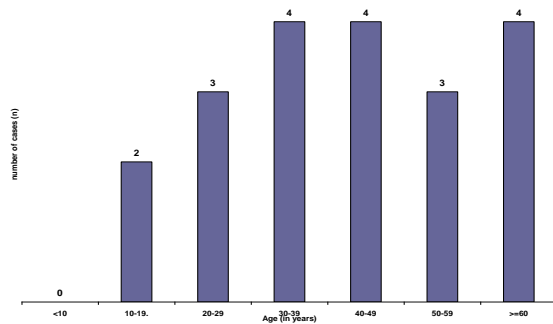


Fig 3
Monthly Distribution of Cobra Bite Cases

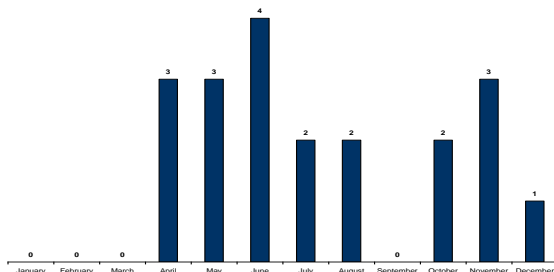


Fig 4
Systemic Manifestations in Cobra Bite Cases

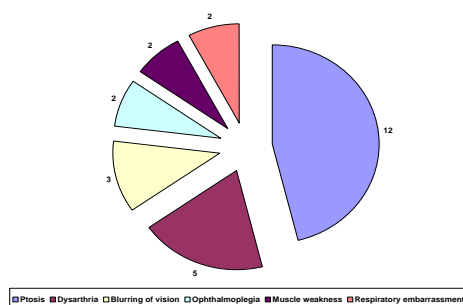


Table 1
Victim Profile and Salient Features in Cobra Bite Cases

	No. of cases (%)
Gender distribution	
• Male	08 (40.0)
• Female	12 (60)
Occupation	
• Farming	16 (80.0)
• Others	04 (20.0)
Diurnal variation	
• Day	16 (80.0)
• Night	04 (20.0)
Place	
• Outdoors	11 (55.0)
• Indoors	09 (45.0)
Site of bite	
• Upper limbs	11(55.0)
• Lower limbs	08 (40.0)
• Trunk	01 (05.0)
Fang marks	
• Single	03 (15.0)
• Double	14 (70.0)
• More than two	01 (05.0)
• Scratches	01 (05.0)
• Not appreciable	01 (05.0)

Table 2
Victim Details of Hospitalization and Clinical Manifestations in Cobra Bite Cases

	No. of cases (%)
Hospital Admission	
• Within 1 hour	02 (10.0)
• 1-6 hours	13 (65.0)
• 7-12 hours	03 (15.0)
• 2 days	01 (05.0)
• >3 days	01 (05.0)
First Aid Prior to Hospitalization	
• Tourniquet	10 (50.0)
• Tourniquet & Incision	01 (5.0)
• No first aid	09 (45.0)
Clinical Manifestations	
• Local only	06 (30.0)
• Neurotoxic only	04 (20.0)
• Both local & neurotoxic	09 (45.0)
• None	01 (5.0)
Final Outcome	
• Recovered	17 (85.0)
• LAMA	03 (15.0)
• Expired	00 (00)

LAMA- left against medical advice

Original research paper

Errors in Drug Labeling and Medico-Legal Awareness

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Abstract

The importance of drug labels can not be overlooked. Many a times drug labels are missing which may lead to toxicological effects catastrophic accident and medico -legal implication. The objective of the present study was to learn and highlight the problems faced by the medical practitioner, pharmacist and the patients as regards to drug label it's, medico- legal problems and suggest remedial measures. 55 medical practitioner of Government Medical College, Haldwani and 40 pharmacist of Haldwani town were surveyed through a questionnaire.

The 90% of medical practitioners and 80% of pharmacist had faced problem with label related errors. None had been charged for malpraxis and negligence. Remedial measures suggested were barcoding (96%, 60%) colour coding, prefilled syringes (90%, 30%), increasing font sizes and more awareness about medico-legal liability, ethical issue and punishment.

Drug label errors are an important cause of patient morbidity, mortality and medico-legal liabilities of medical practitioners. Improved and correct labeling understanding medico-legal importance and communication is the key element in minimising errors. Bar code generated labels, embossing, waterproof labels, improving quality of stickers, increasing font sizes, overcoming language barriers and sense of responsibility will readdress these deficiencies in services.

Key Words: Drug Label, Medico-Legal, Bar Coding, Font

Introduction:

Drug labeling refers to all the printed information that accompanies or drug, including the label, the wrapping and package insert [1]. The label has two main functions. One is to uniquely identify the contents of the container and other to ensure that patients have clear and concise information which will enable them to take or use their medication in the most effective and appropriate way. There are several legal and professional requirements which must be complied with while labeling. If any error occurs it will be considered professional negligence (malpraxis) which is defined as absence of reasonable care and skill or willful negligence of medical practitioners in the treatment of patient which causes bodily injury or death of the patient.

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The manufacturer of medicines has a legal duty (Product liability) to use care in research and development of drugs. They keep a "Package insert" in the drug carton or attach it as the label of the container.

It bears adequate information for its uses, including indication, effects, dosages, routes, methods and frequency, duration of administration and any relevant hazards, contraindication, side effects and precautions under which registered practitioners can use the drug safely for which it is intended. The burden of proving safety and effectiveness of a new drug or new uses of an approved drug rests with the manufacturer. The manufacturer is liable, if a patient is injured due to a drug reaction, due to the negligence or breach of warranty on the part of manufacturer. Therefore the label must be scientifically accurate and provide clear instructions to health practitioners and consumers [2]. Medications errors are an important cause of patients' morbidity and mortality. Therefore the importance of drug labels cannot be overlooked. This is punishable under section I.P.C.

Many a times labels are tattered, torn, transposed (labels attached on incorrect container), missing, misplaced, in very small font sizes which may lead to toxicological effects catastrophic accidents especially with injected emergency medicine. There are language and translation problems where the

details are not explained to patients in local languages, therefore dispensing and usage becomes a problem. An awareness of how easily these errors can occur is at least one step to ensuring that they do not happen. So the objective of the present study was to learn and highlight the problem faced by the medical practitioners and pharmacist regarding drug label, its medico-legal implication and to suggest remedial measures.

Material and Method:

Using retrospective method 95 questionnaire were distributed to 55 medical practitioners of Government Medical College, Haldwani, Uttarakhand and 40 Pharmacist of Haldwani town regarding problems with drug label medico-legal aspects, missing label, font sizes, translation in local languages and suggestion invited regarding remedial measures. The questionnaire were verbally interpreted in simple language and properly explained to avoid any form of misunderstanding and to facilitate accurate response by the subject. The questionnaire was collected immediately after completion to minimise interpersonal communication amongst the subject and to prevent the influence of friends on individual response. Inform consent was also taken. Statistical analysis was done by calculating the percentage.

Results:

The 55 questionnaire were collected from medical practitioners and 40 from pharmacists. Out of these 5 questionnaire from medical practitioners and 10 from pharmacist were not properly answered and so were rejected. The doctors were all post graduates having good grasping power to understand the implication of drug labeling error and its medico-legal responsibility. The pharmacists were mostly diploma holders (90%) and few degree holders. The 90% of medical practitioners and 80% of pharmacist had faced problem with some sort of label related errors (**Table1**). A large number of those interviewed had encountered missing labels (88% , 70%) adding to morbidity of the patient and fear of medico-legal consequences in the minds respondents. Although none had been charged legally for malpraxis (**Fig.1**) and negligence but few (10%, 30%) had been abused by the patient and attendant and found themselves ethically responsible for the problems created.

Substantial number of respondents reported in adequate font sizes of printed matter on label (86% , 90%) followed by faded print matter, dirty tattered and misspelt labels to be the cause of problem (**Fig.2**). Translation in local language is not done by all (66%, 40%) (**Table2**). Lack of time (50%, 66%) and liability concerned were the reason for avoiding translations.

Remedial measures suggested were barcoding (96%, 60%) colour coding, prefilled

syringes (90%, 30%) increasing font sizes and more awareness about medico-legal liability, ethical issue and punishment (**Fig.3**). This will be made them more responsible.

Discussion:

This study highlighted the problem faced by the physician and pharmacist and effective suggestion for improvement were learned which if implemented would reduce medication error which are an important cause of patients morbidity, mortality and excessive cost, medico-legal and unethical practices.

The well qualified doctors and pharmacists having faced problems with drug label of various kinds. Many doctors 88% and pharmacist 70% have found missing labels especially on injectable emergency drug increasing the chances of catastrophic accidents toxicological effect (fig1,2). Although none reported the any incidence of drug administration error leading to mortality they all emphasized medication error could lead to disability and death and thus punishment under different section of IPC. The awareness about medico-legal responsibility were inadequate especially among pharmacist. Although none had received any punishment for negligence but few have been abused by patient and attendants (10%, 30%) for their negligent acts of omission and commission. (fig3).

The study showed that 86% of the doctors had problems due to small font size and 70% pharmacist reported faded print matter which are due to poor quality of printer ink (fig4&5) . The printer needs to be checked at intervals and good quality printers to be used to avoid this problem.

The doctors and pharmacist had good knowledge of the English and could translate in local languages (90%, 77%), Hindi, Kumaoni, Garhwali despite this fact only 40% pharmacist translated in local languages which was considerably low(fig6&7). Various reasons were cited for not translating like, lack of time failure to understand instruction and liability concerns (fig8&9). The researchers also estimated that 60% of the city population cannot speak and read English well.

Remedial measures like barcoding to identify drugs can be adopted. A laptop computer programmed to identify the bar code announces the name of the drug and redisplay the name on the computer screen in large font size along with its color code^[5,6,]. Prefilled syringes and flag label to facilitate order in the layout of syringes and ampoules [7](fig10 &11) . Minor alternation can also go a long way like embossing, water proof labels, improvement in glue quality and increased font sizes so that normal and hypermetropic eye can visualize the label details well decreasing the chances of medication error to a greater extent^[8,9]. Above all overcoming language

barrier and sense of medico-legal responsibility are equally important to readdress this problem.

Conclusion:

Drug labeling refers to all the printed information that accompanies or drug, including the label, the wrapping and package insert. Drug label errors are an important cause of patient morbidity, mortality and medico-legal liabilities of medical practitioner. Improved and correct labeling understanding medico-legal importance and communication is the key element in minimising errors.

Bar code generated labels, embossing, waterproof labels, improving quality of stickers, increasing font sizes, overcoming language barriers and sense of responsibility will readdress these deficiencies in service

Table 1

Problems with label and medico-legal awareness

Profession	Doctor % (n=50)	Pharmacist % (n=30)
Faced problem with drug label	90 (45)	80 (24)
Awareness of medico-legal responsibility		
• Yes	88 (44)	33 (10)
• No	12 (6)	67 (20)
Abused for negligence		
• Yes	10 (5)	30(9)
• No	90 (45)	70 (21)
Missing drug label	88 (44)	70 (21)
• Morbidity	30 (15)	33 (10)
• Mortality	0 (0)	0 (0)
Quality of label		
(a) Font size inadequate.	86(43)	90 (27)
(b) Faded print matter.	62(31)	70 (21)
(c) Dirty label.	50 (25)	30 (9)
(d) Tattered and torn.	10(5)	40 (12)
(e) Misspelling.	6(3)	10 (3)
(f) Transposed	0 (0)	0(0)

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Fig. 3 . Remedial Measure suggestion (Doctors)

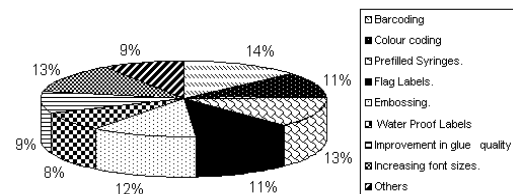


Fig.1. Awareness of medico-legal responsibility

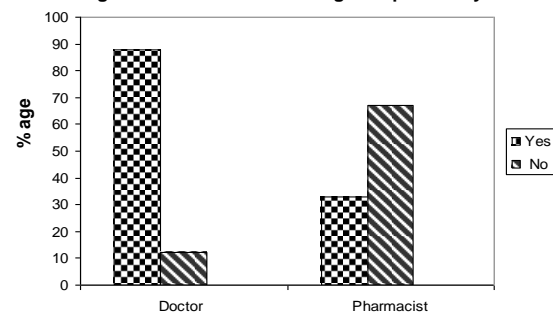


Fig .1. Problems with quality of label (Doctors)

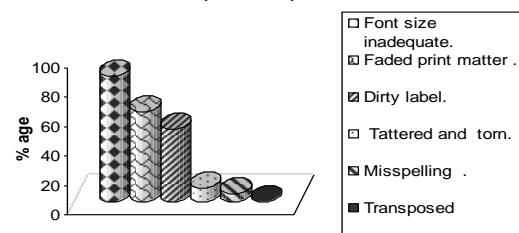


Table 2
Translational problems

Language Problems		
(a) Knowledge of English	100 (50)	90(27)
(b) Knowledge of Local Language	90 (45)	77(23)
(c) Translation in local Language	66 (33)	40(12)
Reason for not translating		
• Lack of knowledge of local language	8 (4)	33(10)
• Lack of time.	50 (25)	66(20)
• Failure to understand instruction adequately	0 (0)	37(11)
• Liability concern	26 (13)	30(9)

Original research paper

Estimation of Height from Measurements of Foot Length in Haryana Region

*Jitender Kumar Jakhar, ** Vijay Pal, *** P.K. Paliwal

Abstract

The present study was carried out on the measurements of foot length and body height of total 103 students between 21 to 32 years of age. The study was carried out in the Department of Forensic Medicine and toxicology at Pt. B.D. Sharma PGIMS, Rohtak, Haryana State, India. A total number of 103 (52 males, 51 females) medical students of state of Haryana were included in the study. Anthropometric measurements were taken by using standard anthropometric instruments in centimeters to the nearest millimeter. All the measurements were taken in a well lighted room. Obtained data was analysed and attempt was made to find out correlation and to derive a regression formula between foot length and height of an individual. A good correlation of height was observed with foot length and it was statistically highly significant. The results of the present study would be useful for Anthropologists and Forensic Medicine Experts.

Key words: Anthropometry, Correlation, Foot length, Total height

Introduction:

Stature is anatomically complex that includes the dimensions of legs, pelvis, vertebral column and skull and the contribution of each of these to the total varies in different individuals and also in different populations. Hence, in the study of human remains, forensic anthropologists must have the necessary knowledge of human variation specific to a given region and population in order to be able to identify any unknown individual. Population based differences exist in both metric and morphological features of the skeleton and these have changed over time. Therefore, it is vital for biological anthropologists to conduct up-to-date research on diverse population groups residing in different geographic zones.

Height estimation by measurement of various long bones has been attempted by several workers with variable degree of success. Each worker has derived his own formula for calculating the stature from long bones. However, foot measurement has not frequently been used for this.

It were Kulthanan et al, Rutishauser (1968), Ozden et al and Philip et al who studied that reliability of prediction of height from foot length was as high as that from long bones.[1, 2, 3, 4]

Ossification and maturation in the foot occurs earlier than the long bones and therefore, during adolescence age, height could be more accurately predicted from foot measurement as compared to that from long bones. Present study was, therefore, conducted to find out correlation between foot length and body height and evaluate the reliability of estimation of height from foot length in the Haryanavi population of North India.

Material and Methods:

The present study was carried out in the department of Forensic Medicine at Pt. B.D. Sharma PGIMS, Rohtak. A total number of 103 subjects were included in the study, out of which 52 were male and 51 were female. The subjects were within the age limit of 21-32 years as stature attains its maximum limits at around 21 years of age and senility related changes of stature start appearing after 32 years. The subjects included in the study were healthy individuals free from any apparent skeletal deformity.

Anthropometric measurements of foot length were taken independently on the left and right side of each individual. Besides the above measurements, stature of each subject was also recorded. All the measurements were taken in a well lighted room. The measurements were taken by using standard anthropometric instruments in centimeters to the nearest millimeter in the following manner:

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Anthropometric Measurements:

Foot length - It is the distance from the most prominent part of the heel backward to the most distal part of the longest toe (2nd or 1st).

Instrument: Vernier caliper

Technique: The measurement was made on the standing subject, his right leg being slightly bent and drawn backward so that the body rested mainly on the left foot, which one was to be measured. The caliper was horizontally placed along the medial border of the foot. The fixed part of the outer jaw of the caliper was applied to the pterion and the mobile part of the outer jaw was approximated to the acropodion and measurements were taken. In the same way, the measurements were taken on the other side.

Stature - It is the vertical distance between the point vertex and the heel touching the floor (ground surface).
Instrument: Height measuring tool.

Technique: The subject was made to stand in erect posture against the wall with the feet axis parallel or slightly divergent and the head balanced on neck and measurement was taken without any we

The data were collected, analysed and subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS) to know the correlation of the stature with the lengths of feet and simple linear regression formulae were derived for various combinations. The reliability of estimation of stature from the lengths of feet was determined with the help of Standard Error of Estimation (SEE).

Observations and Results:

The present study focused on the estimation of stature from the dimensions of feet. Sexual differences in the studied parameters were assessed with the help of "t" test. In order to predict stature of an individual from the anthropometric measurements, simple linear regression was derived. The SEE predicts the deviations of estimated stature from the actual stature. Table 1 shows that the mean \pm S.D. of stature is (173.485 \pm 6.206) in male, (159.045 \pm 5.067) in females and (166.335 \pm 9.191) in both genders together with males being taller than females in the studied sample.

Table 1 also shows statistical analysis of anthropometric measurements of foot in both the sexes. The values of all the measurements of parameter in case of males are higher than in females and these sex differences are statistically highly significant ($p < 0.001$).

Table 2 illustrates the correlation coefficients between stature and dimensions of feet on left and right sides in both the sexes. All the measurements exhibit statistically significant correlation with stature ($p < 0.01$). Correlation coefficients of the foot length measurements are higher in males bilaterally. The highest correlation is exhibited by left foot ($r = 0.719$).

Tables 2 also list the regression coefficients for estimation of stature from measurements of feet of both sexes separately and together. The best correlation with stature is demonstrated by left foot length in all subjects.

Earlier the multiplication factor method was used for estimation of stature from anthropometric measurements of the body but nowadays the most widely used method for estimation of stature from anthropometric measurements of body is the regression formulae. Worldwide, the regression formulae are accepted as of utmost importance in determination of stature from various anthropometric dimensions [5, 6]. No such type of study was carried out in Haryana. In the present study the formula is derived as under.

Regression Equation: STATURE = value of constant (a) + regression coefficient (b) x foot length.

For Male: $Y = 80.671 + 3.648 \text{FOLT}$
 $Y = 86.620 + 3.414 \text{FORT}$

For Female: $Y = 65.194 + 4.068 \text{FOLT}$
 $Y = 73.132 + 3.721 \text{FORT}$

For both gender together: $Y = 43.852 + 5.047 \text{FOLT}$
 $Y = 47.631 + 4.889 \text{FORT}$

Where Y = Total height, FOLT = Foot length Left, FORT = Right foot length.

It was observed that there was no significant bilateral difference in foot length. So the data for the two sides were pooled for statistical analysis of foot length of both genders (table 3). In present study, the value of correlation between foot length and stature in males was 0.725 and in female 0.719. It means there is a strong bond between height and foot length and if either of the measurement (foot length or total height) is known, the other can be calculated and this would be useful for Anthropologists and Forensic Medicine experts.

Table 3 exhibits standard error of estimate (SEE) along with linear regression equations for foot length in male and female subjects. It ranges from 4.346 for males, 3.473 for females. Estimation of height from foot length of female subjects' exhibits lower values of standard error of estimate than from foot length of male subjects. It means the reliability of estimation of stature from foot length of female subjects is more than male subjects.

Discussion:

Various studies have been conducted on the estimation of stature from the human skeleton. There are various methods to estimate stature from the bones but the easiest and the reliable method is by regression analysis [7, 8].

Studies using hands and feet measurement for stature estimation are scarce. These studies indicate that the bilateral variation was insignificant for all the measurements in both the sexes. Robbins

also did not find significant bilateral asymmetry in various measurements of the feet of a U.S. sample.

Similar views are expressed by Philip that either of the feet can be used for the estimation of stature as no significant asymmetry was observed by him while working on the footprints of a South Indian population [2]. The present study similarly did not find any bilateral asymmetry in measurements of foot length in an individual.

The present study shows sex differences to be highly significant for all the measurements ($p < 0.001$) which are in line with studies of Sharma et al [8]. In the present study, the significant differences in stature and foot measurements between males and females can be attributed to the fact that fusion of epiphyses of bones occurs earlier in girls in comparison to boys. In other words, boys have about two more years of bony growth than girls, which were expressed in male surpass of the somatometric measurements of the adult. [9]

The correlation coefficients between stature and all the measurements of feet were found to be positive and statistically significant and the left foot length in subjects of both the genders together exhibits the overall highest value of correlation ($r = 0.969$) with stature followed by length of left foot in females. The correlation coefficients between stature and foot dimensions were found to be highly significant. Similar results were observed by Kanchan et al in North Indian endogamous group [9]. It was observed that the foot length in males and females show highest correlation with stature and minimum standard error in estimation of stature.

Conclusion:

It is concluded that the foot length in males and females show highest correlation with stature and minimum standard error in estimation of stature. So the foot length provided the highest reliability and accuracy in estimating stature. The left foot length gives better prediction of stature than the right foot

length. Stature prediction is more accurate and reliable in case of male Haryanavi medical students than in female medical students.

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Table-1: Sexual differences in foot length

	Mean \pm S.D.		t-test	p-value
	Male	Female		
S	173.485 \pm 6.206	159.045 \pm 5.067	12.920	0.000
FORT	25.445 \pm 1.286	23.089 \pm 0.948	10.564	0.000
FOLT	25.442 \pm 1.232	21.400 \pm 0.927	11.400	0.000

Index: S = Stature. FORT= Foot length right. FOLT= Foot length Left

Table-3: Estimation of Stature

Sr. No.	Sex	Regression equations	S.E.E	Value of r
1	Male	S=82.597+3.572 FL	4.346	0.725
2	Female	S= 65.406+4.057 FL	3.473	0.719

Table-2: Height, foot length, correlation coefficient®, regression coefficient (b) and value of constant (a)

	Male	Female	Both gender together
Total number	52	51	103
Height range(cm)	161-186.2	146.5-166.7	146.5-186.2
Mean height(cm)	173.485	159.04	166.33
S.D. of height	6.20	5.06	9.19
Left foot length range(cm)	22.6-28.4	20.58-22.22	20.58-28.4
Mean left foot length(cm)	25.442	21.400	24.208
S.D. of left foot length.	1.233	0.927	1.95
Correlation coefficient(r) (foot left length and height)	0.525**	0.719**	0.969**
Regression coefficient(b)	3.648	4.068	5.047
Value of constant(a)	80.671	65.194	43.852
Right foot length range(cm)	22.72-28.33	20.80-25.35	20.80-28.33
Mean right foot length(cm)	25.445	23.089	24.279
S.D. of right foot length.	1.286	0.948	1.63
Correlation coefficient(r) (foot right length and height)	0.527**	0.697**	0.869**
Regression coefficient(b)	3.414	3.721	4.889
Value of constant(a)	86.620	73.132	47.631

** Correlation is significant at the .01 level (two-tailed)

Original research paper

The Fourth Incision-A Few Modifications in Autopsy Incisions

*Dr. A.J Patowary

Abstract

Medico legal autopsy is a procedure, where there cannot be any omission on the part of the autopsy surgeon; all the part of the body must be examined for any kind of injury or any disease / deformity, all the cavities are to be opened and all the viscera must be examined for the findings. It is an art on the part of the autopsy surgeon to find out more and more information in relation to the death of the person so as to help the judiciary in administration of justice. He should be cautious not to mutilate the dead body so as to minimize the trauma to the already traumatized bereaved family of the deceased.

Autopsy incision is to serve both the purposes - get maximum exposure of the body for proper detection of the wound and any other findings as well as to keep the integrity of the body intact for better acceptance for the relatives of the deceased.

This paper is aimed to describe few new additions as well as modifications in the autopsy incisions to get maximum possible visualisation of the whole circumference of the body as well as keep the stitches hidden as far as possible.

Key Words: Autopsy Incision, Cosmetic Autopsy Incision, Fourth Incision.

Introduction:

Medico legal autopsy is a special type of autopsy where the main objective is to find out the facts in relation to any sudden unexpected or suspicious deaths and also to help the law enforcing agencies by providing more and more information in relation to the death of the person for proper disbursement of justice. All the medico legal autopsies must be a meticulous one. There is no scope for any omission on the part of the autopsy surgeon; there must be a thorough external examination, exploration of all the body cavities as well as examination of all the visceral organs for proper justice with the case involved. Many a time the findings of the autopsy become the only vital evidence for prosecution of a case and to punish the offender and also sometimes only mean to prove him for an accused that he is innocent. But a carelessly performed autopsy not only fails to help them but may mislead the law enforcing agencies. So, we should adopt the best possible method so as to collect all the possible evidences and injuries and at the same time also to note some important negative findings also which may help in administration of justice.

In India, for performing the medico legal autopsies, the consent of the guardian is not required; relevant papers and identification of the dead body by the escorting police are the only requirement for the autopsy surgeon while performing the medico legal autopsy. But many of us have faced some embarrassing and pathetic situation created by the relatives of the deceased while the body is being carried to the dissection hall and also when the body is being taken out of the dissection hall after autopsy.

Many a time the only cause of the embarrassment is the long stitch mark on the front of the neck and chest. I think, as a human being, it is our duty to consider the sentiment of the relatives of the deceased also while trying to get the maximum information out of the body to help the law enforcing agencies. Apart from that, we used to miss some findings as we do not get sufficient exposure of the whole circumference of the body, for detection of which we are to make some more incisions here and there, on the back of the body. So, I think that the autopsy procedure should be such that, we get the maximum possible exposure of the body and at the same time we can minimise the trauma to the relatives of the deceased by hiding the long stitch marks particularly in the front of the neck and chest.

Conventional Methods in Practice:

During autopsy, we basically use three types of incisions for opening the neck, thorax and the abdomen:

1. **"I" shaped incision**, from the symphysis menti to symphysis pubis – where a prominent stitch mark is always present in

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the front of the neck and thorax; moreover, exposure to the neck structure particularly in both sides of the neck is not adequate in this type.

2. **“Y” shaped incision** or the thoraco-abdominal incision, extending from a point close to the acromion process extending to the xyphoid process passing below the breast bilaterally and carried downward by a single straight incision up to the symphysis pubis – where visualisation of the neck structure is difficult, though the stitches in the front of the neck is absent.
3. **Modified “Y” shaped incision** from behind the ears up to the mid cleavicular point bilaterally, then over the clavicle up to the suprasternal notch from where a straight incision is made downward up to the symphysis pubis – where, visualization of the neck structures in the front of the neck and to some extent, also the sides of the neck is achieved, but at the same time, the stitch marks in the front of the neck remain exposed.

Apart from these, in all the above mentioned incisions, the back of the neck, chest and abdomen is not visualised; for confirmation of any suspected injury in the posterior aspect of the body, we have to make incisions on the parts as sometime, it become very difficult to distinguish between the post mortem staining and the bruise and sometimes we may miss many injuries like bruises in the posterior aspect of the body particularly when they are inflicted or occurred just before the death of the person or in dark coloured persons.

Again, in some conditions like, in cases of custodial deaths or death due to torture etc, it becomes necessary for the autopsy surgeon to see for any evidences in the back. Apart from these, in cases of burn, where it becomes impossible to visualize any bruises or other deeper injuries on the body, it becomes a necessity for the autopsy surgeon to apply incisions on the back of the body for visualisation of the injuries in suspected cases of torture followed by burn. Again, for dissection of the spinal cord, we have to make another straight incision in the back to expose the spinous processes.

In all these type of incisions, as these are made and closed in single layer, chance of seepage particularly from the abdominal cavity is much more, as in Indian setup, usually the abdominal and thoracic contents are replaced in to the cavities after examination is over.

The Fourth Incision:

To overcome all these problems, I have done a few additions and modifications in the present autopsy incision techniques so as to get the maximum

possible exposure of the whole circumference of the body as well as the stitches in the front are also not visualised as such.

Steps of Incision

Exposure of the posterior aspect

1. **Positioning the body:** body is placed in prone position with a wooden block under the shoulder, so that the neck is flexed anteriorly (Fig-1).

2. **Incision on the back:**

- a. A scalp incision is made from the mastoid of one side to the mastoid of the other side in coronal plane through the vertex as in the conventional methods.
- b. From the mastoid process, the incision is extended to the posterior aspect of acromion process through the posterior border of the sternocleidomastoid and then through the posterior border of the trapezius bilaterally (Fig-2)
- c. A curved incision is made bilaterally from the tip of acromion up to the mid axillary line just below the axilla through the medial border of the posterior aspect of the shoulder joint which is then extended up to the iliac crest through the mid axillary line bilaterally (Fig-3)

3. **Reflection of the posterior flap:** the posterior flap of the scalp is reflected back up to the occiput and anteriorly up to the supra-orbital ridges. The posterior flap is then reflected back making superficial strokes by the scalpel on the subcutaneous tissues and continued through the neck, then the chest and back of the abdomen up to the superior border of sacrum. In this way, the whole flap of the skin is reflected back up to the superior border of the sacrum exposing the whole of the back of the head, neck, chest and abdomen simultaneously (Fig-4).

Exposure of the anterior aspect

1. **Positioning the body:**

After completion of the examination of the posterior aspect, the flap of the skin is reflected back and the body is turned back to the supine position with a wooden block under the shoulder to keep the neck in extended position (Fig-5).

2. **Incision in the front:**

- a. A curved incision is made from the acromion process through the medial border of the shoulder joint to the mid axillary line bilaterally, as was made posteriorly (Fig-5).
- b. Another incision is made from the mid axillary line on the iliac crest bilaterally

- over the inguinal ligament, to meet at the symphysis pubis (Fig-5).
- c. The skin with the superficial tissue flap is reflected up, up to the root of the neck and then to the inferior margin of the mandible bilaterally taking care not to injure the neck structures and the rectus sheath. (Fig-6 & Fig-7)
 - d. This way, the whole of front of the neck chest and abdomen is exposed.

3. Opening the abdominal cavity:

To open the abdominal cavity, a para-medial incision is made on the rectus near the symphysis pubis, which is extended upward by keeping the index and the middle fingers as guard up to the xiphoid process using a scissors or enterotome (Fig-8)

4. Opening the thorax:

The sternum is removed by cutting at the costochondrial junction and then separating the sterno-cleavicular joint.

Now after separating the diaphragm, the whole of the thorax and abdomen can be examined. (Fig-9)

Closing of the incisions

The sternum is replaced back to its position. The abdomen is closed by stitching the rectus (Fig-10 & 11). Now the flap of the skin is replaced back (Fig-12). The incision over the inguinal ligament is stitched first then the bilateral mid axillary incisions up to the axilla. Then the stitches are continued in the front on the curved incision in the medial border of the shoulder. The body is then turned back to stitch the curved incision on the medial margin of the shoulder joint in the back and then on the incisions on both sides of the posterior aspect of the neck up to the mastoid process and then continued to close the scalp incision.

Discussion

In the conventional methods, the deeper tissues in the posterior part of the body is not visualised, for detection of any injury in the back, separate incisions are to be made on the suspected areas mutilating the body, so, many wounds, particularly, the recent deep seated bruises may remain unnoticed. Moreover, many a time it becomes very difficult to distinguish between the postmortem staining and the bruises especially in case of the dark coloured persons, so, for distinguishing them, incisions are to be made in the suspected area. Apart from these, it is not possible to detect bruises in cases of burn by mere external examination, so, there is every chance that we may miss these injuries in the back in conventional methods. But, in case of the 4th incision, as the whole of the flap in the back as well as in the front are reflected, there is complete visualisation of the whole circumference of the neck,

thorax and abdomen and any injury like a recent deep seated bruise, even the deeper injuries in cases of burn which may go unnoticed in conventional methods, can be visualised clearly, on any part of the neck, thorax and abdomen. So, this method is very useful particularly in cases of death due to burn, vehicular incidents, suspected tortured cases or any cases of death due to injury where there may be freshly inflicted deep seated bruise in the posterior aspect of the body (Fig-14, 15, 16 & 17).

In the conventional methods, the abdomen and the thorax is closed in single layer, so, there is seepage resulting in inconvenience for the attendants of the deceased; but in this method, as the abdomen is closed first by stitching the rectus and then the flap of skin is replaced back covering it completely, the chance of seepage is almost nil. However, care should be taken while opening the peritoneal cavity, not to make the incision in mid line and should always go for a para median incision on the rectus, as in the mid line, the rectus sheath being fibrous, some gap will remain while stitching.

The stitches made on the body for closing are not seen from the front in this method, except the stitches on the curved incision in the front on the medial border of the shoulder (Fig-13). This can be further minimised, if care is taken while stitching, like use of sub-cuticular stitches in this portion. So, there is better acceptance on the part of the relatives of the deceased who sometimes get shocked on seeing the large incision mark from the chin to the symphysis pubis.

For opening the spinal canal also, no separate incision is required in this method; it can be done, while the body is in the prone position, with reflection of whole flap of the skin in the posterior aspect.

The only disadvantage of this method is that, it is a little bit time consuming in comparison to the conventional methods. In practice, I have found that it requires 10 minutes more time for opening the body, and 15 minute more for closing, than in "I shaped incision", which I consider minimal if we consider the advantages of this method.

Summary:

So, to sum up, the method is superior in comparison to the other three methods of incisions as

- whole of the circumference of the neck, thorax and abdomen is visualised, so, better detection of the wounds particularly in cases of death related to burn, torture, road traffic accidents and any other cases, where there is history of injury just before death of the person.
- No or minimal seepage from the cavities.
- Stitches can be kept hidden in the front of the neck, so, better acceptance for the relatives of the deceased.

- No separate incision is required for opening the spinal canal from the back.
- The only disadvantage that I encountered is that, it is more time consuming in comparison to the "I shaped incision".

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Fig-1

Positioning the body



Fig-2

Scalp incision with extension to the acromion process



Fig-3

Lateral view of the incision in the back



Fig-4

Reflection of the posterior flap up to the lumbo-sacral region



Fig-5

Anterior view of the incision



Fig-6

Reflection of the anterior flap



Fig-7

Complete reflection of the flap



Fig- 8
Para medial incision on the rectus



Fig- 9
Removal of the sternum



Fig- 10
Closing the rectus



Fig-11
Abdomen closed



Fig-12
Suturing the anterior and the posterior flaps



Fig -13
Close view of the neck and the chest after closing



Fig-14
View of the back without external injury



Fig-15
Same case with extensive bruises in deeper tissues



Fig-16
Back view of a burn case without external injury except the burn



Fig-17
Same case with bruises in deeper tissues



Original research paper

Pattern of Head Injuries in Mortality due to Road Traffic Accidents involving Two-Wheelers

*Dr. B. C. Shivakumar, **Dr. Prem Chandra Srivastava, ***Dr. H. P. Shantakumar

Abstract

The study was conducted on 50 cases of fatal road traffic accidents of all age groups. The pattern and distribution of head injuries in dead bodies due to RTA with/without helmet and other associated risk factors was analyzed. A preponderance of victims in the age group 31-40 years (52%) with M:F ratio 7.33:1 was observed. 38% of cases of RTA died on the spot ($p < 0.001$) and 14% cases died while shifting or within one hour of admission to the hospital. 74% of victims were not using helmets. Majority died were the riders (84%), followed by pillion riders (14%). Contusion of the scalp was more common (98%) as compared to the laceration (38%). Contusion of brain was seen in 100% cases and laceration in 26% cases. Fissure fracture was seen in 64% cases. The commonest variety of intracranial haemorrhage was subdural (98%) followed by subarachnoid (96%).

Key Words: Road Traffic Accidents, Head injuries, Motorized Two Wheelers

Introduction:

Accidents represent a major epidemic of non-communicable disease in the present century world over. They are a part of the price we pay for technological progress [1]. India is undergoing major economic and demographic transition coupled with increasing urbanization and motorization. Motorized two wheelers being economical are very common mode of public transportation. According to 2008 report of National Crime Record Bureau of India, 1,18,239 persons were killed in fatal road traffic accidents (RTA) and out of these, 23,552 (19.9%) were killed while riding on two wheelers [2]. The mortality rate is steadily rising.

The head and the abdomino-pelvic cavity have been looked upon as the most vulnerable region. Mortalities and morbidities are more common in head injuries for both riders and pillion riders of two wheelers.

Since the head contains brain, a very important vital organ, trauma to this region challenges the individual because of its anatomical position, size, and movements in all directions. Despite improvements in safety measures in vehicles and greater availability of emergency measures, head injuries have not declined. Some of the factors that increase risks of RTA in India are lack of traffic laws, drunken and rash driving, traffic accidents due to negligent act, poor conditions of the road, lack of infrastructures, traffic mix, encroachments that restrict safe areas for pedestrian, and lack of valid or fake driving licenses.

Two wheelers contribute 70% of total vehicle population of Bengaluru city. Few reliable epidemiological data are available for the study of RTA involving two wheelers with and without wearing helmet. The aim of the present study is to find out the patterns and distribution of head injuries in deaths due to RTA with/without helmet and other associated risk factors and to provide a feed-back for controlling such injuries.

Material and Methods:

This cross-sectional, descriptive, and non-randomized study for the period of one year was done on 50 cases of all age groups with history of road traffic accidents in and around Bengaluru city and where death had occurred within few hours to 16 days of admission to Kempegowda Institute of Medical Sciences, Bengaluru. The bodies were sent to mortuary for conducting post-mortem examination. The inquest reports were studied for various details such as name, age, gender and brief history of road traffic accidents viz., site of death, time of death, use of helmet by riders, and period of survival. In case of incomplete history, enquiries

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were made with the eye witnesses, relatives, friends and police to ferret out relevant details. The postmortem examination of the victims was done in accordance with standard procedures. In hospital treated cases, case sheets were studied for details. Statistical analysis was done by using Chi square test and calculating p value.

Observations and Results:

Table-1 depicts age wise distribution of RTA victims. Out of the 50 RTA victims studied, there was a preponderance of victims in the age group 31-40 years (52%). There were only 2% cases in each age group of <10 years and >70 years. Majority of victims were males (88%) and females accounted for only 12%.

Table-2 depicts site of death and survival time of victims after RTA. 38% of the victims died on the spot and 14% died while shifting or within one hour of admission to the hospital. 14% of the victims died within 1-24 hours of the admission. The mean duration of survival of a RTA victim was 2.20 days with a standard deviation of 3.96 days. The range of survival varied from 15 minutes to 16 days. Number of RTA victims died on the spot (38%) as compared to varied survival time was statistically significant ($p < 0.001$). This indicates the serious impact of head injury leading to the spot death. None of the RTA victims in the present study had consumed alcohol at the time of accidents.

Table-3 depicts use of helmet by riders of vehicles. Majority of victims did not use helmets (74%) and only 6% used helmets. However, no information was available from (20%) of the victims, whether they were using the helmets or not at the time of accidents. Majority of the victims died in this study were the riders (84%), followed by (14%) deaths of pillion riders, and in one case both rider along with pillion rider had died.

Table-4 shows injury to scalp, membrane and brain of RTA victims. Regarding type of injury, contusion of the scalp was most common (98%). The laceration of the scalp was noted in 19 (38%) cases. Almost similar findings were observed for contusion (94%) and laceration (32%) to the membrane. As far as injury to the brain was concerned, contusion was seen in 100% cases and laceration in only 26% cases. Overall, contusions were by far more common than lacerations.

Table-5 shows skull fractures and various types of intracranial haemorrhages in RTA victims. Comminuted fracture involving vault and base, and fissured fracture of vault was noted in 13 (26%) cases each. The fissured fracture of base was seen in 20% of the victims whereas 18% of the victims had fissured fracture of both vault and base. No fracture was observed in 10% of the victims.

The commonest variety of intracranial haemorrhage was subdural haemorrhage (98%) closely followed by subarachnoid haemorrhage (96%). Intracerebral and extradural haemorrhages were present in 12% and 4% of cases respectively whereas intraventricular haemorrhage was reported in only 2% of cases. Interestingly, no instance of isolated intracranial haemorrhage was observed.

Discussion:

In the present study, a total of 50 cases of fatal RTA of all age groups and both sexes were studied for duration of one year. Highest incidence of fatalities occurred in the age group 30-40 years (28%) followed by 20-30 years (24%). Since the age group 20-40 years is the most active phase of life - physically and socially, and outnumbers the other road users, they therefore accounted for the maximum number of accidental deaths. Also, individuals of this age group were either students or prime bread earners of the family and thus remained outdoors during most of the day. Children below 10 years of age were least involved so also was the case with person beyond 70 years of age. This could be explained as the persons in extremes of the age usually remain indoors, whereas children are confined to the outskirts of the residential premises only. Our findings are in general agreement with those of other workers in the field [3, 4, and 5] who also reported maximum fatality by motorized two-wheeled vehicles (MTVs) in the age group 21-40. In contrast, a study by Sirathranout & Kasantikul [6] in Thailand noted the more vulnerable group to be below 21 yrs.

A preponderance of males over females with M/F ratio 7.33:1 was observed. It is due to greater exposure of males on streets and the personal and behavioral characteristics of male. In NCRB report of 2008, out of 23,552 RTA deaths, 20,420 (86.7%) were males and 3,132 (13.3%) were females [2]. Behera et al [3] in their study of 94 cases of motorcycle fatalities also noted that majority of cases (93.6%) were male as compared to female (6.4%) and M:F ratio 14.66:1 which is much higher ratio as compared to our findings. Our findings in general are well supported by other workers [5,6,7].

In our study, majority of the RTA victims (66%) died on the spot or brought dead to the hospital or died within 24 hours of the accident; 22% victims died within one week and rest 12% cases expired after one week despite getting adequate treatment. Our findings were well corroborated by other workers in the field. [3, 8, 9, 10, 11] Although Gupta et al [11] supported our findings with respect to the total number of deaths (61%) within 24 hours; yet the authors reported spot deaths in 22% of the cases, 3% on the way to the hospital and 36% of cases died within 24 hours of their admission in the

hospital. Thus, our findings were at variance to their observations as we noted more cases of spot deaths (38%) and only 28% deaths were within 24 hours of admission including brought dead cases. This broad difference may be because of our study was confined only to occupants of two wheelers whereas the study of Gupta et al [11] encompassed all categories of vehicles on the road and pedestrians wherein the occupants of the bigger vehicles were relatively safe and stable as compared to that of two wheelers.

Majority of the deceased (74%) were not using helmet while riding at the time of accident. Only 6% riders among deceased used helmets, which suggested that use of the helmet, can be lifesaving measure during an accident. Sirathranont and Kasantikul [6] noted that only 4% of the riders were wearing helmet at the time of accident which is in conformity with our observation. Pathak et al [8] in their study of 39 cases of two wheelers accidental deaths reported that 12.82% victims used helmet while 87.18% did not use helmet at all. Thus, death rate was noted to be higher in non-helmet users when compared to helmet users [3, 6, 8] a finding which is in concurrence to our observations. In contrast, Bahera et al [3] observed that among 78.72% deceased, 54.05% individuals wore helmet at the time of accident, and despite wearing helmet they were not fully protected from fatal injuries to head and neck which ultimately resulted in death. The chief purpose of helmet is to absorb the impact of a crash and prevent injury to the brain rather than preventing skull and face fractures. Moreover, comments pertaining to the quality of helmets can not passed for critical assessment for affording protection. Yet helmet use may ensure untreatable and irreversible injuries to a treatable and reversible injury type.

Mortality amongst riders (84%) was more compared to pillion riders (14%). Singh et al [10] reported more fatalities among pillion riders as compared to riders in contrast to our findings. In general, the riders have distinct disadvantage of almost having no physical protection moreover two wheelers are unenclosed, unstable and topple even on slight impact and make riders/pillions vulnerable to contact with hard road surfaces resulting in head injuries and fatalities.

In our study, we noted contusion of scalp, membrane and brain in 98%, 94% and 100% cases respectively. The incidence of laceration of the scalp, membrane and brain were observed to be 38%, 32% and 26% respectively. Khajuria et al [5] and Chaudhary et al [12] noted in their studies that laceration of brain tissue was highest among all brain tissue injuries which were contradictory to our observations, as we observed, incidence of contusion of brain tissue being the highest. 90% of the victims suffered fracture of the skull - either vault or base of the skull or both. Among the skull fractures, 64%

sustained fissured fracture and 26% comminuted fracture. Probably this type of fracture is more common in cases where the head strikes with forcible contact with a stationary surface as in RTA. Our findings were well supported by Pathak et al [8] who reported in 120 cases of head injury deaths, linear fracture of the skull being the highest (43.04%). Khajuria et al [5] noted an incidence of 68.85% fracture of skull among 173 cases of head injuries.

The most commonly found intracranial haemorrhage was subdural haemorrhage (SDH) (98%) followed by subarachnoid haemorrhage (SAH) in 96% of the victims of RTA which coincided with the observations of the other researchers [5, 13, 14, 15, 16]. The study conducted by Gupta et al [11] revealed that subdural haemorrhage was the commonest type of intracranial haemorrhage (68%) supporting our observations; followed by extradural haemorrhage (28%) as second common and intracerebral haemorrhage least common (8%) whereas we noted subarachnoid haemorrhage being the second commonest that too with very high incidence (96%) and intraventricular haemorrhage being the least common (2%) contradicting their observations. Chandra et al [17] in their study in contrast to our observations found subarachnoid haemorrhage as the most common type of intracranial haemorrhage (66.9%) followed by subdural haemorrhage (58.2%).

In summary, we recommend following measures to minimise the incidence of head injuries in RTA victims:

1. Reduce the speed of vehicles.
2. Do not overtake unnecessarily.
3. Ban on drunk and drive.
4. Create safe driver.
5. Making good quality roads with lightings and signals, and not to construct humps in highways.
6. Create western style motor way.
7. Make one way traffic and avoid haphazard road crossing by pedestrians.
8. Build pavements for people to walk and ban of shops or sale on pavements.
9. Do not allow shops/houses adjacent to highway.
10. Awareness to the public regarding importance of 'golden hour' and rapid transportation of victims to specialized trauma centres.
11. Well geared trauma centres with facilities and specialized professionals.
12. Help line and support centres should be established in coordination with emergency response teams to prevent death/morbidity.
13. Impose very hefty fine if one violates the traffic rules with driving license cancellation for repeated violation of traffic rules.
14. Dismiss corrupt traffic wardens.
15. Encourage to utilize public transport system.

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Table 1: Age and Sex Distribution of Road Traffic Accidents Victims

Age (yrs)	RTA victims No. (%)
<10	01 (02)
11 – 20	06 (12)
21 – 30	12 (24)
31 – 40	14 (28)
41 – 50	08 (16)
51 – 60	05 (10)
61 – 70	03 (06)
>70	01 (02)
Total	50 (100)

Table 2: Survival Period

Sr. No.	Survival Time	RTA Victims No. (%)
1.	Died on the spot	19 (38)
2.	Brought dead to hospital or died within 1 hour of admission	7 (14)
3.	1 hour - 24 hours	7 (14)
4.	1 day – 1 week	11 (22)
5.	>1 week	6 (12)
Total		50 (100)

Table 3: Use of Helmet and Persons Died

Use of Helmet	RTA victim No. (%)	Person died	RTA victims No. (%)
No	37 (74)	Rider	42 (84)
Yes	03 (06)	Pillion rider	07 (14)
Data not available	10 (20)	Rider with pillion	01 (02)
Total	50 (100)	Total	50 (100)

Table 4: Head injury - Contusion and laceration of Scalp, Membrane and Brain

Type of injuries	Scalp		Membrane		Brain	
	Present	Absent	Present	Absent	Present	Absent
Contusion No. (%)	49 (98%)	1 (2%)	47 (94%)	3 (6%)	50 (100%)	0 (00%)
Laceration No. (%)	19 (38%)	31 (62%)	16 (32%)	34 (68%)	13 (26%)	37 (64%)

Table 5: Injury to skull and Types of Intracranial Haemorrhage

Sr. No.	Fracture of skull	RTA Victims No. (%)	Intracranial haemorrhage	RTA victims No. (%)
1.	Comminuted fracture of vault and base	13 (26)	EDH	02 (04)
2.	Fissured fracture of vault	13 (26)	SDH	49 (98)
3.	Fissured fracture of base	10 (20)	SAH	48 (96)
4.	Fissured fracture of vault and base	09 (18)	ICH	06 (12)
5.	No fracture	05 (10)	IVH	01 (02)
Total		50 (100%)		

*EDH: Extradural haemorrhage, SDH: Subdural haemorrhage, SAH: Subarachnoid haemorrhage, ICH: Intracerebral haemorrhage, IVH: Intraventricular haemorrhage

Case report

Forensic Diagnosis of Sudden Death due to Pyogenic Meningitis

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Abstract

Acute bacterial meningitis remains a major cause of mortality and long term neurological sequelae worldwide. Despite of availability of potent antibiotic the mortality rate due to acute bacterial meningitis remains significantly high in India and other developing countries. There is a need for periodic review of bacterial meningitis worldwide, since the pathogens responsible for infection vary with time, geography and patient's age.

We are reporting a case of 40 years old married male who became unconscious suddenly with history of fever since last one day. There was no history of any major illness. He was died in hospital under suspicious condition within 12 hours of hospitalization. Forensic experts finally gave the opinion that the death was natural and it was due to pyogenic meningitis after considering autopsy findings, histo-pathological findings and microbiological and biochemistry reports. *Klebsiella pneumoniae* was responsible for acute pyogenic meningitis.

Key Words: Sudden Death, Meningitis, Bacteremia, Pyogenic

Introduction:

Sudden or unexpected deaths occur from unnatural causes, such as violence or poison, as well as from natural causes. Unnatural deaths have always to be investigated by the police, but very often natural deaths form the basis of investigation form the basis of medico-legal investigations, if they have occurred suddenly in apparently healthy persons and under suspicious circumstances. Definition of sudden death is variable. It is based on the interval between the onset of symptoms and death. In sudden death, time interval varies any where from 1- 24 hours. [1]

Meningitis is an inflammation of the covering of the brain, spinal cord. This results in unconsciousness, seizures, raised intracranial pressure, and stroke. Involvement of pia and arachnoids matter is called "leptomeningitis" and for dura "Pachy meningitis" is used. In pyogenic meningitis the pathogens enter in cerebrospinal fluids. Pyogenic meningitis continues to be a formidable illness with high morbidity and mortality in India. Gram positive cocci and gram negative bacilli have been incriminated as bacterial etiological agents of pyogenic meningitis in various studies. [2]

The most recent meningococcal meningitis epidemic began in 1996 and has resulted in more than 300 000 cases and 30 000 deaths had been reported to the World Health Organization. [3] Apart from epidemics, at least 1.2 million cases of bacterial meningitis are estimated to occur each year and of which 135 000 were fatal.[4] These numbers have made bacterial meningitis a top-ten infectious cause of death worldwide.

Total 43 bacteria were isolated from 7759 clinically suspected cases of meningitis. *Pseudomonas aeruginosa* was the most common isolate followed by *Klebsiella pneumoniae*, *Acinobacter* spp, *Streptococcus pneumoniae*, *Neisseria meningitidis*, *Streptococcus pyogens*, *Enterococcus* spp, and other *Streptococcus* spp which were found to be responsible for pyogenic meningitis. [5]

The etiological agents of community acquired meningitis may differ from hospital acquired meningitis. Delay in diagnosis and initiation of treatment can result in poor outcome of the disease. [6] Since clinical signs and symptoms can not be always relied upon, laboratory support is imperative to achieve early diagnosis. As a result of emergence of antimicrobial resistance being reported, recommendations for therapy are changing. Laboratory surveillance of isolates is crucial to identify targets for formation of rational empirical treatment for fatal bacterial meningitis.

Case History:

A 40 year old adult male, resident of Surat, Gujarat became unconscious in his house on 6th May 2009, 12:50 pm with history of mild to moderate fever since last one day. He had been well prior to this and had not suffered from any medical illness.

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Immediately he was shifted to the New Civil Hospital, Surat by his neighbor in ambulance. General treatment was started by Casualty Medical Officer in Emergency ward and admitted in the hospital. On the same day at 11:30 pm, suddenly he collapse and died inspite of using life saving drugs. In this case, treating doctor could not give the cause of death. He informed the concerned police station stating that patient had died in suspicious circumstances within 24 hours of admission.

On 7th May 2009, police made an inquest and requested to conduct postmortem examination in the Department of Forensic Medicine & Toxicology at Surat Municipal Institute of Medical Education and Research (SMIMER), Surat to find out exact cause of death as it became a medico-legal case due to sudden death under suspicious condition.

During post mortem examination, following findings were observed:

External Findings:

- Body was moderately nourished
- Rigor mortis present all over the body in strong form.
- Post mortem lividity present on back of the body except pressure areas.
- No abnormal discharge came out from mouth, nose and ear.
- No evidence of any injury was found over the body.
- Injection mark of size 0.1cm x 0.1cm present over the dorsum of the right hand.

Internal Findings:

- Brain was edematous and congested. Meninges congested, yellow color exudates found in the subarachnoid space.
- Frank pus collection was found in the subarachnoid space of the cerebellum
- Pleura was adherent to the chest wall at places.
- Both lungs were congested, edematous and adherent to the chest wall at places.
- Coronaries were patent and heart valves were normal.
- All organs were congested.

Photograph No. 1

Yellow color exudates seen under the subarachnoid layer



Photograph No.2

Frank pus collection in subarachnoid space



Viscera for histo-pathological examination and CSF for routine and microscopical examination were sent the Pathology Department of SMIMER, Surat. Blood for culture and sensitivity and CSF for bacteriological examination were sent to the Microbiology Department. Sample of CSF was also sent to the Biochemistry Department for sugar and protein level.

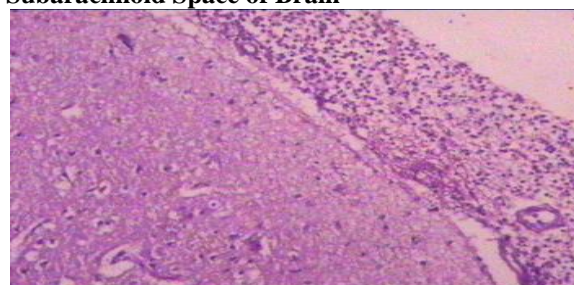
Cause of death was kept pending for histo-pathological, microbiological and biochemistry reports.

Histo-Pathological Report:

Brain showed inflammation of leptomeninges and contain neutrophils and fibrins. Subarachnoid space had congested blood vessels and infiltration of polymorphonuclear leucocytes. Brain parenchyma showed mild congestion. CSF was yellowish in color, turbid and reaction was acidic. On cytological examination of CSF, total cells 40-50/c.mm, polymorphs 80% and lymphocytes 16%.

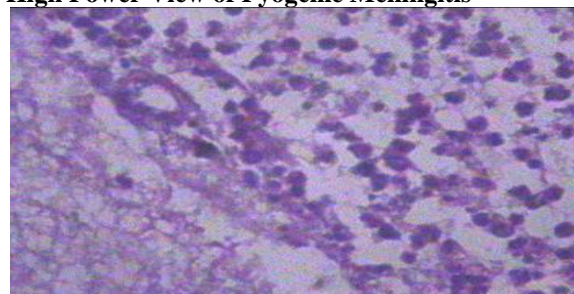
Photograph No.3

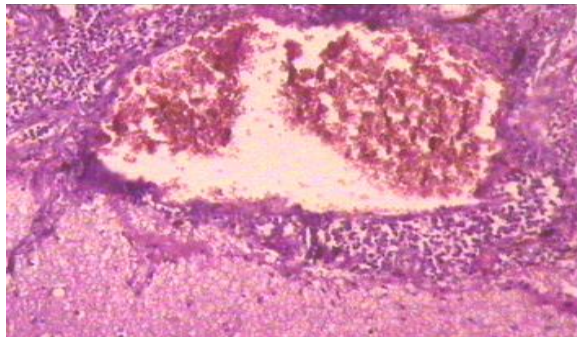
Acute Inflammatory Infiltrate (Polymorphs) In Subarachnoid Space of Brain



Photograph No.4

High Power View of Pyogenic Meningitis



Photograph No. 5**Congestion (Dilated Blood Vessels with RBCs) With Severe Acute Inflammation****Microbiology Report:**

Blood culture showed growth of *Klebsiella* species which were sensitive to ceftriaxone, chloramphenicol, ciprofloxacin, cotrimoxazole and gentamycin. Bacteriological examination of CSF showed *Klebsiella* organism.

Biochemistry Report:

Chemical examination of CSF showed protein 150 mg/dl, glucose 5mg/dl, chloride 160 mEq/L and Pandy's test was positive. After considering autopsy findings, histo-pathological findings, microbiological and biochemical reports, finally cause of death was given as pyogenic meningitis.

Discussion:

The term "sudden" has no agreed universal definition. In the material for the various studies, the duration of the death process has ranged from 1-24 hours, but it is difficult to determine exactly how long fatal symptoms have been present, as death often occurs before the victim reaches hospital. In such circumstances no data on the symptoms are available for want of eye witnesses. Sudden unexpected death in children and young adults due to undiagnosed natural process is extremely uncommon and can prove a diagnostic challenge to the practicing forensic pathologist.

Forensic pathologists routinely certify death certificates in case of sudden, unexpected deaths. Because of the broad scope of this casework, medical examiners inevitably investigate rare diseases that culminate in death. There are many causes of sudden deaths like coronary artery disease, myocarditis, valvular heart disease, pulmonary Koch's, pneumonia, COPD, pyothorax, atelectasis, intracerebral and subarachnoid hemorrhage, meningitis, encephalitis, brain abscess and infarct, cirrhosis of liver, hepatitis, fatty liver, pancreatitis, liver abscess, puerperal abscess etc. [7]

Bacterial meningitis is the most common form of suppurative intracranial infection, with an annual incidence >2.5 cases/100,000 population. The epidemiology of bacterial meningitis has changed in

recent years. Currently, the organisms most commonly responsible for community acquired bacterial meningitis are *Streptococcus pneumoniae* (~ 50%), *Neisseria meningitidis* (~ 25%), group B streptococci (~ 10%), and *Listeria monocytogenes* (~ 10%). *Haemophilus influenzae* was once the most common cause of bacterial meningitis in United States. [8]

The CNS is protected against blood-borne pathogen invasion by an effective blood-brain / CSF barrier and by an external covering of meninges and skull. Thus, the effective CNS pathogen needs either a defect in the external barrier (e.g. purulent mastoiditis, post-traumatic or post neurosurgical dura leak) or must run a biological gauntlet of host defenses to gain access to the CNS. Effective invasion of the CNS involves multiple interactions between the pathogen and the host that sequentially result in mucosal colonization, invasion into, and survival within the intravascular space, and traversal of the blood-brain/CSF barrier.

Sustained (high-grade) bacteraemia is thought to be necessary, although not sufficient, for microbial entry into the subarachnoid space [9]. To invade the meninges, the blood-borne pathogen must cross the physiological barriers between the bloodstream and the CNS. Two different structures separate the bloodstream from the CNS: the blood-brain barrier and the blood-CSF barrier.

Meningitis can present as either an acute fulminant illness that progress rapidly in a few hours. The classic clinical triad of meningitis is fever, headache, and nuchal rigidity ("stiff neck"). Each of these signs and symptoms occurs in > 90% of cases. Alteration in mental status occurs in 75% of patients and can vary from lethargy to coma.

Nausea, vomiting, and photophobia are also common complaints. Focal Seizures are usually due to focal arterial ischemia or infarction. Rashes and raised intracranial pressure are also seen in bacterial meningitis. Nuchal rigidity is the pathognomic sign of meningeal irritation and is present when the neck resists passive flexion. Kernig's and Brudzinski's signs are also classic signs of meningeal irritation.[8] Clinical and neuropathological studies have clearly shown that a fatal outcome of the disease is often caused by neurological complications secondary to bacterial meningitis (e.g. cerebral ischemia, brain oedema formation, hydrocephalus, or increased intracranial pressure).

During the past 15 years, significant changes were seen in the epidemiology of acute bacterial meningitis. The most important change is the marked decline in the incidence of meningitis due to *Haemophilus influenzae* in countries that have introduced programs for the immunization of infants with conjugate Hib vaccines, especially in North America and western Europe. [10] In these countries,

Streptococcus pneumoniae and *Neisseria meningitidis* are the most common causes of acute bacterial meningitis, and bacterial meningitis is now a disease predominantly of adults rather than of infants and children. Additional risk factors include coexisting acute or chronic otitis media, alcoholism, diabetes, splenectomy, hypogammaglobulinemia, complement deficiency, and head trauma with basilar skull fracture and cerebrospinal fluid rhinorrhea. Most developing countries, however, have not added the Hib vaccine to their routine childhood immunization programs. Consequently, an estimated 350 000–700 000 children are worldwide still die from invasive Hib disease each year.

Another epidemiological trend is the emergence of antimicrobial resistance among pathogens causing acute bacterial meningitis. The increasing rate of resistance to penicillin and other β -lactam antibiotics is of particular importance for the clinical management of meningitis.

The clinical outcome of acute bacterial meningitis varies according to socioeconomic aspects (developed or developing countries), age, and the causative pathogen.[11] In developed countries, *S pneumoniae* meningitis has the highest case-fatality rate (about 20%) for community-acquired meningitis.[10] Of the survivors, up to 30% develop long-term sequelae including hearing loss, neurological deficits, and neuropsychological impairment. [12] In the elderly, an unfavorable clinical outcome is markedly more frequent than in children; the case fatality rate among older adults is about 40%. This adverse outcome may be attributable to pre-existing underlying diseases.[13] In developing countries mortality and morbidity rates are dramatically higher than in industrialized countries. About 50% of children with pneumococcal meningitis die while in hospital and up to 60% of survivors have clinical sequelae, whereas the mortality and morbidity rates of this age group in industrialized countries are about 10% and 30%, respectively. [14]

The spectrum of causes of deaths attributed to meningitis is known to be broad, ranging from systemic (e.g. septic shock) to several neurological complications (e.g. brain oedema, hydrocephalus, cerebrovascular involvement, and intractable seizures). Histopathological studies document a wide spectrum of brain injury associated with bacterial meningitis in human beings, including vasculitis, focal necrosis of cortical neurons, apoptotic neuronal cell death in the dentate gyrus, and a loss of myelinated fibres in the subcortical white matter, cerebellum, and brainstem. [15]

One hundred and thirty five cerebrospinal fluid (CSF) samples from children clinically diagnosed pyogenic meningitis (in and around Ahmedabad) were subjected to physical,

bacteriological, cytological and biochemical examinations. It was found that all CSF specimens, were turbid, the culture positivity varied from 12.12 to 56%. The highest percentage was found in children of less than one year of age. The average percentage of culture positivity was 28.68%. The result of gram stain was more than that of cultural examination. Gram stain of CSF was specific, accurate and highly valuable in the diagnosis of pyogenic meningitis. Among gram positive organisms isolated, *Staphylococcus aureus* was highest (8.8%) followed by *Diplococcus pneumoniae* (3.7%), but *Klebsiella* was predominant (6.6%) among gram negative bacilli. *Staph. aureus* was 100% sensitive to erythromycin, gentamycin, kanamycin. The results of cytological and biochemical tests correlated (67.1%). There was increase in polymorphs and protein, sugar levels decreased. [16]

In case of sudden and unexpected deaths, it is difficult task for the forensic experts or medical officer to find out the cause of death. In case of identified bodies, proper history about illness from relative, duration of emerging signs and symptoms, any documentation from treating hospital are the basic keys for solving the puzzle of sudden death. Only external and internal examination of dead body are not sufficient for giving cause of death in sudden death, appropriate samples from the deceased should be taken for pathological, microbiological and biochemical examination to rule out certain disease.

Laboratory investigations of CSF sample in suspected acute meningitis is extremely important for prompt recognition of the nature of the infecting organism as management and therapy of the patient depend on this information and for labeling the sudden death case according to the disease after post mortem examination. Another test of value is the raised levels of C-reactive protein in CSF of patients with bacterial meningitis as opposed to viral meningitis. [17]

From forensic point of view, if any case of sudden death comes with the history of fever, headache, seizure and altered consciousness should be investigated properly by forensic expert after keeping the possibility of cerebral malaria, bacterial or viral meningitis, brain abscess, Subdural or epidural empyema and subarachnoid hemorrhage in mind. The post mortem findings should be corroborated with laboratory investigations before giving the cause of death.

Conclusion:

In case of sudden death, Forensic Pathologist or medical officer cannot presume the exact cause of death by partial or limited post mortem examination such as, "chest only", "abdomen only" or "excluding the brain." Complete autopsy in combination with medical history, clinical course of

any pre-existing disease before death, imaging data, laboratory findings, and bacterial culture are valuable to give the exact cause of death.

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Case report

Fatal Gastro-duodenal perforation following electrocution A case report

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Abstract

A 45 yrs old male was accidentally electrocuted, while cooking on a locally made heater in his home. He was immediately brought to the hospital in unconscious state by the family members. After first aid he was referred to a tertiary care hospital, where he was admitted about two hrs after the incident. On admission he was unconscious, abdomen was distended, with fluid in peritoneal cavity. There was tachycardia and hypotension. Bowel sounds were absent. Electrocution burn marks were present over the right hand. Arterial blood analysis showed severe metabolic acidosis. He was immediately shifted to the ICU. His condition continued to be critical with persistent metabolic acidosis despite repeated sodium bicarbonate infusion. An exploratory laprotomy was planned to rule out abdominal visceral injuries. However the patient expired six hrs after admission to the hospital before being taken to the operation theatre. Autopsy examination showed perforated anterior wall of stomach antrum and first part of duodenum.

Key Words: Electrocution, Stomach, Duodenum, Perforation, Thrombosis

Introduction:

Electrical injury is produced by the conversion of electric energy into heat while passing through tissue. Electrocution, though not very common, is often fatal. It can cause serious injuries and even permanent disabilities in survivors. Clinical manifestation can range from no apparent injury to serious systemic damage. Electrical injuries can be grouped into low-voltage injuries (voltage less than 1000 volts) or high voltage injuries (voltage more than 1000 volts). Intra-abdominal injury associated with electrical injury is difficult to diagnose. Abdominal visceral injuries can be a direct consequence of the passage of electrical current through the abdominal viscera or a complication of electrical injury, such as curling's ulcer. Abdominal visceral injuries consequent to passage of electric current are commonly associated with high-voltage injuries where the contact point is directly over the abdomen. Abdominal visceral injury associated with low-voltage current is a rare phenomenon.

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Case Report:

A 45 yrs old male of average built was found lying unconscious on the ground in the kitchen of his house. A plugged-in heater, with open wires, was also found in the kitchen. Electrocution marks were present on the right hand of the individual. It was surmised that the individual has suffered electrocution injuries accidentally while cooking on a heater in his home. He was taken to the nearest hospital by his family members, where he was resuscitated and later transferred to a tertiary care hospital. He was admitted to the hospital about two hrs after the incidence in a critical condition.

On admission the physical examination revealed an unresponsive, well nourished, middle aged male. Two electric burn marks were present on the right palm. The lungs were clear. ECG did not show any abnormality. Abdominal examination revealed marked distension with no bowel sounds. The chest radiograph revealed clear lung fields and a heart of normal size. Ultra-sonographic examination of the abdomen revealed free fluid in the peritoneal cavity. The arterial blood pH showed severe metabolic acidosis. He was shifted to the intensive care unit of the hospital.

Despite repeated sodium bicarbonate infusion, metabolic acidosis persisted, and it was thought that the individual might have suffered intestinal injury during electrocution. An exploratory laprotomy was thought of approximately four hours after admission. However before the individual was taken to the operation theater, he suffered an episode of cardiac arrest and did not respond to the resuscitative measures.

Autopsy Findings:

The body was that of a middle aged male, with rigor mortis present all over the body. Post mortem lividity was present on the back and dependent parts of the body in supine position. Two electric burn marks of size 1cm x 1cm and 8mm x 8mm were present over the lateral aspect of right palm and palmar aspect of middle phalanx of right little finger respectively. (Fig. 1)

A contusion of size 3.5 cm x 1 cm was present on the extensor aspect of left elbow. On internal examination an irregular perforation of 5cm x 3 cm in size, was present on the anterior wall of stomach antrum extending to the first part of duodenum. There was no charring / blackening in the surrounding area. Stomach and duodenum mucosa were deeply congested with sloughing of mucosa at places. (Fig. 2)

About a litre and half partially clotted blood was present in the intestine and peritoneal cavity. All other internal organs were congested. Toxicological analysis did not detect any drug or alcohol. Death was due to hemorrhagic shock as a result of perforation of stomach and duodenum walls due to electrocution.

Discussion:

Abdominal visceral pathology which is seemingly a direct consequence of the electric current rather than a complication of the injury is most frequently associated with high voltage injuries. The esophagus, pancreas, gall bladder, small intestine and colon have been reported as directly injured. Abdominal visceral injury rarely has been associated with low voltage current, perhaps because the current density and hence heat dissipated are comparatively less. Smith and Rank [1] reviewed a case of coagulation necrosis of the gallbladder in a high-tension electrical injury and manifested on the eighth post injury day with acute abdominal symptoms. Simonin [2] had reported a fatal case of perforation of the small intestine by a 12000-volt current passing through the abdomen. Sinha and Roy [3] reported a 440- volt burn to the right lower quadrant of the abdomen which resulted in caecal perforation. Rijhwani and Sunil [4] have reported a case of colonic fistula in a boy following deep burn of anterior abdominal wall from a high-voltage electric current.

Electric current entering the body follows the path of least resistance, particularly when contact is made with low voltage circuit. Neurovascular channels carry the least resistance while muscle, skin and bone have increasingly greater resistance to the flow of current. Current, which passes through large vessels, may damage them, but they remain patent because flow in them is sufficient to dissipate heat and prevent clotting (Hunt J.L. et.al. 1974). [5]

However, smaller vessels which are damaged frequently thrombose (Butler E.D. and Grant T.D, 1977). [6]

Baldwin and Nelson [7] produced intestinal lesions in albino rats by passing high-frequency current. Sawyer et al. (1960)[8] passed as little as 20 microamperes at a pole-to-pole potential difference of 20 to 30 volts and showed that there was complete thrombosis of the mesoappendix of the rat. In the present case, it appears that a current passing down the vessels supplying the stomach and first part of duodenum and dissipating its energy in its terminal branches supplying first part of duodenum and pyloric antrum, might result in thrombosis, leading to infarction of the part of the antrum and first part of duodenum resulting in perforation and fatal haemorrhage.

Alternatively the high voltage current traveling via the vagus nerve probably caused violent contraction of the stomach, with the result that the air that is normally present in the stomach was compressed and displaced. When the stomach relaxed after passage of current, the compressed air within the stomach rapidly and forcefully re-expanded, causing perforation of the stomach (Kumar S., Thomas S. and Lehri S, 1993). [9]

In summation, the purpose of this report is to point out the potential for serious gastrointestinal damage, associated with not only high voltage electrical injury but also with low voltage electrical injury.



Fig. 1
Electrocution burn Marks

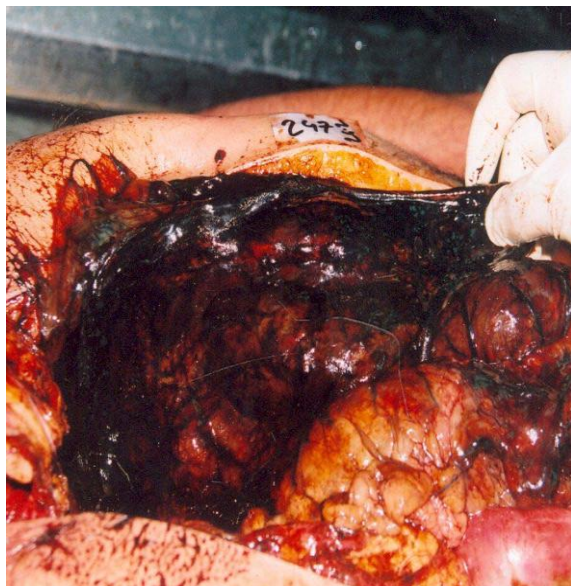


Fig.2
Congested Stomach and duodenum mucosa

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Case Report

Death due to Isolated Mesenteric Vascular Injury Following Blunt Abdominal Trauma: A case report

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Abstract

Death due to isolated injury to small bowel mesentery following abdominal trauma is rare. It is known that seatbelt trauma from motor vehicle accidents is the most common mechanism of mesenteric injury and that the mesentery of the small bowel is injured more frequently than that of the colon. Focal mesenteric infiltration associated with haemoperitoneum, particularly in the absence of solid organ injury, is highly suggestive of a mesenteric tear. In this report one such seat belt abdominal injury with subsequent mesenteric tear and bowel infarction with significant haemoperitoneum leading to death on the Operation table is being discussed. The main significance of this injury is delay and difficulty in diagnosis, especially when there is minimal signs and symptoms to warrant an exploratory laparotomy. Early detection and emergency surgical intervention when necessary are critical in improving the outcome of treatment.

Key Words: Mesentery, Seatbelt, Haemoperitoneum, Blunt Abdominal Injury, Trauma

Introduction:

Deaths due to road traffic injuries are one of the leading causes of deaths in India. The injuries as a result of accidents have potentially serious consequences resulting in disability, morbidity and mortality. Mortality is higher in our country compared to other developed countries. The victim may sustain a wide variety of injuries to various body parts depending on the circumstances of the accident and other factors. Though poly trauma is the cause of death in most of the cases, at times an apparently trivial injury may prove fatal.

Abdominal injuries due to road traffic accident are of particular interest from the forensic medicine point of view for several reasons as these injuries may show minimal or no signs externally to the soft tissues of the abdomen, the frequency with which a symptom free interval is interposed between abdominal trauma and the development of clinical evidence, thus, having a high potentiality of being missed during examination at the Emergency Room.

One such preventable death with no obvious external abdominal signs which proved to be fatal due to an isolated mesenteric vascular injury following blunt abdominal trauma in a road traffic accident is being discussed.

Case Report:

The deceased aged about 48 years on 15/5/10 who was driving his Maruti Van from Mysore to Bangalore met with a head on collision with another car near Mandya, sustained injuries to the abdomen, shifted to the local General Hospital at 7 PM.

On examination around 7.10 PM his vitals were normal with complaint of pain in abdomen and tenderness, administered pain killers and advised X Ray and Ultrasound Scan of Abdomen at 7.30 PM. Due to unavailability of the above investigations he was shifted to Bangalore. At around 11 PM admitted in a Bangalore Nursing Home with increased abdominal pain and sluggish bowel sounds and distension of abdomen and was administered IV Fluids. He was shifted to another hospital for tertiary care at 2 AM on 16/5/2010.

On admission, vitals-BP was 80/60 mm Hg and Pulse 60/min, RR- 24/min. Hb%-7.5% X-Ray Abdomen/Scan- showed dilated bowel loops with Haemoperitoneum. Due to non availability of O +VE blood, there was delay in transfusion of blood. Patient's condition deteriorated at 5 AM, BP was not recordable, pulse was 50/min, he was treated with inotropes and 3 units of blood transfused and patient's attendant was suggested explorative laparotomy. The operation was started at 7.10 AM.

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Operative Notes:

Abdomen was opened with midline incision. About 4 liters was present in the peritoneal cavity. **Multiple transverse small bowel mesenteric tears** present with dusky segment of small bowel (**mid jejunum**). No active bleeder localized. About 750 grams of clot in the pelvis and the peritoneal cavity was present.

Patient sustained multiple cardiac arrests on the operation table. Cardio pulmonary resuscitation was given. Patient could not be reverted from the arrest and was declared dead at 8 A.M, and was later subjected for autopsy.

Salient Autopsy Findings:

Post mortem staining was faint. No demonstrable external injuries were seen over abdomen. Surgically sutured laparotomy wound, 15 cm in length present over midline.

Other injuries: 1. Abrasion, 3 cm x 1 cm present over front over right knee 2. Abrasion, 2 cm x 1cm present over front of left mid leg.

Internal Examination: All organs were intact and pale. Peritoneal cavity contains 750 ml of blood and blood clots. Small intestine shows gangrenous changes over a segment of jejunum for about a length of 2 feet. (photograph)

Cause of Death:

On perusal of hospital case records and autopsy findings, cause of death was attributed to shock and haemorrhage as a result of mesenteric vascular injury consequent upon blunt injury sustained to abdomen.

Discussion:

Blunt abdominal trauma with mesenteric tear and gut perforation has been recognized as a part of seat belt syndrome. Most of the time the two conditions co exists and only rarely does an isolated injury to the small bowel mesentery or meso colon, with subsequent bowel infarction occurs. [1-4] Bowel and mesenteric injury are found in 5% of patients with blunt abdominal trauma [5] but the classical triad of tenderness, rigidity and absent bowel sounds is present in as few as 31% of patients [6] Clinically Isolated Mesenteric Injury present as follows:

1. **Immediate:** due to bleeding- signs of continuous bleeding and peritoneal irritation would be present, making early laparotomy Imperative. In this case the deceased developed significant haemoperitoneum 9 hours after sustaining injury and hence falls into this category.
2. **Delayed:** due to bowel infarction, the patient may present between 12 hours to 5 days following the injury.
3. **Late:** due to bowel stenosis or adhesion formation. The time of presentation is between 5- 8 weeks after injury.

The clinical significance of this injury is the delay and difficulty in diagnosing, because of the minimal signs and symptoms due to slow mesenteric vessel bleed it is undetectable until there is sufficient haemoperitoneum to cause hypotension or until the ischemic bowel becomes gangrenous and peritonitis ensues by which time the golden hour would have elapsed as in this case. The most lethal form occurs when the mesentery has been avulsed. The resulting haematoma being contained retroperitoneally. The abdominal signs then would be minimal and the injury goes unrecognized until hypovolemic shock sets in. [7]

The mechanism of the mesenteric injury in blunt abdominal trauma involves compression and deceleration forces which result in a spectrum of injuries that range from contusions to tearing of the bowel wall to shearing of the mesentery to loss of vascular supply. The bowel or its mesentery may be injured by direct compression between the seat belt and the lordotic lumbar spine. Shearing and decelerating forces can also cause same injury. This commonly occurs at the junction between its fixed and mobile parts i.e. at duodeno jejunal junction and ileo caecal junction. [2, 7, 11]

In this case the deceased was wearing a seat belt and had sustained Multiple transverse small bowel mesenteric tears at the mid jejunum level which had further progressed to a gangrenous change with haemoperitoneum. Two cases of isolated mesenteric injury following blunt abdominal trauma has been reported by McCullough [2]. One was in the mesentery of the terminal ileum and the other in the transverse colon with severed middle colic artery. Asbun [12] reported another case of isolated mesenteric tear with subsequent ischemia of the ileum out of eight cases who had undergone laparotomy. Killen [4] also reported a case of isolated small bowel mesenteric tear following a non penetrating abdominal trauma.

Bolton [7] reported on 59 patients who had undergone laparotomy for blunt abdominal injury between 1906 and 1972. Only one had isolated mesenteric tear while the rest had additional one or more associated injuries.

Conclusion:

Failure of early diagnosis of abdominal injury continues to be a frequent cause of preventable death following trauma. Isolated injury of the small bowel mesentery following blunt abdominal trauma are rare. The physical examination of the patient is often misleading. The diagnosis requires intelligent interpretation of the history, physical findings and the results of available laboratory procedures along with other diagnostic modalities. The diagnosis of mesenteric injuries tends to be delayed. Early detection and emergency surgical intervention when

necessary are critical in improving the outcome of treatment.

So also such cases emphasizes that at the time of recording the history, information as to the type of seat belt worn would give a cue as to the possibility of an intra-abdominal trauma with delayed symptoms for which necessary steps can be adopted.

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Figure No 1

Defibrillator burns marks present over left side of the chest



Figure No.2

Explorative Laparotomy sutures



Figure No 3

On opening the body blood and blood clots present in the peritoneal cavity



Fig No 4

Infarcted mid jejunum with cotton gauze at the site of mesenteric tear



Fig No 5

Mesentery showing extravasation of blood



Case report

Traumatic Asphyxial Deaths Due to an Uncontrolled Crowd at Railway station: Two case reports

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Abstract

Deaths in stampede accidents are not new in India. Majority of casualties occurred as a result of traumatic asphyxia in such cases. Traumatic asphyxia is a rare syndrome first described over 150 years ago by Olivier. It is caused by sudden compressive chest trauma and is associated with craniocervical cyanosis, facial edema and petechiae, sub-conjunctival hemorrhage, and neurological symptoms. Although minor incidents of jostling are common at railway stations, but deaths occurring consequent to stampede by an uncontrollable crowd is not very common. A stampede occurred at New Delhi railway station which results in death of two persons and injuring many. The autopsy findings along with circumstantial evidence, results in arriving of conclusion that these deaths occurs as a consequence of traumatic asphyxia. Various clinical features of this condition are described in the literature, a brief review of which is given in this article. In the conclusion few preventive measures are also suggested so that in future such tragedies can be averted.

Key words: Stampede; Traumatic Asphyxia; Fatalities

Introduction:

In a country like India which has many highly populated areas such as places of worship, stations and tourist places, accidents like stampede are waiting to be happened. A human stampede at the Hindu temple of Naina Devi occurred on 3rd August 2008 in the Indian state of Himachal Pradesh. 162 people died when they were crushed, trampled, or forced over the side of a ravine by the movement of a large panicking crowd. In another incident at least 65 people died and over 100 have injured in the Ram Janki temple stampede which occurred here on 04.03.2010 in Uttar Pradesh's Pratapgarh District when a gate collapsed triggering panic among the 10,000-strong crowd that had converged for a ritual. Most of victims were women, elderly and children. The present case reports also indicated that despite of the fact that such accidents are occurring at a regular interval no lessons are learnt from our past mistakes which leads to such incidents.

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Also these deaths often are attributed mistakenly to blunt impacts from trampling. The autopsy, however, typically finds inconsequential blunt injury but does find signs of traumatic asphyxia.

Case Reports:

On a Sunday morning during summer vacation time, a huge number of people, mostly migrants returning to their home towns, were waiting at platform no 12 of New Delhi railway station where their train was scheduled to arrive. However, just few minutes before the arrival of the train an announcement was made through public addressable system that this train will now arrive at platform no 13. Soon after this the people start running towards the platform no 13. The narrow foot over bridge meant to reach there soon got overcrowded and this results in a stampede in which two lives were lost. The dead bodies were sent to the mortuary for PM examination which was conducted on the next day.

Case 1:

On external examination it was a dead body of a 10 yrs old child of average built. PM staining was present at the back and fixed. Rigor was complete. Face was congested with multiple petechiae hemorrhages present over the face. A linear abrasion (9cm X 0.2cm) was present obliquely over front of chest (Fig 1).



Figure 1: Showing Linear Abrasion on Chest and Multiple Petechiae Hemorrhages on Face.

Multiple small abrasions were also present over the face and chin. Subconjunctival hemorrhages present in both eyes. Internally no injuries were present and all the organs were congested.

Case 2:

On external examination it was a dead body of 40 yrs old female of mild obese built. PM staining was present at the back and fixed. Rigor was complete. Facial congestion with multiple petechiae hemorrhages over facial region was also present (Fig 2).



Figure 2: Facial Congestion with Multiple Petechiae Hemorrhages

Subconjunctival hemorrhages present in both eyes. No external injuries present. Internally contusion and effusion of blood present over the chest region in midline. All the internal organs were congested.

The cause of death in both cases based on the PM findings and history given was traumatic asphyxia consequent upon mechanical chest compression as a result of stampede.

Discussion:

A syndrome was first described in 1837 by Olliver d'Angers as he performed autopsies on

people trampled to death by crowds in Paris [1] consisting of craniocervical cyanosis, subconjunctival hemorrhage, and cerebral vascular engorgement. He used the term *masque ecchymotic*, which was subsequently expanded upon by other authors and termed *traumatic asphyxia*. [2] Other terms like traumatic cyanosis, compression cyanosis, and traumatic apnea are also used to describe this syndrome which includes mental dullness, hyperpyrexia, hemoptysis, tachypnea, petechiae, epistaxis, peripheral nerve damage, amnesia, and convulsions. [3]

Presently, traumatic asphyxia is described as asphyxia occurring as a result of sudden or severe compression of the thorax or upper abdomen. [4] It is most often associated with blunt trauma secondary to a crushing injury mechanism. In children, it is most often associated with motor vehicle accidents, but it has also been described after epileptic seizures, severe emesis, whooping cough, and asthma exacerbations. [5]

People who succumb in these scenarios typically die ("standing up") in a vertical position. Survival or death is determined by the person's orientation with respect to the compressive force of the crowd. When force is applied front to back or vice versa, chest expansion is compromised. When force is applied side to side, chest expansion is not compromised. Survivors of such incidents have described this positional dyspnea. This same compression prevents a fall to the floor. Victims do not collapse to the floor until after the crowd density and pressure have been relieved.

The exact pathophysiology of traumatic asphyxia is a subject of debate. The most widely accepted explanation is that the crushing injury puts pressure on the mediastinum and the heart. This pressure forces blood out of the right atrium in a retrograde fashion into the valveless innominate and jugular veins. This results in a sudden and rapid increase in the pressure of the small venules and capillaries of the face and head, resulting in petechial hemorrhages. [6] Furthermore, these damaged small vessels become atonic, causing stasis and pooling, which leads to cyanosis. A critical step in this process is a sudden inspiration and the closure of the glottis. This is believed to be secondary to a fear response and is crucial in order to elevate the intrathoracic pressures to a level that will cause damage.

Some people who die of traumatic chest compression may not have petechiae. [7],[8] This may be seen with chest compression that is great enough to impair the left heart function as well as the right. Increased cephalic venous pressure will not develop in this scenario because even though the venous return is impaired, the input arterial pressure is also compromised. Patients who experience a

sudden crushing injury without warning often do not develop the craniofacial signs of traumatic asphyxia.

The usual clinical presentation of traumatic asphyxia is facial edema, cyanosis, and purpuric and petechial hemorrhages of the upper torso, neck, and face after a crushing injury. The petechiae may be most prominent within the conjunctiva and oral mucosa and are most commonly seen 2 to 3 hours after the initial injury.

Other ophthalmologic findings include exophthalmos, proptosis, orbital edema, and visual loss. [9, 10, 11] The venous pressure may be transmitted to the abdominal viscera, leading to hematemesis, intestinal mucosal bleeding, hematuria, and albuminuria. [12] Neurologic sequelae include loss of consciousness, disorientation, agitation, brachial plexus injuries, quadriplegia, and coma without evidence of spinal cord injury. These are thought to be secondary to the anoxic injury, as well as the cerebral edema and hemorrhages. [13, 14]

The development of sequelae depends on the duration of the crush injury. Prolonged compression is associated with increased mortality and is most likely secondary to apnea and hypoxemia. [12] Since traumatic asphyxia is most often secondary to severe crushing injuries, other traumatic injuries, such as pneumothorax, hemothorax, flail chest, pulmonary contusions, blunt abdominal injuries (ie, splenic lacerations and liver lacerations), and blunt pelvic injuries, must be considered. [15]

The diagnosis of traumatic asphyxia is evident from the history of the injury and the physical examination. The differential diagnosis includes superior vena cava syndrome and basilar skull fracture, both of which can present with subconjunctival hemorrhages and periorbital ecchymosis. A high index of suspicion should be maintained for other traumatic injuries.

Conclusion:

The railways need to control platform ticket sales and exercise tighter control of security to restrict the numbers of relatives who came along with the passengers to decongest the platforms, especially

during festival/ holiday seasons when huge footfalls are expected at stations. The security personnel/police need to anticipate and recognize crowd control problems early and respond quickly with reinforcements. Finally, the crowd must demonstrate a sense of responsibility and respect other people and understand the potential risks in these poorly controlled circumstances.

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Case report

Capsulo-ganglionic Bleed: Murder or Pathology?

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Abstract

Intra parenchymal (intra cerebral) haemorrhage is the most common type of spontaneous intracranial haemorrhage. It accounts for 10% of all strokes with a 50% case fatality rate. Hypertension is the one of the most common causes of intra parenchymal haemorrhage followed by other causes like, amyloid angiopathies, cocaine abuse, haematologic disorders and head injury. The present case is a case of death due to intra parenchymal haemorrhage where the relatives of the deceased alleged the death to have been caused as a sequel to an assault by neighbours. Autopsy conducted by experts proved that death was due to pathology and not trauma, thereby assisting in establishment of justice. Usually a single deep seated intracranial haemorrhage in ganglionic region without any injury to scalp, skull and brain is due to natural disease. Hypertension is the most common cause of spontaneous intracranial haemorrhage.

Key Words: Amyloid Angiopathies, Autopsy, Capsulo-ganglionic, Head injury, Hypertension, Intra-cerebral haemorrhage

Introduction:

Intra parenchymal (intra cerebral) haemorrhage is the most common type of spontaneous intracranial haemorrhage. It accounts for 10% of all strokes with a 50% case fatality rate. Hypertension is the one of the most common causes of intra parenchymal haemorrhage followed by other causes like, amyloid angiopathies, cocaine abuse, haematologic disorders and head injury. The present case is a case of death due to intra parenchymal haemorrhage where the relatives of the deceased alleged the death to have been caused as a sequel to an assault by neighbours. Autopsy conducted by experts proved that death was due to pathology and not trauma, thereby assisting in establishment of justice. Usually a single deep seated intracranial haemorrhage in ganglionic region without any injury to scalp, skull and brain is due to natural disease. Hypertension is the most common cause of spontaneous intracranial haemorrhage.

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Case Report:

In the present case, dead body of a 90 year old female was brought to the mortuary of SMS Hospital for post-mortem examination. The deceased had been an in-patient at our hospital and was under treatment for 12 days.

As soon as the patient expired, the relatives of the deceased alleged that she had been assaulted by neighbours, due to which she had fallen ill. On the arrival of police, investigation was done. Post – mortem examination was done by a panel of doctors after the inquest.

External Examination

On examination, the deceased was an averagely built and nourished female. Rigor mortis had developed all over the body and post mortem staining present and fixed over the back and dependant parts of body. There were no external visible injuries and all natural orifices were within normal limits.

Internal Examination:

There were atheromatous changes in the greater vessels. Other than that the viscera were grossly within normal limits. Brain showed a 5 X 3 X 1.3cm hematoma in the left capsule ganglionic region with brain edema. There was no skull fracture and no subscalp hematoma or any visible external injury. Viscera were preserved to rule out the presence of common poisons and to detect any histopathological changes. Opinion regarding cause of death was given as due to coma, however final opinion was kept reserved. On the arrival of the reports, final opinion was given as Coma due to intracranial haemorrhage,

which was due to spontaneous intracranial haemorrhage, thereby ruling out trauma.

Discussion:

In the present case, the actual assault had taken place at a village near Jaipur after which the deceased had been taken to the nearby Government Hospital for treatment and preparation of the Medico-Legal report. The Report prepared by the Medical officer showed no external injury. The deceased had complained of pain over chest and abdomen with no external visible injuries. Hence the doctor had not advised for any investigation.

The patient was conscious and oriented at the time of examination and the general condition was stable. Five days after the incidence the deceased had become unconscious suddenly and was rushed to the local hospital. On examination, she was unconscious, with weakness of right upper and lower limbs with a Blood pressure of 180/90mm Hg. The patient was referred to the nearby tertiary hospital, for further investigation and management. On arrival to our hospital, she was admitted in the Medical Unit and investigated. CT scan of Brain showed a 57 X 33mm hematoma in the left capsuloganglionic area with periventricular edema and thinning of grey matter with features of cerebral atrophy. On the basis of clinical findings and investigations, she was treated for Hypertensive Intracerebral haemorrhage and poor prognosis was explained to attendants. After 12days of treatment, the patient expired due to cardiorespiratory arrest. After death, the attendants alleged of foul play hence body was shifted to mortuary.

Conclusion:

A stroke, or cerebrovascular accident (CVA), occurs when blood supply to part of the brain is disrupted, causing brain cells to die. When blood flow to the brain is impaired, oxygen and glucose cannot be delivered to the brain. Blood flow can be compromised by a variety of mechanisms. The main causes are blockage of an artery and due to haemorrhage. Blockage of an artery can be due to narrowing of the small arteries within the brain can cause a so-called lacunar stroke, Hardening of the arteries (atherosclerosis) leading to the brain and Embolism to the brain from the heart. [4] Cerebral haemorrhage can be due to bleeding within the brain substance. Atherosclerosis is a modifiable risk factor for ischemic stroke. Old age, family history of thrombotic stroke, diabetes mellitus, hypertension, tobacco smoking, abnormal blood cholesterol levels and other factors are either proven or probable risk factors for ischemic stroke largely by their link to atherosclerosis. Stroke is mainly a disease process and is unrelated with trauma. [3, 2] Hence a proper autopsy is mandatory to clarify misconceptions and establishment of justice. [1]

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Case report

Victim of Adultery with Bigotry

* Dr. J.Jaya Raju, ** Dr. K.Sudhakar Suresh

Abstract

A classical case in which the victim was killed in a bizarre manner, by his own (two) wives and their boyfriend. For the past 8 years victim had been living in the city for livelihood while he left the family in the village. In his absence both the wives who are sisters developed an illicit relationship with a man from the same village.

The victim unexpectedly visited the village on the occasion of Ganesh Chaturthi and came to know about their illicit relationship. He put-up the issue in the panchayat which enraged both the wives and their paramour hence they planned to kill him. In the name of a get-together they got the husband drunk and once unconscious, they beat him mercilessly and strangled him to death. They packed the body in a gunny bag, wrapped it in a woolen blanket and buried him in a partially dried pond in the outskirts of the village. Due to the sudden disappearance of the victim the relatives suspecting foul play, informed the police. During interrogation by the Police the wives and their paramour confessed their crime.

Key words: Exhumation, Strangulation, Adultery, Bigamy, Bigotry

Introduction:

A murder is not a rare occurrence and Adultery is not an uncommon phenomenon in a society, wife killing the husband is somewhat rare in Indian culture where wives worship the husband. If a person has two wives it is a common situation where one is favoured and the other plots to kill him out of jealousy. This case where the victim was in a bigamous relation, where the wives are sisters, both the wives develop an illicit relationship with the same man and both together kill the husband. The way the body was buried is also adding to the rarity of the case.

Case History:

The victim belongs to a village called Hathnoora in Medak district, Andhra Pradesh. The victim was aged about 35 to 40 years and was married and since his first wife did not beget children, again he married the younger sister of the first wife, after 6 to 8 years of their marriage he had two children through the second wife.

The victim was shifted to Hyderabad city for his livelihood, and working as a Mason. Often he was visiting his family and coming back to Hyderabad.

Meanwhile the accused developed intimacy and illicit relationship with both wives of the deceased, and almost staying with them in the absence of the deceased.

When the deceased came to the village on the occasion of the Ganesh chaturdhi (festival) he came to know the relationship between his wives and accused through his friends, and he quarreled with the wives and the accused and had open discussion in the panchayat. On 27th/28th August 09, onwards the friends and the relatives of the deceased groused suspicion against the three people, to the sudden disappearance of the deceased. The villagers quarreled with the accused and wives of the deceased, their suspicion grew into reality to the sudden disappearance of the deceased from 27th onwards, they approached the police and complained against the above three people on 31/8/09. Then the police made their investigation and took the above three people into custody and interrogated.

All the three accused confessed that, after Ganesh chaturdhi they decided to get rid of him forever, planned a get-together on 27th/28th at the deceased house, they ate and drank and when the deceased became unconscious, they tied his legs and both hands at wrist level, and beat him with a blunt weapon on right side of the head, chest, scrotum and both legs. Even then, the victim made some movements, then the ladies held the victim and the male accused strangled the victim with a binding (iron) wire encircling the neck, using 3 rounds and knotted it on left side of the neck. [1, 2] After confirming the death of the deceased, they tied his legs and wrist in knee chest position put him in a

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gunny bag, again the gunny bag was wrapped in multicolored woolen blanket. With cooperation of the ladies, the accused carried the body on bicycle to the outskirts of the village, into the partially dried pond and **dug a grave 3 ½ feet by 3 feet and put the body into the grave vertically.**

Exhumation (Post-Mortem examination):

At the request of the police we reached the village and went to the dried pond at the outskirts of the village, the grave was identified by the accused, the diggers dug the grave removed the body which was in a vertical position and kept aside for examination. After removing the woolen blanket the body was found in a gunny bag, in knee-chest position.

Body was kept on open ground, noted down the dress which was worn by the deceased; tattoo mark present on left forearm was recognized by the family members.

The body was decomposed, eyes protruded, skin and scalp hair was peeling off.

The following Ante-mortem injuries present on the deceased body:

1. Three rounds of binding (iron) wire completely encircling the neck, it is over and below the thyroid cartilage and transversely placed.[1, 2]
2. Abraded contusion present on front of the chest and both leg.
3. Contusion present on left side of scrotum
4. On reflection of scalp, contusion present on right temporal area, with contused right

temporalis muscle, reddish grey liquefied brain matter.[1, 2]

5. When the neck structures were opened fracture of the thyroid cartilage was seen viscera congested and softened.
6. **Stomach** contains about 150 grams of semi digested rice with dhal; mucosa congested, and smells of alcohol present. [1, 2]

Cause of Death: Ligature strangulation associated with Head Injury.

Discussion:

The Medical Officer has observed that the strangulation was done in a manner with a binding wire. The way it was tied on left side of neck with a hook called binding wire hook without any other injuries over the neck area. The deceased was unable to show any resistance because he was already beaten and was unconscious.

Conclusion:

The original narration given by the accused for the sudden disappearance of the deceased and the confession during interrogation has misled the police towards suicide or accidental death of the deceased. Because the villagers sympathy towards the deceased leads to the exhumation and the postmortem findings has revealed how they mercilessly killed the deceased.

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Case report

Sudden Death –Following Metastasis from Carcinoma of Breast

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Abstract

We report a case on sudden death brought to the Department of Forensic Medicine, Gauhati medical college, Assam. Death was due to syncope as a result of cardiac tamponade due to pericardial effusion following metastasis from carcinoma of breast. Death from cardiac tamponade following carcinoma breast is not a usual finding on the autopsy table. These sudden deaths make forensic pathologists aware of the course of natural diseases. Cardiovascular diseases accounts for vast majority of cases and certain neoplasm may also present as sudden death. Malignancy of breast is one of the commonest malignancies in females and often it presents late with metastasis to the underlying organs. The importance of autopsy lies here in the fact that it alleviates the doubts in the minds of the relatives of the deceased and relieves the law of the burden of un-necessary investigations. Moreover, role of pathology in Forensic Medicine in such cases is inevitable in establishing the cause of death.

Key Words: Sudden Death, Carcinoma of Breast, Metastasis, Pericardial Effusion

Introduction:

All Forensic work at autopsy table does not deal always with medico -legal causes of death. Many of these deaths are due to sudden unexpected death following natural diseases. These sudden deaths not only make forensic pathologists aware of the course of natural diseases but also they give clue to the Forensic Pathologists in certain cases where criminal involvement might be wrongly suspected. Cardiovascular diseases accounts for vast majority of cases and certain neoplasm may also present as sudden death. Malignancy of breast is one of the commonest malignancies in females and often it presents late with metastasis to the underlying organs.

Brief History:

This case was referred to us from Garchuk Police station of Assam on 11th September, 2009. A female dead body was found dead in the inter -state bus terminus, Guwahati and was brought to the FSM Dept. of Gauhati Medical College for autopsy on 11th September, 2009 at 12 pm (noon). She suddenly became unconscious while she was waiting for the bus at the inter state bus terminus on 10th September, 2009 at about 4.30pm and was found dead.

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External Examination:

- A female dead body of thin built, age about 35 - 37 years, light brown complexion, black long hair and was wearing ear ring and bangles on the forearms, yellow blouse and white petticoat.
- Nails were pale. Eyes closed and mouth partly opened.
- Rigor mortis present over all the body parts and fully developed.
- Post mortem hypostasis present and fixed on the back of the body.
- All natural orifices were healthy and intact.
- No sign of any external injury mark on the body.
- A hard lump was palpable in the upper outer quadrant of left breast, No lymph nodes palpable on the body. Other breast appeared normal on inspection and palpation.

Internal Examination:

- On dissection a hard lump of (size 4cm x 3cm x 1.5 cm) found in the upper outer quadrant of left breast attached with fatty tissue (picture1).
- Pericardial cavity appeared bulged out and contained yellowish discolored fluid of 350 ml. Heart- Right ventricular surface was coarse. Cavity contained 150ml of liquid and clotted blood.
- Lungs- Surfaces of both lungs showed nodularity of varied sizes (picture 2). Left lung showed adhesion at places
- Brain- Pale and no gross abnormality detected.
- Liver- No abnormality on gross examination
- Gall bladder- Distended. On dissecting the gall bladder, only bile comes out.
- No calculi or mass.

- Stomach cavity was empty.
- Uterus- Healthy and empty.
- Other organs were pale and no other abnormality detected.

Histo-pathological Examination:

Sections of heart, lungs, brain tissue and whole breast lump were sent to the Pathology Dept. of Gauhati Medical College, preserved in 10% formalin for Histopathology examination. The Histopathology examination reports showed Infiltrating duct carcinoma found in the breast lump (picture 3 and 4). The malignant cells have round or ovoid vacuolated nuclei with prominent nucleoli. Metastasis was found in three organs, namely- lungs (picture5), brain (picture6) and heart (picture7).

Cause of death: Death was due to syncope as a result of cardiac tamponade due to pericardial effusion following metastasis from carcinoma of breast.

Discussion:

Death is said to be sudden or unexpected when a person not known to have been suffering from any dangerous disease, injury or poisoning is found dead or dies within 24 hours after onset of terminal illness (WHO). [5] The incidence is approximately 10% of all deaths. [5]

Causes of Sudden Death: [3] [5]

A. Cardiovascular:

- Coronary Artery Disease and Occlusion.
- Valvular Heart Disease esp. Aortic Stenosis.
- Rupture of an Aortic Aneurysm
- Acute Pericarditis
- Congenital Heart Disease
- Cardiac Tamponade

B. Respiratory:

- Pneumonia
- Haemoptysis from T.B. or Bronchiectasis
- Inhalation of a Foreign Body
- Trauma
- Spontaneous Pneumothorax
- Neoplasm etc

C. Abdominal:

- Perforated Ulcers of Stomach, Intestines
- Trauma to Liver or Spleen
- Ruptured Ectopic Pregnancy
- Acute Haemorrhagic Pancreatitis
- Malignancy etc.

D. Nervous:

- Cerebral Hemorrhage
- Sub Arachnoid Hemorrhage
- Pontine Hemorrhage
- Epilepsy
- Malignancy etc.

E. Miscellaneous:

- Haemorrhage

- Acute Infection
- Adrenal Insufficiency
- Trauma etc.

Incidence:

Carcinoma breast is a very common malignancy amongst females and leading cause of carcinoma death in females. [4] Invasive carcinoma accounts for about 90% of all breast cancer. [1] Approximately 30% of ca breast have metastatic implants in the regional axillary lymph nodes, where they are usually first diagnosed and another 10% have distant metastatic disease and 50% of the lumps are located in upper quadrant of breast. [4]

Pericardial Effusion and Cardiac Tamponade:

The accumulation of fluid in the pericardium in a quantity sufficient to cause serious obstruction to the inflow of blood to the ventricles results in cardiac tamponade. [6, 7]

Three principal features of cardiac tamponade are: elevation of intracardiac pressure, limitation of ventricular filling and reduction of cardiac output. [6] The quantity of fluid produce this critical state may be as small as 200ml when the fluid develops rapidly or more than 2000ml in slowly developing effusions when the pericardium has had the opportunity to stretch and adapt to an increasing volume. [6, 7] The volume of fluid required to produce tamponade also varies directly with the thickness of the ventricular myocardium and inversely with the thickness of parietal pericardium. [6]

If pericardial effusion develops, in a short span of time may lead to cardiac tamponade which might be fatal. Three most common causes are- **neoplastic diseases, idiopathic pericarditis and secondary to renal failure.** [6]

Distant Metastasis: [8]

Malignancy to heart is mostly due to secondaries rather than primary. The most common tumours metastasizing to heart are carcinoma of the lungs and breast, melanomas, lymphoma, leukaemia carcinoma of liver and colon. Brain and lungs are also commonly involved by secondaries from breast.

Conclusion:

Sudden death raises many issues. The importance of autopsy lies here in the fact that it alleviates the doubts in the minds of the relatives of the deceased and relieves the law of the burden of unnecessary investigations. Moreover, role of pathology in Forensic Medicine in such cases is inevitable in establishing the cause of death.

Acknowledgements:

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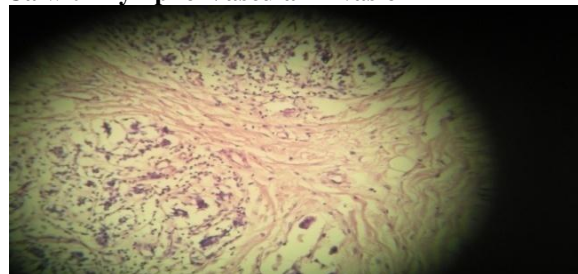
Picture 1: Lump of the breast



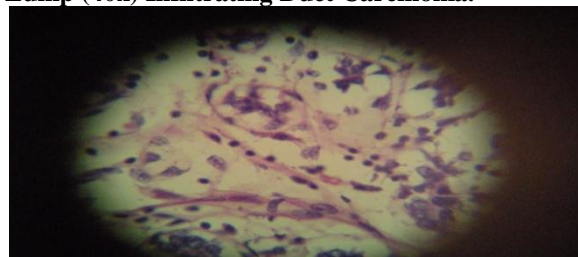
Picture 2: Secondaries in Lungs



Picture 3: Microscopic Appearance of Breast Lump (10x) Shows Presence of Infiltrating Duct Ca with Lympho-Vascular Invasion



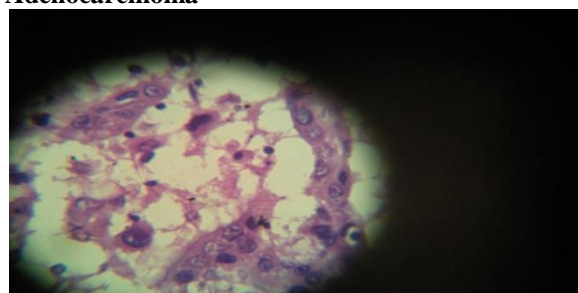
Picture 4: Microscopic Appearance of Breast Lump (40x) Infiltrating Duct Carcinoma.



Picture 5: Microscopic Appearance of Lung Tissue shows Features of Metastatic Adenocarcinoma.



Picture 6: Microscopic Appearance (40x) of Brain Tissue shows Features of Metastatic Adenocarcinoma



Picture 7: Microscopic appearance (40 xs) of heart tissue shows Metastatic adenocarcinoma

Case report

Death due to Ruptured Ectopic Pregnancy Natural Death or Negligence?

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Abstract

A young adult female of low socio-economic status, and a labourer by profession, was brought dead to the Government Medical College & hospital, Chandigarh. History provided by her husband revealed that she had pain abdomen for the last five days for which she was getting treatment from a private practitioner. She had been prescribed NSAIDs and antispasmodics for the same. However, she was not investigated upon and no attempt was made by the practitioner to arrive at any diagnosis. The autopsy was conducted on the next day and at autopsy, about two-and-a-half liters of blood was present in the abdomen and pelvic cavity. Careful internal examination revealed a ruptured ectopic pregnancy as the source of bleeding. The case is discussed with regard to establishing whether the death could have been natural, due to the negligence of the treating doctor or due to contributory negligence. However, even in cases of contributory negligence, the “last chance doctrine” may not save the physician.

Key Words: Ectopic Pregnancy, Ruptured Ectopic Pregnancy, Pain Abdomen, NSAIDS, Negligence, Contributory Negligence

Introduction:

Ectopic pregnancy occurs when a fertilized egg implants outside of the uterine cavity. One out of every 100 pregnancies is ectopic with the most common site being within a fallopian tube. [1]

More rarely an embryo may implant within an ovary, in the cervix, or on the abdominal wall or caesarian scar. Although the fertilized egg is not cradled within the uterus, the embryo continues to grow and expand. Without treatment, the fallopian tube can rupture and can cause serious problems and sometimes death, as in this case. The most common risk factors for ectopic pregnancy are pelvic inflammatory disease (PID), misshapen tubes, endometriosis, surgery on a tube such as tubal ligation done to prevent pregnancy, adhesions from prior surgery, history of infertility, an earlier ectopic pregnancy, an intrauterine device (IUD), a pelvic mass like a fibroid, increasing age, smoking, etc. [1-4]

Clinicians should consider the diagnosis of ectopic pregnancy in any woman in the child-bearing age with history of secondary amenorrhea and who has abdominal or pelvic pain, vaginal bleeding, or both.[5] Only 50% of patients present with the classic clinical triad of ectopic pregnancy i.e., pain, amenorrhea, and vaginal bleeding.[6] Other symptoms common to early pregnancy like nausea, breast fullness, fatigue, low abdominal pain, heavy cramping, shoulder pain, and recent dyspareunia may also be present. A high index of suspicion in patients presenting with the above symptoms and with physical findings of pelvic irritation or tenderness, an enlarged uterus or an adnexal mass helps the clinician in considering the diagnosis of a ruptured ectopic pregnancy.

Fortunately, using modern diagnostic techniques, most ectopic pregnancies can be diagnosed prior to rupturing.

Case:

Dead body of a 25-year-old woman of low socio-economic status, and a labourer by profession, was brought to the hospital mortuary for post mortem examination. History, as per the police and her husband revealed that she had pain abdomen for the last 5 days for which she was taking treatment from a local private practitioner. She was prescribed pain killers along with antacids, apparently without any investigations. Her condition worsened on the fourth day, when she reported to the same doctor. This time, she was given another pain killer along with Tab Buscopan™ (antispasmodic) (German Remedies, India) and was advised strict bed rest. She was,

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however neither investigated nor advised admission. On the very next day the condition deteriorated significantly, the lady became unconscious and then the same treating doctor was called who, after examining her advised the husband to shift the patient immediately to the GMCH hospital. She was declared brought dead to the emergency. The body was shifted to the mortuary and the postmortem examination was conducted the next day.

Autopsy Findings:

The body was that of a young adult female, rigor mortis was present all over and faint post mortem staining was present and fixed over back. Eyes were closed, corneas were hazy, conjunctiva pale and generalized pallor was present over the body. There were no signs of decomposition. No injuries were present on the body on external examination.

Internal examination showed presence of about 2.5 liters of blood in the abdomen and pelvic cavity. On careful internal examination, a ruptured ectopic pregnancy of size 1 cm × 1 cm was found on the left fallopian tube at its isthmus. The ectopic had eroded the uterine artery. The uterine cavity was empty with slightly thickened walls, and corpus luteum was present in the left ovary. All other internal organs were pale. Histopathology of the fallopian tube and the mass confirmed the presence of products of conception.

Discussion:

Ectopic pregnancy occurs when a fertilized egg implants outside of the uterine cavity. One out of every 100 pregnancies is ectopic with the most common site being within a fallopian tube. [1]

More rarely an embryo may implant in the cervix, on an ovary, on the spleen or liver, in the cul-de-sac, on the abdominal wall or within the broad ligament. [7] Although the fertilized egg is not cradled within the uterus, the embryo continues to grow and expand. Without treatment, the fallopian tube can rupture and can cause serious problems and sometimes death, as was in this case. The most common risk factors for ectopic pregnancy are pelvic inflammatory disease (PID), misshapen tubes, endometriosis, surgery on a tube such as tubal ligation done to prevent pregnancy, adhesions from prior surgery, history of infertility, an earlier ectopic pregnancy, an intrauterine device (IUD), a pelvic mass like a fibroid, increasing age, smoking, etc.[1,7-10] The highest rate of ectopic pregnancy occurs in women aged 35-44 years.[11] A three to four-fold increase in the risk for developing an ectopic pregnancy exists in this age group compared to women aged 15-24 years. One proposed explanation involves the myoelectrical activity in the fallopian tube, which is responsible for tubal motility. Ageing

may result in a progressive loss of myoelectrical activity along the fallopian tube. [11]

Clinicians should consider the diagnosis of ectopic pregnancy in any woman in the child-bearing age with history of secondary amenorrhoea and who has abdominal or pelvic pain, vaginal bleeding, or both.[12] Only 50% of patients present with the classic clinical triad of ectopic pregnancy i.e., pain, amenorrhea, and vaginal bleeding.[11] Other symptoms common to early pregnancy like nausea, breast fullness, fatigue, low abdominal pain, heavy cramping, shoulder pain, and recent dyspareunia may also be present. A high index of suspicion in patients presenting with the above symptoms and with physical findings of pelvic irritation or tenderness, an enlarged uterus or an adnexal mass helps the clinician in considering the diagnosis of a ruptured ectopic pregnancy.

However only 40-50% of patients with an ectopic pregnancy present with vaginal bleeding, 50% have a palpable adnexal mass and 75% may have abdominal tenderness. [12] Approximately 20% of patients with ectopic pregnancies are hemodynamically compromised at initial presentation, which is highly suggestive of rupture.[11] Fortunately, because of the modern diagnostic techniques, most ectopic pregnancies can be diagnosed prior to rupturing.

According to a study by Lewis, ectopic pregnancy was one of the most important causes of death in early pregnancy. A significant number of these early pregnancy deaths were in women who were discharged from the primary care setting (either general practice or emergency department) having never had a pregnancy test or misdiagnosed with gastroenteritis.[13] The present case was similar in the sense that it was misdiagnosed as a case of gastroenteritis / gastric complaints.

Approximately 10-15% of tubal ectopic pregnancies resolve spontaneously. [14-16] In the present case, due to irresponsible and careless diagnosis and wrong prescription of drugs, the lady was robbed of her chance of spontaneous cure.

No efforts were made by the doctor in the present case to diagnose or rule out pregnancy; moreover, history was not elicited with regard to amenorrhea, irregular vaginal bleeding, or sexual activity. Treatment was given only on the lines of pain abdomen due to gastrointestinal disturbances, which is the most common mistake done by the treating doctor (either in general practice or in the emergency department). Suspicion of pregnancy and subsequent possibility of a tubal pregnancy could have saved the life of the woman. Any of the following could have been done to rule out pregnancy – simple urine pregnancy test, serum pregnancy test, pregnancy ultrasound,[17-21] putting a needle into the abdomen through the posterior

vaginal fornix to tap any leaking blood from a ruptured ectopic pregnancy or laparoscopy.[21-25] Instead, on the patient complaining of worsening of the pain, she was prescribed a stronger pain killer with an antispasmodic which could have, and in this case, must have caused more bleeding from the ruptured ectopic pregnancy, as a result of relaxation of the affected tissues, due to which she passed into shock and expired on the way to hospital. The husband of the deceased never pressed charges of negligence on the doctor, either due to poverty, illiteracy, ignorance or absence of support from the police.

It can also be argued here that the case could fall in the category of contributory negligence on account of the patient not giving the history of pregnancy. This argument may hold water if the knowledge of the patient regarding pregnancy can be proved along with the fact that the doctor had indeed made an attempt to rule out pregnancy before managing the case as one of gastrointestinal disturbance. However, the “last chance doctrine” may not save the physician in such a case.

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Research paper

Issue of Consent for MTP by Orphan, Major and 'Mentally Retarded': A Critical Review

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Abstract

An orphan, mentally retarded woman, above 18 years age, when suffered pregnancy as a result of rape poses a serious challenge before the Chandigarh Administration on the issue of MTP. Law on abortion in India as per the MTP Act, 1971, (Amendment 2002) prohibits MTP without consent, if the woman is above 18 years of age.

Several subject-experts to contend that with the advancement of Medical Science, universal recognition of the Fundamental Rights of the mentally retarded persons, recent theory of mixing them in the main social stream instead of barricading at a secluded place. The legislative transformation has also taken place whereby purposefully and knowingly, the competence to give consent for MTP in the cases of mentally ill pregnant woman on one hand and mentally retarded pregnant woman on the other hand, has now been distinguished.

A critical review of prolife and prochoice support for abortion, statutory provisions in India and abroad, views of Hon'ble Court are discussed in detail. Paper tried to raise the debate for policy makers, higher judiciary and medical fraternity especially dealing with MTP.

Key Words: MTP, Abortion, Mental Age, Physical Age, Capacity to Consent, Mental retardation, Mental Illness

Introduction:

The mentally-challenged rape victim of 18 years had given birth to a baby girl on December 2, 2009. Earlier, on July 17, 2009, the Punjab and Haryana (P & H) High Court had directed the Chandigarh Administration (C.A.) to medically terminate her pregnancy, but the Supreme Court had ruled against the order in an appeal in July, 2009. [1] She was at the Missionaries of Charity, Delhi, till December 1998, and later sent to Chandigarh. In March 2005, she ran away from Missionaries of Charity, Chandigarh. After being traced, she was taken to Nari Niketan where she was alleged rape. On March 13, 2009, she was sent to Ashreya, an orphanage, the victim was understood to be about 16 years of age.

During initial inquiries made by the Medical Social Worker and a Staff Nurse, the girl had not only described rape but also had talked about her menstrual cycle.

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She was capable of identifying people and capable of expressing herself, but in not many words. The victim was responsive enough to feel the agony and anguish of rape. On May 16th 2009 after her complaints for nausea and pain in lower abdomen along with missed period, urine test for pregnancy revealed positive for pregnancy.

The victim was responsive enough to feel the agony and anguish of rape. On May 16th 2009 after her complaints for nausea and pain in lower abdomen along with missed period, urine test for pregnancy revealed positive for pregnancy.

Brief Facts of the case:

The authorities of the Government Medical College & Hospital (GMCH), Chandigarh were immediately informed, a Medical Board comprising two Gynaecologists and a Radiologist was constituted on 18th May, 2009, who, on clinical examination of the victim, found out that she was 8-10 weeks' pregnant. The pregnancy was re-confirmed by the Radiologist on the basis of the ultrasound examination done and as per the report; the pregnancy was of 9 weeks 1 day +- 3 days of Gestation. Due to the increasing abdominal pain, the victim was admitted to the Gynae Ward of the Hospital and thereafter, an ossification test is said to have been conducted on 20th May, 2009, which set her bone age to be between 19-20 years.

A case of rape and criminal conspiracy has been registered by the police under Sections 376 and 120-B of the IPC; vide FIR No.155 of May 18th 2009. [2, 3]

The Director-Principal, GMCH, Chandigarh constitute a three Member Medical Board on 25th May, 2009, headed by the Chairperson of the Department of Psychiatry (Assistant Professor, Department of Psychiatry, Clinical Psychologist and a Special Educator) to evaluate the mental status of the victim. Board opined her in the category of “mild mental retardation”. On 26th May, 2009, another four Member Multi-Disciplinary Medical Board (a Gynaecologist, a Radiologist, a Paediatrician and a Psychiatrist) was constituted “to submit their considered opinion as to the consequences of continuation of pregnancy and the capability of the victim to cope with the same”. [4] [Para 26]

On 27th May, 2009 after considering all the relevant points, the board was of the opinion that she will not be able to cope with the continuation of pregnancy which in this case is detrimental for her and the child's health, and so recommended MTP. In the victim's case, records available with the C.A. say neither her parents, nor her relatives are traceable.

State as a Guardian of Mentally Retarded to give Consent for MTP:

The Act, 1995, [5] enacted to give effect to the proclamation on the Full Participation and Equality of the People with Disabilities in the Asian and Pacific Region. The objects of the Act are:

- To spell out the responsibility of the State towards the prevention of disabilities, protection of rights, provision of medical care, education, training, employment and rehabilitation of the persons with disability
- To create barrier free environment
- to remove any discrimination against them in the sharing of development benefits
- To ensure that the persons with disabilities are not exploited
- To make special provisions for their integration into the social main stream.

Section 2[i], [q], [r] defines ‘disability’, ‘mental illness’ and ‘mental retardation’. [4] [Para 4]

Another recent progressive legislation of the 1999 Act[R] meant to provide for the constitution of a National level body for the Welfare of the persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities and for matters connected or incidental thereto. Section 2[g], [j], and [m] defines ‘mental retardation’, ‘person with disability’, and ‘registered organization’. [4][Para 5]

Sections 13 and 14 of the Act, 1999 [6] provide for the constitution of the Local Level Committees and the procedure for appointment of guardianship of the disabled persons. [4] [Para 6]

The C.A. could have possibly resolved the issue[s] raised herein through its own administrative mechanism under the 1999 Act, namely, by approaching the Local Level Committee, who is

competent to appoint a guardian of the person with disability and who [the guardian so appointed], in turn, can act in the best interests of the disabled person, including giving consent for medical termination of the pregnancy in accordance with the provisions of the 1971 Act. [4] [Para 8]

The C.A. instead opted for approached the P & H High Court to issue appropriate directions as, the Administration was unwilling to become a Judge in its own cause.[4] [Para 8]

Having regard to the fact that *prima facie sensitive issues* involving the rights of a mentally retarded woman subjected to rape and resulting in an unwanted pregnancy as well as the highly debatable issues relating to interpretation of the Statutes relevant to the situation have arisen for consideration, the Court, therefore, vide an order dated **30th May, 2009** requested AG, P& H High Court to provide assistance and also appointed *amicus-curiae* to assist the Court. [4] [Para 9]

High Court's Directions for MTP and ensuring best medical services to the Victim:

The P & H High Court on June 9th 2009 [4] had, explicitly authorised the medical **expert board** to go ahead with the MTP of the victim. **But the body had expressed its hesitance to take a final decision.** The decision to go in for the MTP was arrived during meetings of the medical board constituted for this purpose.

The Authorities of the GMCH are directed **to ensure best of the post-operational medical services to the victim.** We further direct that, in such an eventuality, the **foetus shall be preserved for the DNA and other scientific tests, especially for the purposes of the criminal case pending investigation.**

Sub-sections 4(a) & (b) barred the termination of pregnancy of a woman below 18 years of age, or a mentally-ill woman, except with the written consent of her guardian and ruled out abortion, except with the consent of a pregnant woman respectively.

It is the **end of the road to motherhood for the mentally challenged.** The P & H High Court further on July 17, 2009 [4] directed the Chandigarh Administration **“to act promptly and forthwith medically terminate the pregnancy of the victim”** which is over 18th weeks.

Views of Supreme Court of India:

The mentally challenged girl, with 19th week's pregnancy with the help of an NGO and a public spirited advocate, moved the SC in July 2009 seeking protection of the unborn child with a delicate question to be answered by the Apex Court. The C.A. argued that even normal mothers found it difficult to raise a mentally retarded child. The attempt was to

magnify the future trouble that the victim would face if the case was decided on the basis of emotion.

For the victim, advocate argued that the victim had no one in the world as her blood relative. Both arguments sounded cogent. And the SC appeared to be swinging from one view to the other when the contrast arguments were advanced, liberally sprinkled with emotion. But, at the end it chose life and said, “Nature will take care.” [1]

Discussion:

What was unique in this case?

- She was major i.e. above 18 years of age (19-20 years)
- She was mentally retarded with mental age of 7-9 years
- She has no guardian or relatives
- She had valid ground for MTP
- She was willing to continue the pregnancy
- She has no resources to rear her would be offspring and earn livelihood
- Continuation of pregnancy does not pose any threat to her life and health
- Legal authorities were not willing to give consent on her behalf
- No threat to child to be born with physical or mental handicapped

Questions for consideration before the Court:

- Whether the pregnancy of the victim is liable to be terminated?
- Whether or not the continuance of the pregnancy of a mentally retarded major pregnant woman involves risk to her life or can cause grave injury to her physical or mental health?
- Should the consent of the victim be considered mandatory to terminate her pregnancy or,
- Who shall be the competent person to give consent for such termination?
- Can Chandigarh Administration or Other Government Authorities competent to give consent on her behalf?
- Can High Court, in exercise of its *parens patriae* jurisdiction, assign such consent by issuing appropriate directions?
- Would a surrogate mother take care of the victim's child?
- Would it not be traumatic for the victim to lose her child to a surrogate mother?
- Why could not the court permit her to have her first blood relative?
- Can a mentally challenged woman be denied the right to motherhood?
- Can the courts order abortion without the consent of the mother, which is prohibited under Medical Termination of Pregnancy Act?

Interpretation of the relevant provisions of the MTP Act [7, 8]:

As may be seen, Section 3[1] of the 1971 Act expressly provides that if a pregnancy is terminated in accordance with the provisions of this Act, it shall not constitute an offence under the **Indian Penal Code** [9] or any other law. The 1971 Act, thus, is **an exception to the general penal laws**. Sub-Section [2] of Section 3 authorises the registered medical practitioner[s] to terminate a pregnancy on formation of an opinion in good faith that continuation of the pregnancy would risk the life of the pregnant woman or cause grave injury to her physical or mental health, after taking into account her actual or reasonable foreseeable environment, or if there is a substantial risk that if the child were born it would suffer from such physical or mental abnormalities as to be seriously handicapped.

Explanation 1 is noticeably significant as it provides that if the pregnancy is alleged to have been caused by rape, the anguish caused by such pregnancy shall be presumed to constitute a grave injury to the mental health of the pregnant woman. Sub-Section [4] of Section 3, however, obligates that **the pregnancy can not be terminated except with the consent of the pregnant woman or of her guardian if the pregnant woman has not attained the age of 18 years or is a mentally ill person**.

Section 5 of the Act enables termination of the pregnancy if it is immediately necessary **“to save the life of the pregnant woman”**. On a plain reading of the statute and given the **literal meaning** to its provisions, it can be plausibly inferred that **if the pregnant woman is above 18 years of age, the consent of the guardian would be necessitated only if she is a mentally ill person**. It would necessarily imply that **if the pregnant woman is above 18 years of age and is a mental retardee only, she alone would be competent to accord consent for termination of her pregnancy** as mandated by sub-section [4][b] of Section 3 of the Act. [4] [Para 12, 27]

Since the expression **“mentally ill person”** does not include a person who is in need of treatment by reason of mental retardation, the purposive construction of sub-section [4][a] of Section 3 of the 1971 Act can not be stretched to include **“mentally retarded persons”** also.

Similarly, sub-Section [4] [b] **does not intend to exclude from its ambit the mentally retarded pregnant woman**. We say so for the reason that when the words in a Statute are not ambiguous and are capable of bearing one construction only, the principles of *casus omissus* or *external aid* need not be applied and the provision has to be interpreted as such regardless of its consequences. Any interpretation which may amount to re-writing of the

statute falls outside the jurisdictional scope of this Court.

It further appears to us that the **amendment introduced vide Act No. 64 of 2002 [8]** is a **progressive legislation** based upon universally accepted theory that though mental retardness may be incurable, yet a retardee has a fundamental human right to live and enjoy the main social stream.

Court concluded that “It means that ordinarily a mentally retarded pregnant woman who is more than 18 years of age has a right of self determination regarding continuation or otherwise of her pregnancy”. [4][Para 12]

Prolife supporter’s views against the MTP:

Many prolife supporter advocates including then Advocate General, Haryana argued that in the light of the amended provisions of the 1971 Act, the pregnancy can not be terminated unless, consented by the victim. They questioned the *bona-fide* of the authorities, broadly supported the line of action chosen to oppose MTP. [4][Para 25]

Mentally ill vs. mentally retarded:

Per-contra, Advocate, urged strenuously that there is no ambiguity in the provisions of the 1971 Act, rather the expression “*mentally ill person*” has been added recently by Act of 2002 [8] in substitution of the expression “lunatic” and the legislation was fully conscious and informed of the consequences of excluding mentally retarded persons from the category of ‘mentally ill persons’. [8]

A pointed reference has been made to Section 2[1] of the Mental Health Act, 1987 which too defines “mentally ill person” to mean a person who is in need of treatment by reason of any mental disorder other than mental retardation. [10]

According to the learned *amicus-curiae*, there is **no legislative omission** while excluding the retardees from the category of **mentally ill persons** as **retardation is only a mental condition distinct from mental disease**. He **highlighted the medical opinion** which is suggestive of:

- the victim’s self sustenance;
- her perception and thinking process being normal;
- her orientation to time, place and person;
- her immediate, recent and remote memory being intact and
- the fact that she is adept in activities of daily living

The learned *amicus-curiae* expressed his anguish and rightly so against the manner in which the victim has been treated like a subject. He lambasted the petitioner (C.A.) for seeking termination of the pregnancy for the sake of convenience and not for the reason of necessity.

- Obligation of the State in terms of Articles 39[f] and 46 of the Constitution as well as the commitment to the UN declaration on Human Rights
- In no uncertain terms, the consent of the victim shall be a condition precedent before medical termination of her pregnancy
- the mentally retarded person has, to the maximum degree of feasibility, the same rights as other human beings

Consent for MTP by mentally ill / mentally retarded global scenario:

Debate on this issue was relied upon the Mental Capacity Act, 2005 of UK and the views of several subject-experts, advancement of Medical Science, universal recognition of the Fundamental Rights of the mentally retarded persons, recent theory of mixing them in the main social stream instead of barricading at a secluded place. The legislative transformation on the issue of consent has also taken place whereby purposefully and knowingly, the non-competence to give consent for medical termination of a pregnancy in the cases of mentally ill pregnant woman on one hand and competence of major mentally retarded pregnant woman on the other hand, has now been distinguished. [Para 21] [4]

A judgment of the **Canadian Supreme Court**[11] and two judgments of the U.S. Appeal’s Courts [12, 13] were also relied upon, where **the Courts declined consent for medical termination of pregnancy in somewhat similar circumstances**. [Para 22][4]

Human Rights Principles for mentally ill: [14]

Emphasis has also been laid on **25 principles** adopted by the **General Assembly of the United Nations** for the protection of persons with **mental illness and for improvement of mental healthcare**, with a special reference to the following clauses: [4] [Para 17]

“Principal 1: Fundamental freedoms and basic rights:

6 Any decision that, by reason of his or her mental illness, a person lacks legal capacity, and any decision that, in consequence of such incapacity, a personal representative shall be appointed, shall be made only after a fair hearing by an independent and impartial tribunal established by domestic law. The person whose capacity is at issue shall be entitled to be represented by a counsel. If the person whose capacity is at issue does not himself or she secures such representation, it shall be made available without payment by that person to the extent that he or she does not have sufficient means to pay for it. The counsel shall not in the same proceedings represent a mental health facility or its personnel and

shall not also represent a member of the family of the person whose capacity is at issue unless the tribunal is satisfied that there is no conflict of interest. Decisions regarding capacity and the need for a personal representative shall be reviewed at reasonable intervals prescribed by domestic law. The person whose capacity is at issue, his or her personal representative, if any, and any other interested person shall have the right to appeal a higher court against any such decision”.

Principal 11: Consent to treatment:

1. No treatment shall be given to a patient without his or her **informed consent**, except as provided for in paragraphs 6, 7, 8, 13 and 15 of the present principle.

‘Informed Consent’:

2. Informed consent is consent obtained freely, without threats or improper inducements, after appropriate disclosure to the patient of adequate and understandable information in a form and language understood by the patient on:
 - a. the diagnostic assessment;
 - b. The purpose, method, likely duration and expected benefit of the proposed treatment;
 - c. Alternative modes of treatment, including those less intrusive;
 - d. Possible pain or discomfort, risks and side-effects of the proposed treatment.

When treatment may be given without the Informed Consent?

8. Except as provided in paragraphs 12, 13 and 15 of the present principle, treatment may also be given to any patient without the patient’s informed consent if a qualified mental health practitioner authorised by law determines that it is urgently necessary in order to prevent immediate or imminent harm to the patient or to other persons.

Mentally retardee vs. mentally ill and Unsoundness of mind and consent:

It was urged that there is an **inherent fallacy** in understanding Section 3 of the 1971 Act to construe that howsoever severe may the **degree of mental retardation** be, the **consent of the retardee alone would be required**, whereas in the case of **mental illness**, howsoever mild it may be, that the **consent can be accorded by a guardian only**.

“Consent” given by unsound mind person has no legal sanctity?

5th description of **Section 375** read with **Sections 90 and 92, IPC** [9] was referred to impress upon that the **“consent”** given by a person suffering from **unsoundness of mind** has no legal sanctity. It was urged that the **expression “unsound mind”** includes **“mental retardation”** for the purposes of

Section 375 IPC as ruled by the **Supreme Court** [15] in the following passage:

“The plea of consent is too shallow to even need detailed analysis or consideration. A mentally challenged girl can not legally give a consent which would necessarily involve understanding of the effect of such consent. It has to be a conscious and voluntary act. There is a gulf of difference between consent and submission. Even consent involves a submission but the converse does not follow and mere act of submission does not involve consent. An act of helpless resignation in the face of inevitable compulsion, quiescence, non-resistance or passive giving-in when the faculty is either clouded by fear or vitiated by duress or impaired due to mental retardation or deficiency can not be considered to be consent as understood in law. For constituting consent, there must be exercise of intelligence based on the knowledge of the significance and the moral effect of the act. A girl whose mental faculties are undeveloped, can not be said in law, to have suffered sexual intercourse with consent”. [Emphasis applied]

Advocate then referred to Order 32 Rule 15 CPC to canvass that a person of unsound mind can sue or be sued only through his next friend or a guardian to be appointed by the Court. [4]

Freedom of consent:

The Courts can not be oblivious of the fact that ours is a country inflicted with imbalanced male-female sex-ratio; marred by female foeticide; ashamed of a vast majority of abandoned girls in orphanages; clouded with social evils like dowry; poor literacy rate amongst girls, with alarming increase in dowry deaths and, therefore, the freedom of consent given to a mentally retarded major pregnant woman by virtue of sub-section [4] of Section 3 of the 1971 Act, has to be taken as susceptible and can not be accepted on its face value by a Court while exercising its *parens-patriae* jurisdiction. [Para 31] [4]

Howsoever, laudable the legislative object may be, the **realities of life including the fact** that the **“consent”** of a person with best of prudence, can be secured by dubious means of undue influence, fraud, misrepresentation etc. etc., we **decline to accept the omnibus interpretation** of sub-section [4] of Section 3 of the 1971 Act that **in the case of a mentally retarded major pregnant woman, the medical termination of her pregnancy shall always depend upon her own decision**. [Para 31] [4]

Court added that “We also hasten to add that the 1971 Act as amended by the Act No. 64 of 2002, **fails to take notice of the fact that:**

- In majority of the eventualities to seek consent of a mentally retarded major pregnant woman for medical termination of her pregnancy might be

of those who have been orphans and have no identified relative to act as their natural guardian.

- Could they also be placed at the same pedestal and at par with those who are under the direct care, control and guardianship of their parents, kith and kin etc. – is a question to be examined by the Law Makers and not to be commented on by us”. [Para 33] [4]

Relying upon two Division Bench judgments [16] and a judgment of the Supreme Court [17] it was urged that even a court decree against a *lunatic* without the appointment of a guardian is a nullity. [Para 14] [4]

Literature in favour:

Court after **in-depth study of the case** in hand, gone through **series of books and articles of the world renowned authors:** [18-22]

While **DSM-IV-TR** explains the universally accepted and approved methodology of determining the **degree of mental retardation**, the book **MENTAL RETARDATION** highlights the inherent disabilities suffered by the mental retarded and how the prejudiced misconceptual theory of ‘**disablism**’ is being practiced against them by the non-retardees.

The literature including the opinions and articles relied upon, does suggest that the individuals with the mental retardation have developmental delays in learning and processing information, yet nearly 85% of them are able to live successfully in the community. People with mild mental retardation account for about 85%; they more or less develop normal language abilities and social behaviour during the pre-school years and their learning disability may never be formally identified; most of them can lead their lives independently in ordinary surroundings, though they may need help in coping with family responsibilities, housing and employment or when under unusual stress.[4] [Para 23] They also referred to the research conclusions to show that 90% of mentally retarded infants are born out of non retarded parents, which completely debunks the eugenics myth. [Para 24][4]

Debate for MTP without consent:

A passionate reference to the medical reports/opinions on record and urged that having regard to the deficiencies in the areas of self-help grooming and socialisation and the fact that she is unable to look after herself and can not fend for herself if left to her own devices, coupled with the IQ level of the victim stated to be that of a nine years old, especially owing to the major spinal surgery undergone by the victim during her childhood and possibility of bony abnormalities to be genetically inherited by the baby, this Constitutional Court should come to the rescue of the victim and invoke its *parens-patriae* jurisdiction by granting permission to terminate the pregnancy, which is otherwise also a

cause of anguish having been caused by a diabolic act of rape. [Para 15] [4]

The Madras High Court Judgments relied:

- The first case is of a detainee who was impregnated while in custody, whereas the second case relates to an 18 years old victim burdened with an unwanted pregnancy caused by rape. [23]
- In the second case, the Bench after referring to the provisions of the 1971 Act and having held that the petitioner was a major woman who was under great distress causing traumatic and psychological shock and grave injury to her mental health due to unwanted pregnancy caused by rape, issued the appropriate directions to conduct medical termination of pregnancy. [24]

Court's Observations:

The Division Bench, P & H High Court, after hearing the arguments on day-to-day basis for over 10 days, asserted that:

- “We have no reason to doubt the continuation of the pregnancy shall constitute a grave injury and may lead to more deterioration in the mental health of the victim.... We find that except her physical ability, the victim is neither intellectually nor on social, personal, financial or family fronts, able to bear and raise a child. We are satisfied with the reports of the experts that the victim is incapable of understanding the concept of motherhood or of pregnancy or pre and post-delivery implications”.
- “The victim, notwithstanding her innocent emotional expressions, is not mentally in a position to bear and raise the child. Asking her to continue with the pregnancy and thereafter raise the child would be a travesty of justice and a permanent addition to her miseries”.
- “The toy with which she wants to play, would want her to invest hugely, which she is incapable of. We also cannot overlook the fact that if allowed to be born, the child’s own life, grooming and future prospects may itself be highly disappointing.”

The Bench further asserted that:

- “There would be no choice, but to keep the child in Ashreya where the victim is living, in the company of other mentally challenged inmates. There shall, thus, be a consistent risk to the innocent life. His mother’s own mental age being seven-eight years, the learning process of the child would be highly inadequate”.
- “The grooming and education of the child would again be at the mercy of the government run/aided institutions whose dismal performance or the severely negligent behavioral attitude towards the inmates has already prompted us to

issue various reformatory directions and to monitor their implementation in future. [25]

‘Judicial bye-pass procedure’:

Some of the books have highlighted the increase in risks to the pregnant woman’s health after the first trimester and how in the developed countries like the USA and Canada also the practice of parental consent has gained importance and the Courts also follow the ‘judicial bye-pass procedure’. [4][Para 16]

The literal interpretation as given above, however, completely falls short of achieving the legislative object of not only the 1971 Act, it may also tinker with the legislative object of the 1999 Act as well as the UN Declaration on the rights of the mentally retarded persons. [4]

We say so for the reason that in the context of termination of pregnancy being a penal offence prior to the 1971 Act came into force and one of the objects of the Act being permitting the termination of pregnancy on humanitarian grounds when it is caused by a sex crime like rape *or intercourse with a lunatic woman* the expression which has been amended by the Act of 2002 only and which prior to such amendment included mentally retarded pregnant woman also, any interpretation should lean towards liberalizing medical termination of pregnancy. [Para 28] [4]

Duty of the Guardian:

We are unhesitatingly of the view that such like cases can not be decided on the solitary strength of interpretation of legal provisions. Besides being vested with plenary and inherent jurisdiction to act as a custodian of the fundamental and human rights of the citizens, a writ Court while exercising *parens-patriae* jurisdiction owes a bounden duty to act in the best interest of the guardee, keeping in view his/her care, protection, health, education, intellectual development, comforts, contentment and congenial environment, along with moral and ethical values, as emphasised by their Lordships of the Supreme Court in Nil Rattan Kundu’s case [26]. [4][Para 29]

Holistic approach in interpreting the 1971, 1995 and 1999 Acts:

While adopting a **holistic approach in interpreting** the 1971 Act, Court had also kept in view the fact that the **1995 Act** though **defines “mental illness”** and **“mental retardation” separately and distinctly**, nevertheless **both have been clubbed together** for the purposes of State’s endeavour **for their education, employment, affirmative actions and non-discrimination**.

Similarly, the **1999 Act** primarily meant to constitute a **National Trust** for the welfare of the persons with disability, has also grouped together persons suffering from **‘mental retardation’** with those suffering from **“multiple disabilities”** under the 1995 Act [which includes mentally ill persons

also]. The 1999 Act has foreseen the necessity of appointment of any person of choice of the **‘person with disability’** to act as his/her guardian and such person may include even a juristic person like a **“registered organization”**. [Para 30] [4]

Different legislative fields of the Acts:

Court was conscious of the fact that the legislative fields of 1995 and 1999 Acts are altogether different and accordingly ruled that they do not have any overlapping with the provisions of the 1971 Act.

Similarity in the three legislations:

- The welfare of the ‘mentally ill’ as well as the ‘mentally retarded’ persons in order to secure their social rehabilitation through legislative means.
- It is in the context of achieving the legislative objects that the 1999 Act visualises the need of appointment of a guardian that may arise even in the case of a ‘mentally retarded person’.

Exclusion of mentally retarded persons is not absolute:

Court further observed that “In our view, the exclusion of mentally retarded persons from the category of mentally ill persons under the 1971 Act is not absolute in the sense that irrespective of the foreseeable environment in which such mentally retarded person is living or the degree and condition of mental retardedness, the Court even while exercising its *parens-patriae* jurisdiction can not appoint a guardian to determine as to whether or not the continuance of the pregnancy of a mentally retarded major pregnant woman involves risk to her life or can cause grave injury to her physical or mental health”. [Para 30] [4]

***Parens-patriae* jurisdiction of Court:**

Court accordingly hold that notwithstanding the plain and literal meaning of Section 3(4) of the MTP Act, 1971, every Court while exercising its *parens-patriae* jurisdiction is competent to act or appoint guardian *ad-litem* of a mentally retarded major pregnant woman for the purpose of deciding the retention or termination of her pregnancy in her best interest, though depending upon the individual facts and circumstances of each case”.

“Such guardian may consult or seek consent of the pregnant woman concerned for the purpose of formation of his final decision as to whether or not the pregnancy be medically terminated”. [Para 34][4]

Summary and Conclusion:

Issue of major, orphan and mentally retarded woman victim of sexual assault leading to pregnancy was discussed and debated not only by the media but also by the scientific community and legal experts in details for the first time in India. Uniqueness of this case was the issue of consent and interpretation of the MTP Act, 1971 with Amendment 2002 and role of

state, and court as a guardian to give consent on behalf of mentally retarded.

Due to issue of human rights involved every body concerned with the case whether government authorities or medical experts or even judiciary was throwing the ball in each others court. Finally, the case land up before the P & H High Court which directed for the MTP without the consent of the victim, after receiving Board of Expert's opinion in this regard. Court was of the considered view that the **many vital issues need** to be answered by an **Expert Body**, who should be free from the administrative control and/or influence of the petitioner, the Chandigarh Administration.

Seeing the technicalities involved P& H High Court observed that "In the light of what has been held above, and **taking into consideration the medical opinion/evidence on record**, which we have no reason whatsoever to doubt or disbelieve, and taking notice of the predicament of the petitioner – State and for the absolute satisfaction of this Court in its capacity as a *parens-patriae*.

Aggrieved by this order victim with the help of a NGO and pubic spirited Advocate challenged the validity of direction for MTP before the Supreme Court of India, which stayed the order of the High Court.

No one can quarrel with the pro-life order of the SC, which way back in 1994 in Dr Jacob vs. State of Kerala had quoted Rig Veda and Mahatma Gandhi to say, "Life is said to be the most sublime creation of God. It is the belief and conception, which lies at the root of the arguments, and forceful at that, by many religious denominations that human beings cannot take away life, as they cannot give life." To be pro-life is prudent. But it would be akin to ostrich approach if one shuts his eyes to the ground reality and relies on nature to take care of problems that pervade humanity and society. [1]

Birth of baby girl in the month of December 2, 2009 poses many challenges before the State, NGO and medical fraternity, legal experts, etc. like what should be the fate of such a baby, who will look after her daily needs, education and social discrimination by the society. Would a surrogate mother take care of the victim's child? Would it not be traumatic for the victim to lose her child to a surrogate mother? There is need to study this case and follow up to find out answers to all these questions to justify the Supreme Court judgment. Main responsibility lies with the State to look after the welfare of the child, but NGO and society as a whole should also come forward to prove respect for humanity in this case and also in such other cases.

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MEDICAL JURISPRUDENCE, TOXICOLOGY & FORENSIC SCIENCE FOR CLASS ROOM, INVESTIGATION & COURT ROOM WITH CASE LAWS

■ BY PROF (Dr.) A.S. DEOSKAR



Book Review

Medicine Jurisprudence, Toxicology, & Forensic Science for Class Room, Investigation & Court Room with Case Laws

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