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



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Journal of Indian Academy of Forensic Medicine (JIAFM)

The official publication of Indian Academy of Forensic Medicine

Editor,

Dr. Mukesh Yadav

Professor & H.O.D.,
Forensic Medicine & Toxicology,
School of Medical Sciences and
Research, Sharda University, Greater
Noida-201306, Uttar Pradesh, INDIA

Residence:

G-216, Parsvanath Edens,
Alfa-II, Greater Noida, G.B. Nagar, U.P. INDIA
Ph. No. 0120-2326060, Cell: 09411480753
Email: drmukesh65@yahoo.co.in

Joint Editor,

Dr. Akash Deep Aggarwal

Assistant Professor,
Department of Forensic Medicine,
Govt. Medical College, Patiala
Punjab, INDIA

Residence:

H.No. 14, Desi Mehmadari,
Patiala-147001, Punjab, INDIA
Cell: 9815652621
Email: toakashdeep@yahoo.co

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Journal of Indian Academy of Forensic Medicine

Volume: 34

Number: 2

April-June 2012

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Print ISSN: 0971-0973. Electronic ISSN: 0974-0848. IndMED www.medind.nic.in/jal/jalm.shtml

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JIAFM

A Quarterly Publication
Volume 34, Number 2, April-June, 2012

I feel immense pleasure to present before you the second issue of 2012. I would like to inform all of you that our esteemed Journal of Indian Academy of Forensic Medicine which is published quarterly since 1991 has been started gaining wide recognition not only in India but globally among the scientific community. I am trying to maintain your faith and trust in me to bring this journal to highest level of its achievements.

I have received many requests from other countries about inclusion of many papers in their indexing data base, including USA Government agencies. JIAFM is indexed not only in **IndMed** and **MedInd Indian indexing** agencies but also in the **SCOPUS**, **IMSEAR** informed by the **Information Management and Dissemination (IMD)**, **World Health Organization, Regional Office for South-East Asia, Indraprastha Estate, New Delhi, India**. It is hoped that once this journal indexed in IMSEAR it would be automatically indexed in the **Global Index Medicus managed by WHO Headquarters in Geneva as informed**.

The title mentioned above has been evaluated for inclusion in **SCOPUS by the Content Selection & Advisory Board (CSAB)**. The review of this title is now complete and the CSAB has advised that the title will be **accepted** for inclusion in Scopus. For your information, the reviewer comments are copied below:

This is a well produced journal in an important subject field with interesting content, which deserves a wide readership. The editors are to be commended on their efforts.

I assure you about the quality of research papers and quality of printing in future issues. Your valuable suggestions are always encouraging me and I heartily welcome for future suggestions.

Professor [Dr.] Mukesh Yadav
Editor, JIAFM

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The journal is indexed with IndMed and made available online by following website:

www.iafmonline.com

www.medind.nic.in

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Editorial

Is Forensic Medicine Gaining Lost Glory in New Curriculum MCI, 2012?

After the declaration of "Vision 2015" document by the BOG/MCI future of Forensic Medicine was in dark. At one point of time due to malafied and ill-conceived ideology of MCI/BOG attempts were made to make Forensic Medicine an optional subject to be taught by Lawyers and other specialty teachers. But awareness, vigilance and fighting instinct of young faculty of Forensic Medicine has started showing its results in the form of New document "**Medical Council of India Regulations on Graduate Medical Education, 2012**" released by MCI/BOG for public opinion.

Although it is not mentioned that up to what time these opinion need to be submitted and to whom, in this utter confusion state responsibility of all the faculty members of Forensic Medicine has been increased to go through the whole document and critically review and come up with constructive comments and suggestion to retain the lost glory of Forensic Medicine in India.

Recently held Workshop on the theme of '**Quality of Forensic Work and need for Audit**' at **AIIMS, New Delhi on 4th May 2012** was a right effort in this direction. Similar efforts at every medical college level are the need of hour.

Ethics has been taken care of in new curriculum, but responsibility of Department of Forensic Medicine has not been defined in this respect especially for "**Professional Development and Ethics**" assigned 35 hours in each year of teaching.

Some of the highlights of New Curriculum are as follows:

3.5. Professional who is committed to excellence, is ethical, responsive and accountable to patients community and the profession

3.5.1 Practice selflessness, integrity, responsibility, accountability and respect.

3.5.2 **Respect and maintain professional boundaries** between patients, colleagues and society.

3.5.3 Demonstrate ability to recognize and manage **ethical and professional conflicts**.

3.5.4 Abide by prescribed **ethical and legal codes of conduct and practice**.

3.5.5 Demonstrate **a commitment to the growth of the medical profession as a whole**

4.3. **Teaching-learning methods shall be student centric** and shall **predominantly include small group learning, interactive teaching methods and case based learning**.

4.7. **The development of ethical values and overall professional growth as integral part of curriculum shall be emphasized through a structured longitudinal and dedicated programme on professional development and ethics.**

4.8. Progress of the medical student shall be documented through **structured periodic assessment** that includes **formative assessment. Logs of skill-based training** shall be also **maintained**.

7.4.2 **Phase 2 (12 months):** will consist of Para-clinical, namely Pathology, Pharmacology, Microbiology, Community Medicine, **Forensic Medicine and Toxicology**, and clinical subjects as detailed below (III MBBS) ensuring both horizontal and vertical integration.

a. The clinical exposure to students will be in the form of student doctor method of clinical training. The emphasis will be on primary, preventive and comprehensive health care. A part of training during clinical postings should take place at the primary level of health care. It is desirable to provide learning experiences in secondary health care, wherever possible. This will involve:

- i. Experience in recognizing and managing common problems seen in outpatient, inpatient and emergency settings.
- ii. Involvement in patient care as a team member.
- iii. Involvement in patient management and performance of basic procedures.

7.4.3 Phase 3 (28 months)

a. **Part 1 (13 months):** The clinical subjects include Oto-rhinolaryngology, Ophthalmology, Community Medicine and **Forensic Medicine and Toxicology**.

b. 7.5. Didactic lectures shall not exceed one third of the schedule; two third of the schedule shall include interactive, practical, clinical or/and group discussions. The learning process should include living experiences, problem oriented approach, case studies and community health care activities. The teaching roster should be carefully prepared by each institution so as to give adequate and justified time for students to learn as well as prepare for their assessments.

c. 7.6. Universities shall organize admission timing and admission process in such a way that teaching in the first Professional year commences with induction through the Foundation Course by the **1st of August each year**.

7.7. Supplementary examinations shall be conducted not earlier than 60 days and not later than 90 days after the declaration of results, so that the students who pass can join the main batch and the students who fail, will appear in the subsequent year.

8.8. 25% of allotted time of Phase 3 shall be utilized for integrated learning with pre- and para-clinical subjects. This will be included in the assessment of clinical subjects.

Table showing distribution of teaching learning hours for #FMT & *PDE					
Subjects	Lectures (hours)	***Small group learning	Clinical Postings (hours)	Self-Directed Learning (hours)	Total (hours)
Table 4: Phase II teaching hours					
*PDE	35	0	-	0	35
Table 5: Phase II teaching hours					
FMT	15	30	-	5	50
*PDE	35	0	-	35	35
Table 6: Phase III Part 1 teaching hours					
#FMT	25	45	-	5	75
Total #FMT					125
*PDE	-	-	-	-	25
***Casualty			***2 weeks		2 Weeks
Table 7: Phase III Part 2 teaching hours					
*PDE					43
		**435			*138
*Professional Development including Ethics shall be a longitudinal teaching program **25% of allotted time of Phase 3 (435 Hrs) shall be utilized for integrated learning with Pre- and Para- clinical subjects. This will be included in the assessment of clinical subjects. ***Casualty posting shall be under supervision of Department of Forensic Medicine for medico-legal (Clinical Forensic Medicine) training (as per the recommendations of Survey Committee Report, 1964 and Court orders in this regard) *** (Tutorials/Seminars) /Integrated-learning (hours) # Forensic Medicine & Toxicology (FMT) Source: Compiled from Medical Council of India Regulations on Graduate Medical Education 2012 document released by BOG/MCI					

10.6. Phase III Part 1

10.6.1. Forensic Medicine and Toxicology

a. **Competencies:** The student must demonstrate:

- Understanding of medico-legal responsibilities of physicians in primary and secondary care settings,
- Understanding of the rational approach to the investigation of crime, based on scientific and legal principles,
- Ability to manage medical and legal issues in cases of poisoning / overdose
- Understanding the medico-legal framework of medical practice and medical negligence,
- Understanding of codes of conduct and medical ethics.

b. **Integration:** The teaching should be aligned and integrated horizontally and vertically recognizing the importance of medico-legal, ethical and toxicological issues as they relate to the practice of medicine

Integration:

10.7.6. Surgery

a. **Competencies:** The undergraduate student must demonstrate:

- Ability to administer informed consent and counsel patient prior to surgical procedures

10.7.10. Obstetrics and Gynaecology

a. **Competency in Obstetrics:** The student must demonstrate ability to:

- Apply medico-legal principles as they apply to tubectomy, Medical Termination of Pregnancy (MTP) and Pre-conception and Prenatal Diagnostic Techniques (PC PNDT Act).

11.3.7. University Examinations shall be held as under:

c. Third Professional

- Part 1 shall be held at end of Phase 3 (Part 1) of training (13 months) in the subjects of Ophthalmology, Oto-rhino-laryngology, Community Medicine and Forensic Medicine and Toxicology

Questions Still Needs Answers:

- Who will be held responsible for implementing PDE?
- Which departments?
- At least one department (preferably Forensic Medicine) should be given responsibility
- What should be the contents of PDE?
- Which Department will do orientation?

- f. Teaching hours in Anatomy and Physiology and faculty strength?
- g. Early clinical exposure? Who will be doing it (dept.)
- h. Small group (no. of students) not defined
- i. Self directed learning (how enforced?)

There is need for Correlation between Marks and teaching Hours:

- In Forensic why only one Paper of 100 Marks (100 Marks for Theory Paper and 100 Marks for Practical)?
- No mention of Internal Assessment Marks?
- Marks will not be added to the main examination?
- It will be against the standard adopted by the Universities throughout India
- No mention found about maintenance of Internal Assessment Records which is not good for maintaining uniformity and keeping in mind the scenario of private medical colleges.
- How to maintain day to day record?
- Marks are not defined?
- No provision has been made for periodic review of curriculum at least at one or two years interval
- Integration in FMT:

Examinations:

1. What are the minimum numbers of students examined in a day?
2. What are the minimum numbers of day examination to be conducted?
3. Who will be the coordinator of examination?
4. How External will coordinate and when?
5. Can non-medical teachers be appointed examiners?
6. Why non-medical teachers with less experience of (five years) can be appointed as examiner and why Medical Teacher with eight years experience? What is the justification for discrimination?
7. Whether same set of external examiners will conduct the supplementary examination or different external examiners to be appointed?
8. Is there need for special permission from MCI/ University?
9. What is the meaning and scope of term 'Small Group' for teaching and learning?
10. Provision of grace marks needs clarification whether in one professional examination or in all the four examinations (Reference Court case)
11. No date mentioned for asking of public opinion?
12. Non-inclusion of Internal Assessment marks in main examination needs to be debated vigorously and opinion of both teaching and student community required for impact of new provision
13. What is the penalty for violations and who will take action?

Advisory to BOG/MCI:

Clear instructions should be given to the Deans /Principals to hold debate in each medical college and asking for feedback from all the specialties and students in a time bound manner. In this way wider opinion can be obtained which helps to improve the quality of medical education and uniformity of standards (Objective of MCI Act, 1956). This exercise will also help in finding the difficulties in implementing of new curriculum proposed by MCI/BOG.

Dr. Mukesh Yadav
Editor

Excerpts from Presidential Address XXXIII Annual National Conference of I. A. F. M. Raipur (Chattisgarh)

In last (32nd) conference at Nellore in 2011, emphasis was given on the need of modernization of Medico-legal Institutes and Forensic Medicine Departments along with development of proper infrastructure. In spite of the facts that the Departments of Forensic Medicine and Medico-legal Institutes deal with dead and work in horrible conditions, do so called “dirty work” and suffer from deficiencies and basic facilities, at the same time they have to do highly responsible work related with criminal justice delivery and administration that too under pressure of various types. The services of this subject are required by all sections of society but the authorities have not paid due attention towards its development to attract the specialists, experts and students to make career in this field.

Dear friends, our specialty is passing through a tough time. Previous Board of Governors (BOG) of Medical Council of India had left us nowhere. Some years ago Medical Council of India (MCI) formulated the staff pattern for medical colleges and made it mandatory (for recognition of both Government and Private medical colleges). This mandatory requirement of medical teachers in Forensic Medicine reflected the non availability of postgraduates in this subject. That was the time when Forensic Medicine attracted a good number of students to opt for post graduate degree. But this golden opportunity could not stay for long and the elected body of MCI was dissolved and superseded by the Government of India appointed BOG. In this BOG no faculty member from Forensic Medicine was included. The past BOG prepared a detailed document regarding restructuring the under graduate medical education and placed it on the web site of MCI. This document was called “Vision 2015”. In this document Forensic Medicine was fragmented in multiple pieces, which can be taught by gynaecologists, surgeons, pharmacologists, and lawyers in such a way that no teacher of Forensic Medicine is required in the department. This resulted in removal of Forensic Medicine teachers from medical colleges bringing us back to past conditions.

If we do not have qualified teachers in Forensic Medicine how can one impart quality education to under-graduate and post graduate in this subject. The IAFM approached the BOG many times and submitted detailed representations regarding restructuring the Forensic Medicine for better teaching and medico-legal work performance in this field. In some of the States our members have also knocked the door of Courts to seek some favorable direction. Though the past BOG promised to consider our demand but nothing has been notified. Central Medico-legal Advisory Committee recommended long back in 1957 to appoint a Survey Committee on Medico-legal Practices in India. This Committee submitted its report in 1964 and made recommendations for development of infrastructure, creation of separate cadre of Medico-legal Officers at district level, to give incentives and facilities to attract doctors to make career in Forensic Medicine and to do so called dirty work which no doctor is willing to do it with pleasure in the present circumstances. But, in the last 45 years or more nothing concrete has been done by the Central as well as by the State Governments and the situation is almost the same as before.

There is an urgent need of a uniform Medico-legal Code in the country and also that the medico-legal services be made more lucrative by way of providing honorarium, incentives, free accommodation, telephone, transportation facilities along with other amenities to attract medical graduates to take up this specialty of Forensic Medicine.

The government must realize that Medico-legal services are a matter of the State and it is the duty of State to give free and fair justice through proper set-ups to deliver these services. Medico-legal services in the State are an integral part of Criminal Justice Administration System and it cannot be taken lightly. The States should realize need for strengthening this specialty of medical science to meet the challenges imposed by the criminals and its utility in fair administration of justice.

It is very unfortunate that most of the Medico-legal work is done by M.B.B.S. doctors which are of very poor in quality. Even in the eyes of law M.B.B.S. doctors are considered as expert in medico-legal cases while it is not true in relation to other branches of Medical Sciences. The need of society today is to have the medico-legal services from expert like other branches of medical sciences.

In 2011, looking to the low standard of Medico-legal services including medico-legal reports and post mortem reports, the Government of India constituted an Expert Committee under Chairmanship of Prof. Madhav Menon, Former Director of National Judicial Academy Bhopal, to draft a Bill on Forensic Science Services in the country with objective of improving quality, timeliness and credibility of Forensic Services

in Criminal Justice Delivery System. This Committee was to decide the ways and methods to improve Forensic Pathology. Many eminent Forensic Medicine Experts of the country were invited to attend the meeting which was held on 22nd January 2011 in New Delhi. A brain storming session was convened to prepare a Status Report of medico-legal services and need of country's program. This status report was supposed to include the:

1. Number and types of Medico-legal cases being taken up in the country
2. Number of Medico legal centers required in the country
3. The requirement at the district level
4. The model of organization structure, infra structure and facilities, etc
5. Establishment of Medico legal centers at the district level
6. Legalities of entrusting postmortem work to private medical colleges
7. Co-ordination between Forensic Medicine Expert and investigating agencies
8. Qualifications and competence of staff
9. Budget requirement
10. Penalty in case of undue delays
11. Need for integration of Forensic Medicine with Forensic Science for drafting a effective Bill
12. Taking Forensic Medicine out of the ambit of Ministry of Health and place it under the Department of Justice. There should however be co-ordination between the two Ministries for effective training of doctors in clinical, toxicological and pathological, medico-legal work at the undergraduate and postgraduate levels.

Recently I have come to know that in place of **Bill on Forensic Science Services**; a separate Bill in the Name of "**Forensic Regulatory and Development Authority of India Bill, 2011**" is in the process of enactment. In this Bill Forensic Medicine and Toxicology has been included along with other branches of Forensic Science, criminalities and other allied disciplines like Forensic Anthropology. But weightage is given to Forensic Science. How far this Bill will be beneficial to Forensic Medicine cannot be assessed at this point. Moreover, looking to the provisions of this Bill its implementation seems to be difficult in near future.

Authorities should realize that Forensic Medicine Expert has a holistic approach as to the cause and manner of death hence deserves more attention while, Forensic Scientists deal mainly with trace evidences in piece-meal without any co-ordination as to the commission of offence. People compare our medico-legal and forensic investigation system with developed countries but they should realize that we do not have facilities like them. There is urgent need to create medico-legal and forensic investigation system under one roof so that complete and fruitful investigation is done timely, which is the need of Criminal Justice Delivery System of India.

There is need to draw your kind attention towards Section 293, Cr.P.C. under which the reports of various experts are used as evidence in any inquiry, trial or other proceedings unless the court thinks fit, summon and examine any such expert as to the matter of his report. But medical expert is not included in this section like other forensic experts. It is a request on behalf of IAFM that the same consideration should be given to Medico-legal Experts at least in those cases where there is no dispute as to the cause of death, manner of death and the circumstances of death such as road traffic accident and suicide cases. Usually in such cases there is no cross examination so reports can be admitted without any dispute. Appearance of doctors in such cases results in wastage of time, money, energy and adversely affects the performance and loss of interest in the medico-legal work. Not to mention delay in judicial proceedings.

With the advancement and research in the medical field and introduction of Ultrasonography machine a cumbersome problem has arisen. This machine is now widely used in the diagnosis of disease and condition of foetus during intra-uterine period, so that the mother and the foetus are taken care of in the best possible way; but not to forget its demerits and disadvantages. Its indiscriminate use for sex selection in recent times has resulted in rampant female foeticide and abortions not only among illiterate masses but also among affluent sections of our society and deranging the sex ratio.

The Govt. of India enacted the **Preconception and Prenatal Diagnostic Technique (Prohibition of Sex Selection) Act, 1994**. The offence committed under this act is cognizable, non bailable and non compoundable and imposes punishment, fine and removal of name from medical register to prevent the misuse of Ultrasonography machine. In spite of all these facts a large number of unregistered Ultrasonography machines are in use everywhere. We the Forensic Experts can play a very important role in prevention of its misuse and female foeticide as well.

Many hospitals, nursing homes and doctors are involved in such inhuman and unethical practices of sex selection, sex determination, selective female foeticide and abortions for huge amount of easy money. These foetal remains are thrown anywhere which is sent for examination to a medico legal expert.

In such cases it is not only difficult but impossible to determine its sex due to loss of sex organs, mutilation and decomposition. Such cases should not be disposed off lightly. We should make all possible efforts to determine the source, sex and also the paternity by preserving proper and sufficient tissue material for DNA analysis and DNA finger printing. The role of Medico legal experts as a Social Forensic Scientist is important in prevention of such illegal abortion and female foeticide and misuse of Ultrasonography machine as well. Thus we can actively participate in **saving girl child mission i.e. Beti Bachao Abhiyan** launched by many States by exposing persons involved in such a practice.

An unhealthy tendency of criticizing fellow colleagues has been seen springing these days which is dangerous. It does not mean that one should not point out the mistakes or deficiencies of our brethrens but before doing so one must try to know all the facts and findings of the case from a reliable source or from the concerned expert and that to on a proper platform. Some of these criticisms may be based on incomplete information and without knowledge of facts. Some of our fellow colleagues and experts may involve themselves, to remain in the news. It was suggested that we should restrain ourselves from such practices unless asked by the competent authority and not without examining the total facts and findings. It is neither correct nor ethical to make derogatory remarks.

We hope that in the near future BOG/MCI will implement the curriculum suggested by our fraternity. Govt. of India as well as State Governments will take necessary action to develop appropriate infrastructure and the facilities for improvement of medico-legal services and for creation of special medico-legal cadre at National and State level. The President assures on behalf of IAFM that all will continue their sincere efforts and struggle not only for survival but also for the better development of our specialty.

Dr.D.S. Badkur
President, I.A.F.M.
Director, Medico-legal Institute
Govt. of M.P., Bhopal

Original Research Paper

Age Determination from Pelvis A Radiological Study in Mumbai Region

*S.S. Bhise, **S. D. Nanandkar

Abstract

The bones of human skeletons develop from separate ossification centers. From these centers ossification progresses till the bone is completely formed. These changes can be studied by means of X-rays and these changes are age related. It is therefore possible to determine the approximate age of an individual by radiological examination of bones till ossification is complete.

This radiological study was carried out with the objective to assess the general skeletal maturity around crest of ilium and ischial tuberosity, of subjects in Mumbai region. 99 males between age group of 9-25 years and 76 females between age group of 3-23 years attending the outpatient department of this hospital were selected. Age confirmed from history and noting the birth dates from driving license, passport, rations card or voter's card. The cases were selected after ruling out the nutritional, developmental, and endocrinal abnormality which affects the skeletal growth. Data analysis was done in P4 computer using HPSS software. At the end conclusions were drawn which are compared with available results of various previous studies

Key Words: Epiphyseal Fusion, Ossification Centres, X-Rays

Introduction:

Determination of the age of an individual from the appearance and the fusion of the ossification centres is a well accepted fact in the field of medical and legal professions. Epiphysis of bones unites during age periods which are remarkably constant for a particular epiphysis.

The determination of age presents a task of considerable importance from the viewpoint of the administration of justice. It is not possible to enunciate a hard and fast rule for age determination from this union for the whole India because India is composed of areas which differ in climatic, dietetic and disease factors which affect skeletal growth. The present study was carried out to study roentgenographically the epiphyseal appearance and fusion of crest of ilium and ischial tuberosity in subjects between age group of 3 to 25 years attending outpatient department of this hospital.

Aims and Objectives:

- To assess the skeletal maturity of crest of ilium and ischial tuberosity for a known chronological age in subjects of Mumbai region.

- Comparative study of appearance & fusion of crest of ilium and ischial tuberosity with known standards
- Comparative study of appearance & fusion of crest of ilium and ischial tuberosity with known standards
- To evaluate sex related variation & its correlation with age.
- To know variation if any & exception of appearance & fusion of crest of ilium and ischial tuberosity.
- To evaluate the medico legal aspects of different ages.
- To suggest any additional radiological investigation to aid and to reduce range in determining age.

Material and Methods:

The study was carried out in Grant Medical College and J. J. Hospital Mumbai which is a tertiary referral centre. The objective was to assess the general skeletal maturity of crest of ilium and ischial tuberosity in subjects in Mumbai region. 99 males between age group of 9-25 years and 76 females between age group of 3-24 years attending the outpatient are selected.

Age confirmed from history and noting the birth dates from driving license, passports ration card or voter's card. The cases were selected after ruling out the nutritional, developmental, and endocrinal abnormality which affects the skeletal growth. X-rays of crest

Corresponding Author:

*Assistant Professor, Dept. of Forensic Medicine,
Grant medical college Mumbai
E-mail: sadanand_bhise@rediffmail.com

**Prof. & HOD

DOR: 29.8.11 DOA: 28.5.12

of ilium and ischial tuberosity were taken at department of radiology. The epiphysis of crest of ilium and ischial tuberosity was observed for appearance (A) and non appearance (NA) and different phases of fusion were graded according to Dr. William Sangma et al and Mckern and Stewart's method. The 5 stages were as follows

- Stage 1 (F1): Non union – when the epiphyseal cartilage did not begin to decrease in thickness
- Stage 2(F2): Commence of union – when the thickness of epiphyseal cartilage was found to be reduced appreciably (1/4th united)
- Stage 3(F3): Incomplete union – when the epiphysis has begun to fuse with shaft and complete union was well underway (1/2 united)
- Stage 4(F4): Complete union – when the epiphyseal cartilage was bony in architecture and its density indistinguishable from the epiphysis and diaphysis in its neighbourhood but an epiphyseal line called epiphyseal scar could still be distinguished. (3/4 united)
- Stage 5(F5): Complete union – with absence of epiphyseal scar.

The appearance and fusion of medial end of clavicle was evaluated radiologically and the results were compared with the previous known standard studies

Results and Observations:

Table 1: In males in 20 cases (74%) at 9 – 14 years, in 4 cases (14.8%) at 14 – 15 years and in 3 cases (11.2%) at 15 – 16 years centre for crest of ilium was not appeared. In 5 (83.3%) cases at 15 – 16 years and 1 case (16.7%) at 16 – 17 years centre was appeared

- F1 stage of fusion was seen in 4 cases (100%) at 16 – 17 years age group.
- F2 stage of fusion was seen in 2 cases (40%) at 16 – 17 years age group, in 2 cases (40%) at 17 – 18 years age group and in 1 case (20%) at 18 – 19 years age group.
- F3 stage of fusion was seen in 6 cases (42.9%) at 17 - 18 years age group, in 7 cases (50%) at 18 – 19 years age group and in 1 case (7.1%) at 19 – 20 years age group.
- F4 stage of fusion was seen in 1 case (5.9%) at 17 - 18 years age group, in 4 cases (23.5%) at 18 – 19 years age group, in 9 cases (52.9%) at 19 – 20 years age group and in 3 cases (17.6%) at 20 – 21 years age group.
- Complete fusion (F5) was seen in 8 cases (30.8%) at 20 - 21 years age group, in 7 cases (26.9%) at 21 – 22 years age group,

in 5 cases (19.2%) at 22 – 23 years age group and in 6 cases (23.1%) at 23 – 25 years age group.

Table 2 shows in females in 24 cases (85.7%) at 3 – 13 years, in 3 cases (10.6%) at 13 – 14 years and in 1 case at 14 – 15 years centre for crest of ilium was not appeared. In 3 (42.9%) cases at 14–15 years, 3 cases (42.9%) at 15 – 16 years and in 1 case (14.3%) at 16–17 years centre for crest of ilium was appeared

- F1 stage of fusion was seen in 3 cases (42.9%) at 15 – 16 years and 4 cases (57.1%) at 16 – 17 years age group.
- F2 stage of fusion was seen in 1 case (50%) at 16 – 17 years age group and in 1 case (50%) at 17 – 18 years age group.
- F3 stage of fusion was seen in 2 cases (66.7%) at 17 - 18 years age group and in 1 case (33.3%) at 18 – 19 years age group.
- F4 stage of fusion was seen in 5 cases (62.5%) at 18 - 19 years age group and in 3 cases (37.5%) at 19 – 20 years age group.
- Complete fusion (F5) was seen in 3 cases (14.3%) in 19 – 20 years age group, in 10 cases (47.6%) at 20 - 21 years age group, in 2 cases (9.5%) at 21 – 22 years age group and in 6 cases (28.6%) at 22 – 24 years age group.

Table 3 shows in males in 24 cases (70.6%) at 9 –15 years, in 8 cases (23.6%) at 14–16 years and in 2 cases (5.9%) at 16 – 17 years centre for ischial tuberosity was not appeared. In 5 (83.3%) cases at 16– 17 years and 1 case (16.7%) at 17 – 18 years centre were appeared.

- F1 stage of fusion was seen in 1 case (100%) at 17 – 18 years age group.
- F2 stage of fusion was seen in 4 cases (66.7%) at 17 – 18 years age group and in 2 cases (33.3%) at 18 –19 years age group.
- F3 stage of fusion was seen in 2 cases (14.3%) at 17 - 18 years age group, in 9 cases (64.3%) at 18 – 19 years age group and in 3 cases (21.4%) at 19 – 20 years age group.
- F4 stage of fusion was seen in 1 case (5.9%) at 17 - 18 years age group, in 1 case (5.9%) at 18 – 19 years age group, in 7 cases (41.2%) at 19 – 20 years age group and in 8 cases (47.1%) at 20 – 21 years age group.
- Complete fusion (F5) was seen in 3 cases (14.3%) at 20 - 21 years age group, in 7 cases (33.3%) at 21 – 22 years age group, in 5 cases (23.8%) at 22 – 23 years age group, in 4 cases (19%) at 23 – 24 years age group and in 2 cases (9.5%) at 24 – 25 years age group.

Table 4 shows in females in 27 cases (84.5%) at 3 – 14 years, in 3 cases (9.3%) at 14 – 15 years and in 2 cases at 15 – 16 years centre for ischial tuberosity was not appeared.

In 1 (11.1%) case at 14 – 15 years, 4 cases (44.4%) at 15 – 16 years and in 4 cases (44.4%) at 16 – 17 years centre for ischial tuberosity was appeared

- F1 stage of fusion was seen in 2 cases (100%) at 16 – 17 years age group.
- F2 stage of fusion was seen in 2 cases (100%) at 17 – 18 years age group.
- F3 stage of fusion was seen in 1 case (20%) at 17-18 years age group and in 4 cases (80%) at 18-19 years age group.
- F4 stage of fusion was seen in 2 cases (13.3%) at 18 - 19 years age group, in 5 cases (33.3%) at 19 – 20 years age group and in 8 cases (53.3%) in 20 – 21 years age group.
- Complete fusion (F5) was seen in 1 case (9.1%) in 19 – 20 years age group, in 2 cases (18.2%) at 20 - 21 years age group, in 2 cases (18.2%) at 21 – 22 years age group, in 5 cases (45.5%) at 22–23 years age group and in 1 case (9.1%) at 23 – 24 years age group.

Discussion:

Crest of ilium: In present study, in males majority of cases show epiphyseal appearance in between 15 – 16 years age group and in females in between 14 – 16 years age group.

In present study males show epiphyseal union at 21 - 22 years age group and earliest union occurred at 20 years. Females show epiphyseal union at 20 - 21 years age group and earliest union occurred at 19 years.

Ischial tuberosity: In present study in males' majority of cases show epiphyseal appearance in between 16–17 years age group and in females in between 15 –17 years age group.

In present study males show epiphyseal union at 21-22 years age group and earliest union occurred at 20 years. Females show epiphyseal union at 21-22 years age group and earliest union occurred at 19 years.

The present study findings are close to Galstaun, Parikh, Das gupta et al, Sankhyn et al, Davies and parson, Flecker. [2, 6, 8, 12-14]

Conclusions:

In present study majority of cases show complete union for iliac crest at 21 – 22years for males and at 20 – 21 years for females.

These findings are close to study carried out by Galstaun, and Parikh because both studies are done in India and for ischial tuberosity complete union was seen at 21 to 22 years for both males and females. These findings are in tandem with study carried out by Galstaun, Parikh, Sankhyn S et al because all these studies were done in India.

From the present study it can be concluded, that

- Epiphysis of Crest of ilium appears at 15–16 years in males and 14-16 years in females and epiphysis of ischial tuberosity appears at 16-17 years in males and 15-17 years in females.
- Epiphysis of crest of ilium fused in most of the cases at 21–22 years for males and at 20–21 years for females and ischial tuberosity fuses at 21-22 years in both sexes.

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Table 1: Incidence and Extent of Appearance and Fusion of Crest of Ilium in Different Age Groups in Males

Extent of appearance & fusion	9-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-25	Total
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
NA	20(74)	4(14.8)	3(11.2)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	27(100)
A	0(0)	0(0)	5(83.3)	1(16.7)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	6(100)
F1	0(0)	0(0)	0(0)	4(100)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	4(100)
F2	0(0)	0(0)	0(0)	2(40)	2(40)	1(20)	0(0)	0(0)	0(0)	0(0)	0(0)	5(100)
F3	0(0)	0(0)	0(0)	0(0)	6(42.9)	7(50)	1(7.1)	0(0)	0(0)	0(0)	0(0)	14(100)
F4	0(0)	0(0)	0(0)	0(0)	1(5.9)	4(23.5)	9(52.9)	3(17.6)	0(0)	0(0)	0(0)	17(100)
F5	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	8(30.8)	7(26.9)	5(19.2)	6(23.1)	26(100)

Table 2: Incidence and Extent of Appearance and Fusion of Crest of Ilium in Different Age Groups in Females

Extent of appearance & fusion	3-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-24	Total
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
NA	24(85.7)	3(10.6)	1(3.6)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	28(100)
A	0(0)	0(0)	3(42.9)	3(42.9)	1(14.3)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	7(100)
F1	0(0)	0(0)	0(0)	3(42.9)	4(57.1)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	7(100)
F2	0(0)	0(0)	0(0)	0(0)	1(50)	1(50)	0(0)	0(0)	0(0)	0(0)	0(0)	2(100)
F3	0(0)	0(0)	0(0)	0(0)	0(0)	2(66.7)	1(33.3)	0(0)	0(0)	0(0)	0(0)	3(100)
F4	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	5(62.5)	3(37.5)	0(0)	0(0)	0(0)	8(100)
F5	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	3(14.3)	10(47.6)	2(9.5)	6(28.6)	21(100)

Table 3: Incidence and extent of Appearance and Fusion of Ischial Tuberosity in Different Age Groups in Males

Extent of appearance & fusion	9-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Total
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
NA	24(70.6)	8(23.6)	2(5.9)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	34(100)
A	0(0)	0(0)	5(83.3)	1(16.7)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	6(100)
F1	0(0)	0(0)	0(0)	1(100)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(100)
F2	0(0)	0(0)	0(0)	4(66.7)	2(33.3)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	6(100)
F3	0(0)	0(0)	0(0)	2(14.3)	9(64.3)	3(21.4)	0(0)	0(0)	0(0)	0(0)	0(0)	14(100)
F4	0(0)	0(0)	0(0)	1(5.9)	1(5.9)	7(41.2)	8(47.1)	0(0)	0(0)	0(0)	0(0)	17(100)
F5	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	3(14.3)	7(33.3)	5(23.8)	4(19)	2(9.5)	21(100)

Table 4: Incidence and extent of Appearance and Fusion of Ischial Tuberosity in Different Age Groups in Females

Extent of appearance & fusion	3-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	Total
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
NA	27(84.5)	3(9.3)	2(6.2)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	32(100)
A	0(0)	1(11.1)	4(44.4)	4(44.4)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	9(100)
F1	0(0)	0(0)	0(0)	2(100)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(100)
F2	0(0)	0(0)	0(0)	0(0)	2(100)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(100)
F3	0(0)	0(0)	0(0)	0(0)	1(20)	4(80)	0(0)	0(0)	0(0)	0(0)	0(0)	5(100)
F4	0(0)	0(0)	0(0)	0(0)	0(0)	2(13.3)	5(33.3)	8(53.3)	0(0)	0(0)	0(0)	15(100)
F5	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(9.1)	2(18.2)	2(18.2)	5(45.5)	1(9.1)	11(100)

Table 5: Comparison of Time of Fusion (In Years)

Author	Year	race	Sex									
			Males				Females				Mixed	
			Crest of ilium		Ischial tuberosity		Crest of ilium		Ischial tuberosity		Crest of ilium	Ischial tuberosity
			A	F	A	F	A	F	A	F		
Galstaun	1937	Bengalis	17	19-20	16to18	20	14	17-19	14to16	20		
Pillai	1936	Madrasis									14-18	
Flecker	1932	Australia		18	19	20	14	15-16	16			
Davies & Parson	1927	English									A-18, F-23	
Dasgupta et al	1974	U P									19-20	
Parikh	1990	Indian		20- 21		23-24		18 -19		21- 22		
Sankhyn S et al	1993	HP									21 ^{1/2}	
Bennet KA	1993	USA									23	24 - 25
Hoolinshed WH	1963	New York										20 - 21
Present study	2010	Mumbai	15-16	21-22	16 -17	21-22	14-16	20 -21	15-17	21-22		

Original Research Paper

Blunt Injuries of Chest: A Medicolegal Analysis

*Amit Kumar, **Mousami Singh, *A K Verma, ***A K Rastogi

Abstract

Chest injuries are always a great challenge for medical professionals as two of the vital organs, which are present there, very often involved & damaged causing excessive bleeding and death. These injuries are usually caused by blunt forces or sharp penetrating weapons.

Here in this paper 60 cases of chest injuries by blunt forces are studied for their epidemiological, medicolegal and clinico-pathological aspects. Most of them are adult/ middle aged male between 20-50 years of age, hit or run over by heavy vehicles in road traffic accidents. Lungs are lacerated in almost all the cases and internal haemorrhage & shock is the prime cause of death. Heart, aorta & other organs were also involved in substantial number of cases. Though majority of them died within two hours, either on the spot or in the way to the hospital, an attempt is also made to correlate the prognosis & the nature of injuries.

Key Words: Run over, Crushing injury, vital organs, internal haemorrhage

Introduction:

A large number of penetrating and non-penetrating (blunt) injuries are produced on chest and abdomen. Blunt injuries to the chest are mostly seen in road traffic accidents in form of multiple abrasions & contusions on chest wall, fractures of ribs & sternum and contusion & laceration of lungs, heart etc. Driver of an automobile in a collision accident will strike his chest against the steering column & can sustain sternal fracture or contusion & laceration of heart. [10] Sometimes serious damage may occur in thoracic cavity without any external injury and diagnosed only when chest is opened either during operation or autopsy. [6]

Fall from a height and run-over accidents can cause multiple fractures of ribs on both sides. Direct hit also cause fracture of the ribs and sometimes the fractured ends may penetrate the lung or heart. Sternum is usually fractured by direct impact especially in drivers in collision accidents by steering column. Heart is ruptured during diastole when it is filled with blood.

Corresponding Author:

*Associate Professor, Dept. of Forensic Medicine
Subharti Medical College
Swami Vivekanand Subharti University
Delhi Hardwar bypass road, Meerut 250002
E-mail: dramit1995@rediffmail.com

** Lecturer, CSM Medical University, Lucknow

*Assoc. Prof., CSM Medical University, Lucknow

*** Assist.Prof., Subharti Medical College, Meerut

DOR: 7.9.11 DOA: 18.5.12

Here in this study the epidemiological, medico-legal and clinico-pathological aspects of blunt chest injuries are studied in the cases brought to the mortuary of KG Medical University Lucknow for Post Mortem examination.

Material and Methods:

The materials for the present study were the fatal cases of blunt chest injuries brought to the mortuary of KGMU, Lucknow for post-mortem examination in the year 2005-06. The cases where few superficial injuries were on the chest but the cause of death was in the abdomen or in other parts of body were not included in the study. Badly decomposed or skeletonised bodies, where significant blunt injuries were not visible, also not included in the study. All the information related to epidemiological & medicolegal aspects of the cases were collected from the interrogation of relatives, friends and police officer accompanying the dead body and also from the inquest report. Attempt was also made to collect this information from the victim when he was alive, conscious and admitted in the hospital.

Data related to injuries, damage to internal organs and cause of death were collected during the post-mortem. All the data are thus collected, compiled and presented in the table.

Observation & Results:

Sixty cases of blunt chest injuries are studied of which majority of the victims (70%) are young adult male between 21-40 year of age group. Age-wise the maximum number i.e., 26

(43.33%) of the victims were from 21-30 years of age, followed by 31-40 and 41-50 years of age group i.e., 26.67% & 11.66% cases respectively. (Table 1) The cases below 10 and above 70 years are very few, only one case (1.67%) in each group. Sex-wise there is a clear predominance of male over female i.e., 45 (75%) & 15 (25%) cases respectively.

More than three-fourth (82.17%) of the blunt chest injuries are caused by road traffic accidents, of which 2/3 (66.67%) by direct impact of the vehicle. (Table 2) Other blunt chest injuries are caused by collapse of building (13.33%), fall from height (1.67%) and by multiple blows (3.33%) in homicidal assault.

Injuries are caused from the front side in majority of the cases more from the left side. (Table 3) These were all around the chest in 28 (46.67%) and only on the back in 08 (13.33%) of the victims. Ribs were found fractured in all fatal cases of blunt chest injuries of which 4th, 5th & 6th ribs were involved in majority of the cases.

Internally lungs were found injured in all 60 & heart in 43 (71.66%) cases. It is also associated with injury to ascending aorta in 11 (18.33%), right pulmonary artery in 7 (11.66%) and diaphragm in 4 (6.66%) cases. (Table 4)

Amongst cardiac injuries right ventricle was involved more often (74.41%) than other parts of heart. The right ventricle alone was found injured in 18 (41.85%) & left ventricle alone in 11 (25.59%) while whole heart was found lacerated in 4 (9.30%) of the cases. (Table 5) More than half (61.67%) of the victims were died on the spot just after the incidence. Another 14 (23.33%) were died within 3 hours. (Table 6) Haemorrhage and shock was the cause of death in most of the cases. Only 2 (3.33%) of the victims survived more than 48 hrs. and died due to infection &/or complications of haemorrhage.

All most all the cases of blunt chest injuries are accidental caused by road traffic accident, collapse of building/wall or fall from height. Only 2 cases (3.33%) are homicidal caused by blow of hard blunt objects.

Discussion:

Blunt injuries to the chest are responsible for a large number of casualties. Road traffic accidents are responsible for most of these injuries. A substantial number of such cases are also seen in other accidents as collapse of building, fall from height, stampede etc. Few cases of blunt trauma on chest are also seen in deadly scuffle when someone is beaten by a group of person/crowd with fist, foot or some hard blunt weapon.

In this study majority of the victims are young adult males, rarely seen in children, mostly accidental and RTA is the main cause behind such deaths. This is similar to the observations made by other workers. [1, 4, 5]

Amongst the RTA direct impact by the vehicle is most frequent cause of blunt trauma to the chest. [2, 3 and 7] Ribs were found fractured in all the cases, of which 4th, 5th & 6th ribs were most often involved. This is also consistent with the observations made by the other experts. [8, 11] Lungs were found injured in all the cases of fatal chest injuries while other internal organs such as heart, aorta, pulmonary artery and diaphragm were involved in substantial number of cases. In the cases where heart was involved the right ventricle was most commonly injured. This is similar to the observations mentioned in standard text books. [3, 9]

Conclusion:

- Majority of victims of blunt chest injuries were young adult males between 21-40 years of age.
- More than three-fourth of the victims is of Road traffic accidents & they were hit from front side in majority of the cases.
- Ribs were found fractured in all the cases, of which 4th, 5th & 6th ribs were most often involved.
- Internally lungs were involved in all the cases followed by heart, ascending aorta and pulmonary vessels and diaphragm.
- Heart alone was not injured in any of the cases. In the cases where heart was involved; right ventricle was most commonly injured.
- Most of the victim died either on spot or within 3 hrs. in the way to hospital or in emergency before proper treatment given.
- Shock & internal hemorrhage was the most common cause of death.

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Table 1: Incidence of Age & Sex

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
0 – 10	1	1.67	0	0	1	1.67
11 – 20	3	5.00	1	1.67	4	6.67
21 – 30	20	33.33	6	10.00	26	43.33
31 – 40	12	20.00	4	6.66	16	26.67
41 – 50	5	8.33	2	3.33	7	11.66
51 – 60	2	3.33	1	1.67	3	5.00
61 – 70	1	1.67	1	1.67	2	3.33
Above– 71	1	1.67	0	0	1	1.67
Total	45	75.00	15	25.00	60	100.00

Table 2: Modes of Injuries

Modes of Blunt Injuries of chest		Number	%
1.	Road traffic accident	49	82.17
a.	By direct impact	40	66.67
b.	By run over vehicle	05	8.83
c.	By impact of steering wheel	04	6.67
2.	Collapse of building/wall	08	13.33
3.	Fall from height	01	1.67
4.	By multiple blow	02	3.33
Total		60	100.00

Table 3: External Injuries - Area Involved

Area involved	Number	%
Left side chest	04	6.67
Right side chest	0	0
Both side front of chest	20	33.33
Back of the chest	08	13.33
Front & back of chest	28	46.67
Total	60	100.00

Table 4: Internal Organs Involved

Internal organs	Number	%
Both Lungs alone	17	28.33
Both Lungs +Heart	22	36.67
Left Lungs +Heart	8	13.33
Both Lungs + Heart + Ascending Aorta	4	6.67
Both Lungs + Heart + Right Pulm. Artery	2	3.33
Both Lungs + Heart + Ascending Aorta + Right Pulm. Artery	3	5.00
Both Lungs + Heart + Ascending Aorta + Diaphragm	2	3.33
Both Lungs + Heart + Ascending Aorta+ Right Pulm. Artery + Diaphragm	2	3.33
Total	60	100.00

Table 5: Parts of Heart involved

Parts of Hearts	RTA	Others	Total
	No. (%)	No. (%)	No. (%)
Left ventricle	11(25.59)	0(0)	11(25.59)
Right ventricle	16(37.20)	2(4.65)	18(41.85)
Both ventricles	5(11.62)	0(0)	5(11.62)
Right atrium+ Right ventricle	3(6.98)	0(0)	3(6.98)
Right atrium + Left ventricle	2(4.66)	0(0)	2(4.66)
Whole heart	4(9.30)	0(0)	4(9.30)
Total	41(95.35)	2(4.65)	43(100)

Table 6: Period of Survival

Period of survival (in hrs)	RTA	Others	Total
	No. (%)	No. (%)	No. (%)
Died on the spot	36(60)	1(1.67)	37(61.67)
½ hrs – 1 hrs	8(13.33)	1(1.67)	9(15.00)
1 hrs – 3 hrs	3(5.00)	2(3.33)	5(8.33)
3 hrs – 12 hrs	1(1.67)	2(3.33)	3(5.00)
12 hrs – 48 hrs	1(1.67)	3(5.00)	4(6.67)
More than 48 hrs	0(0)	2(3.33)	2(3.33)
Total	49(81.67)	11(18.33)	60(100)

Original Research Paper

Study of Deaths in Industrial Areas around Aurangabad City

*K. U. Zine, ***S. D. Wakde **R. M. Tandle, **N. M. Varma, **M. P. Jambure, ***G. V. Tasgaonker

Abstract

We retrospectively studied the death cases brought for medico-legal post-mortem examination at mortuary, Government Medical College, Aurangabad in last one year i.e. 2010. All the cases from these areas (Police station MIDC Waluj, MIDC Cidco, MIDC Chikhalthana, and MIDC Paithan, etc.) were included in the study and the results are analyzed. Deaths from industrial areas accounted for 6.85% of total autopsies. It is observed that the most common cause of death in industrial area is road traffic accident probably due to higher frequency of transportation. Males outnumbered the females and they suffered injuries most in their fourth decade of life. Maximum incidences occurred in the month of October, that too on Friday between times 12:00 pm to 6:00 pm. Maximum cases were accidental in manner and brought dead to Government Medical College, Aurangabad. The most common cause of death was vehicular accidents involving head.

This is the first time such a study has been carried out locally. The proportion of accidental deaths in industrial areas relative to that of non industrial area may be attributed to the poor enforcement of safety measures in these areas.

Key Words: Industrial Areas, Accidents, Fatal Injuries

Introduction:

India is a developing country with increasing industrialization and urbanization. Aurangabad is regarded as a capital of Marathwada having largest industrial zone. The city was a major silk and cotton textile production centre. A fine blend of silk with locally grown cotton was developed as Himroo textile. Paithani silk saris are also made in Aurangabad. [1] Aurangabad caters a total population of 2,897,013 (2001) and a total area of 10,100 km² (3,900 sq mi). [2]

Many renowned Indian and MNCs have established themselves in the Industrial Estates of Aurangabad. (Table A) Some of the well known names are: Garware, Ajanta Pharma, AMRI, Glenmark Pharmaceuticals, Lupin Ltd, Wipro, Orchid pharma, Endurance systems, Rucha Eng, Indo German Tool Room, Ceekay Daikin Ltd, Cosmos Films, NRB bearings, Hindalco-Almex Aerospace, Can-pack India, Varroc, Dagerfrost, Frigorifico Allana.

Corresponding Author:

Dr. S. Wakde ***Resident,
Dept. of Forensic Medicine and Toxicology,
Government Medical College,
Aurangabad, Maharashtra, Pin. 431001
E-mail: sdwakde@gmail.com

*HOD, **Assistant Professors,
***Resident

DOR: 13.9.12 DOA: 19.5.12

Table A

• Škoda Auto	• Sterlite Optical Technologies
• Wockhardt	• Franke
• Videocon	• Greaves Cotton
• Siemens	• Goodyear
• Bajaj Auto	• Forbes Gokak Ltd
• Johnson & Johnson	• Baxter
• Colgate-Palmolive	• Lombardini India
• Kenstar	• Intelenet Global Services
• Endress+Hauser	• Mahyco Seeds / Monsanto
• MAN Diesel	

The Aurangabad - Jalna belt has some of the largest seed companies in India. Mahyco (R&D+Production), Nath Seeds (R&D+Production) Seminis seeds (R&D+Production) and Monsanto (R&D currently) are some of the big names in the industry. Many firms, in the sectors of automotive and auto components, pharmaceuticals and breweries, consumer durables, plastic processing, aluminium processing, agriculture and biotech, have their manufacturing bases in Aurangabad. Among pharmaceuticals there is Recombinant Insulin Manufacturing plant of Wockhardt (Wockhardt Biotech Park) in Aurangabad, which is Largest Biopharmaceutical plant in India. [3]

As industries are set to manufacture products that aid in prosperities of human but human themselves employing in those industries unfortunately meet with fatal accidents sometimes losing their lives. Road Traffic Accidents, burns, poisoning, drowning, hanging, electrocution, snake bite are some of the commonest causes of deaths in industrial areas.

In UK, a report attributed 20% of all accidental deaths during 1987-1990 to haulage or transport operations. [4] As per the International Labour Organization (ILO) (1994) estimates, nearly 2 lakhs workers die annually and about 1200 lakhs are injured. [5]

Material and Methods:

This retrospective study included all cases of deaths brought for autopsy at Mortuary Government Medical College Aurangabad from police stations belonging to industrial areas from January to December 2010. Variables analysed include age, sex, time, day and month of incidence, survival period, causative agent, and cause of death at autopsy. The data was collected and tabulated to determine the frequency and proportion of these fatalities and the results were expressed in percentage.

Results:

Males constitute 76.54% with a male to female ratio of 3.26:1. About 8 accidents occurred in industries proper, few are comment-able, one of the men slipped off his hand of an unprotected staircase and injured his head on the concrete floor, fracturing the base of skull. While another male suffered a crush injury to his chest because of running over of a machine wheel and died of traumatic asphyxia.

A goldsmith was found dead in his Jewellery shop while working with ornamental chemicals, on autopsy both lungs were found congested and oedematous, and lungs were preserved for necessary investigation. One miner got injured when a stone fell on his head while working in a mine. Another worker got electrocuted while working in electric chamber. (Table 1) The commonest time is during later part of day 34.57% following is the initial part of day 20.37%. (Table 2) Deaths occurred mostly in the month of October 12.34% and particularly on Fridays 17.8% with a second peak on Sundays with no wonder that Friday (Sunday) is holiday and fun day for workers and as they do on holidays that they cannot do on working days. (Table 3)

Out of 162 patients 38.27% patients were brought dead to Government Medical College Aurangabad and only 3 (1.85%) patients survived for up to 1 hour. Out of 30 natural modes of deaths 12 deaths (40%) were due to cardiovascular system involvement. (Table 4)

Out of 132 cases of unnatural deaths, road traffic accidents claimed 54 lives, and death due to inflammables accounting second leading cause of death. (Table 5) Amongst these 54 cases of road traffic accidents 31.81% were due to head injury followed by burns. (Table 6)

Discussion:

Industrialization is an important step in overall development of any nation. Under conditions of rapid industrialization in the developing countries tens of thousands of people are recruited directly from the rural areas. [6] The present study was conducted on routine autopsy cases of deaths in industrial areas including all modes and manner of death. Majority of cases were middle aged males.

The leading cause of death is road traffic accident that occurred in later half of the day following initial half of the day clearly indicating towards the haste and waste to reach the place of work. In addition to this time requirement, condition of roads and improper illumination also add to the accidents. Majority of cases died from trauma to head, burns and multiple injuries. This distribution is similar to other studies. [7] Nevertheless interpersonal adjustments because of belonging from different geographic areas also provoke traumatic and homicidal deaths. People working in the industries prove to be inadequate in using proper protective measures. Thus use of proper personal protective measures and limitation of vehicles speed with enforcement of use of helmets is utmost required to decrease the incidence of deaths to a considerable amount.

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Table 1: Age & Sex wise distribution of cases

Age in years	Males	Females	Total (%)
0-10	2	2	4(2.46)
11-20	8	8	16(9.87)
21-30	35	16	51(31.48)
31-40	40	6	46(28.39)
41-50	17	1	18(11.11)
51-60	15	4	19(11.72)
61-70	6	1	7(4.32)
>70	1	0	1(0.61)
Total	124	38	162(100)

Table 2: Time of Incidence

Time	Cases	%
00.00-06.00 am	13	8.02
06.00-12.00 pm	33	20.37
12.00-00.6.0 pm	56	34.57
00.60-12.00 pm	35	21.6
Not known	25	15.42
Total	162	99.98

Table 5: Causative Agent

Agent	Cases	%
Vehicle	54	40.49
Poison	16	12.12
Inflammables	19	14.39
Ligature material	7	5.3
Electrical tools	5	3.78
Snake	5	3.78
Fall	3	2.27
Machine	2	1.51
Railway	3	2.27
Assault	1	0.75
Drowning	7	5.3
Suspected Poison	10	7.57
Total	132	99.53

Table 3: Day of Incidence

Days	Cases	%
Monday	21	12.96
Tuesday	22	13.58
Wednesday	25	15.43
Thursday	17	10.49
Friday	28	17.28
Saturday	23	14.19
Sunday	26	16.04
Total	162	99.95

Table 4: Survival Period

Time	cases	%
Brought Dead	62	38.27
< 1 hr	3	1.85
1-6 hrs	13	8.02
6-24 hrs	17	10.49
1-3 days	18	11.11
3-7 days	29	17.91
>7 days	20	12.34
Total	162	99.99

Table 6: Cause of Death in Unnatural Cases

Cause of Death	cases	%
Head injury	42	31.81
Burns	18	13.63
Multiple Injuries	7	5.3
Hanging	7	5.3
Drowning	6	4.54
Blunt abdomen	5	3.78
Poisoning	5	3.78
Snake bite	5	3.78
Blunt chest	4	3.03
Electrocution	4	3.03
Spinal cord injury	4	3.03
Blunt trunk	3	2.27
Heart stab	1	0.75
Traumatic asphyxia	1	0.75
Choking	1	0.75
Pul. Thromboemboli	1	0.75
Suspected poisoning	10	7.57
Under investigation	8	6.06
Total	132	99.91

Original Research Paper

Correlation of Risk Factors with Coronary Atherosclerosis

*A.S. Keche, ** B. H. Tirpude, ***H.J. Bobade

Abstract

The prevalence of any disease among individuals likely to cause tissue or organ injury is related to a number of factors. The risk factors that predispose to atherosclerosis have been identified by a number of studies. This study was undertaken to correlate risk factors with the occurrence & severity of coronary atherosclerosis. The study duration was of 2 years from October 2006 to October 2008 & it includes 120 medicolegal autopsies conducted at MGIMS, over a period of 2 years. Data (age, sex, occupation, education, alcoholism, smoking, dietary habits etc) was recorded from the short history. Major coronaries were sectioned transversely by sharp knife at intervals of 0.3 cm and also longitudinally. The morphological lesions were noted in proforma and then they were sent for histopathology. The data was evaluated statistically. The study shows definite correlation between the risk factors and atherosclerosis. Certain life style modifications can decrease the incidence of atherosclerosis in the population.

Key Words: Risk factors, Coronary Atherosclerosis, IHD, Prevalence

Introduction:

The term Atherosclerosis is derived from the Greek, athero (meaning gruel or porridge) referring to soft lipid rich material in the center of atheromas and sclerosis (scarring) referring to connective tissue in the plaques. [1] Economic development, habits of diet and diminished physical activity can favour atherogenesis. Such factors have now become globalise, so that we face an epidemic of atherosclerosis that reaches far beyond Western societies. [2] Although many generalized or systemic risk factors predispose to its development, atherosclerosis affects various regions of circulation and yields distinct clinical manifestations depending on the particular circulatory bed affected.

The risk factors that predispose to atherosclerosis and resultant IHD have been identified by means of a number of prospective studies in well defined population groups, most notably the Framingham study and multiple risk factor intervention trial. [3] Risk factors include are non-modifiable like age, male gender, genetics & Modifiable like smoking, obesity, physical inactivity, lipid disorder, hypertension, diabetes, stress. [4]

Corresponding Author:

*Assistant Professor, Dept. of Forensic Medicine, JNMC, Sawangi, Wardha- 442004

E-mail: dratul73keche@rediffmail.com

**Prof. & Head, Dept. of Forensic Medicine, MGIMS, Sevagram, Wardha-442102

***Assist. Professor, Dept. of Anatomy, JNMC, Sawangi, Wardha- 442004

DOR: 14.10.11 DOA: 19.5.12

Material and Methods:

This study was carried out in the department of Forensic Medicine and Toxicology in collaboration with the department of Pathology at Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha.

The study duration was of 2 years from October 2006 to October 2008. The study includes 120 medicolegal post-mortem cases conducted at our institute. Data like age, sex, occupation, education, alcoholism, smoking & dietary habits was recorded from the short history of each case. The specimens of hearts were collected from these cases. They were fixed in 10% formalin.

Major coronary arteries were sectioned transversely by sharp knife at intervals of not more than 0.3 cm as well as longitudinally up to its ostia, and morphological lesions were noted. Related sections were taken from the areas for histopathological study and grading of atherosclerosis according to Stary. [5] The relevant data was collected and analysed according to Kagan and Uemura (1976). [6] Evaluation was done by means of Chi-square test (χ^2) and Fisher exact probability test both of which compare the proportions of cases falling into various categories in one group with the proportions of cases falling into the same categories in another group.

Results:

During the period from October 2006 to October 2008 total 120 cases were taken randomly for the study from the medicolegal post mortems done at MGIMS, Sevagram.

There were 90 (75%) males & 30 (25%) females.

The data taken from short history was recorded in the proforma. The right & left coronaries were evaluated macroscopically and also microscopically in the Department of Pathology. Samples one of Anterior descending part of left coronary artery (LCA), & two of Right coronary artery (RCA) showing positive signs of atherosclerosis were subjected to histopathological examination. The results are shown in various tables below.

Table 1: Level of Atherosclerotic Changes in Coronary Arteries Examined

Level of Atherosclerosis	Arteries with different levels of Atherosclerosis	
	RCA	LCA
1	00	00
2	29	34
3	1	2
4	6	3
5	24	20
6	6	5
7	2	3
8	1	5
Arteries with atherosclerosis	69(57.5%)	72(60%)
Arteries without Atherosclerosis	51	48
Total arteries examined	120	120

p-value=0.03 Significant

Left coronary artery was affected by atherosclerosis in 60% cases and right coronary artery in 57.5% cases. The levels of atherosclerosis in these arteries were also statistically significant.(Table 1)

Table 2: Atherosclerotic Changes in RCA by Selected Variables

Selected Variables				
S.No.	Variable	Total Subjects	Mean level of atherosclerosis	Statistical Significance
1.	Age group			F=13.71 p-value=0.000 S,p<0.05
	10-19	07(5.9)	0.28±0.75	
	20-29	24(20.0)	0.66±1.49	
	30-39	26(21.7)	1.26±1.58	
	40-49	19(15.8)	2.00±2.10	
	50-59	19(15.8)	3.89±2.46	
	60 & above	25(20.8)	3.96±1.90	
	Total	120(100)	2.18±2.30	
2.	Sex			t= 1.61 p-value=0.11 NS, p>0.05
	Male	90(75.0)	2.37 ± 2.40	

(Figures in parenthesis represent percentage)

Histopathologically microscopic grading of each right coronary artery affected was noted. Grades of all the affected right coronary arteries of the subjects in the respective age groups were added and the mean was calculated. It can be seen that the mean level of atherosclerosis in RCA is consistently rising with age. It was highest (3.96) in 60 & above age group & lowest (0.28) in 10-19 age groups. Also males are seen affected more than females. (Table 2)

It can be seen that the mean level of atherosclerosis in LCA as well as in RCA is also consistently rising with age. Males are seen affected more than females. (Table 3)

Table 3: Atherosclerotic Changes in LCA by Selected Variables

S.N	Variable	Total Subjects	Mean level of Atherosclerosis	Statistical Significance
1.	Age group			
	10-19	07(5.9)	0.28±0.75	F=8.52 p-value=0.000 S,p <0.05
	20-29	24(20.0)	0.83±1.60	
	30-39	26(21.7)	1.50±1.96	
	40-49	19(15.8)	2.73±2.15	
	50-59	19(15.8)	3.42±2.34	
	60& above	25(20.8)	3.96±2.70	
	Total	120(100)	2.30±2.44	
2.	Sex			
	Male	90(75.0)	2.47±2.43	t=1.32 p-value=0.189 NS, p>0.05
	Female	30(25.0)	1.80±2.44	
	Total	120(100)		

(Figures in parenthesis represent percentage)

Table 4: Atherosclerotic Changes in RCA by Selected Variables

S.N	Variable	Total subjects	Mean level of atherosclerosis	Statistical Significance
1.	Diet			t= 2.19 p-value=.002 S, p<0.05
	Vegetarian	30(25.0)	1.10 ± 1.44	
	Non-vegetarian	90(75.0)	2.57 ± 2.38	
	Total	120(100)		
2.	Smoking			t= 3.75 p-value=0.000 S, p<0.05
	Yes	32(26.7)	3.43 ± 2.38	
	No	88(73.3)	1.76 ± 2.07	
	Total	120(100)		
3.	Alcoholism			t= 3.18 p-value=.002 S,p<0.05
	Yes	31(25.8)	3.29 ± 2.10	

(Figures in parenthesis represent percentage)

Significantly higher level of atherosclerosis is found in non-vegetarians (2.57), smokers (3.43) and alcoholics (3.29) in RCA. (Table 4)

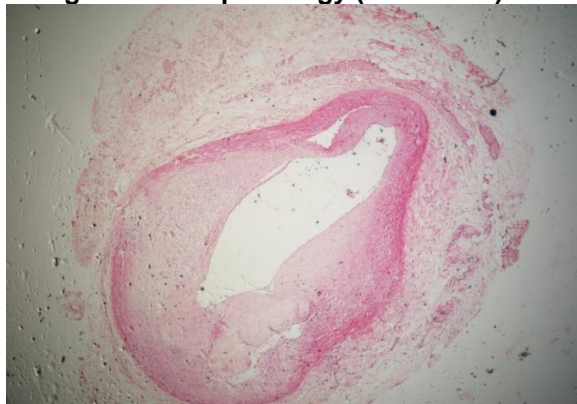
Table 5: Atherosclerotic changes in LCA by selected variables:

S.N	Variable	Total subject	Mean level of Atherosclerosis	Statistical Significance
1.	Diet			
	Vegetarian	30(25.0)	1.36±1.90	t=2.49 p-value=.014 S,p<0.05
	Non-vegetarian	90(75.0)	2.62±2.52	
	Total	120(100)		
2.	Smoking			
	Yes	32(26.7)	3.37±2.35	t=2.97 p-value=.004 S, p<0.05
	No	88(73.3)	1.92±2.36	
	Total	120(100)		
3.	Alcoholism			
	Yes	31(25.8)	3.45±2.21	t=3.13 p-value=.002 S, p<0.05
	No	89(74.2)	1.91±2.40	
	Total	120(100)		

(Figures in parenthesis represent percentage)

Significantly higher level of atherosclerosis is found in non-vegetarians (2.62), smokers (3.37) and alcoholics (3.45) in LCA. (Table 5)

Photo 1: Coronary artery showing grade V changes on histopathology (H & E x 10)



Discussion:

In the present study out of 120 cases, there were 75% males and 25% females. Risk factors for atherosclerosis include non-modifiable like age, male gender, and genetics & modifiable like smoking, obesity, physical inactivity, lipid disorder, hypertension, diabetes, stress. [4] Age factor shows dominant influence on atherosclerosis. Some authors even express the opinion that atherosclerosis is not a disease but a result of increasing age. It is difficult to consider that aging begins as early as 20 years, where as there are no signs of aging of the vessels in a certain proportion of the people even at 60 years of age. [6] In our study the total mean level of atherosclerosis in the coronary arteries examined was found to be highest in the 60 and above age group & lowest in 10-19 years age group. It shows that the severity of atherosclerotic lesion increases with advancing age, age being a non-modifiable risk factor. Harkirat Singh et al observed in their study that the severity of atherosclerotic lesions increases with increased age. [7] Sex is another non-modifiable risk factor. Males are much more prone to atherosclerosis and its consequences than are females. In this study we observed the severity of atherosclerosis was more in males than females. Roberts WC et al observed that significantly higher proportion of men had vascular catastrophes than did women. [8] Matova EE inferred that women are known to die less frequently than men from coronary heart disease. He reported that only 28% women die because of coronary heart disease. [9]

In many developing countries like India oils rich in saturated fats may constitute a major component of their diet. Higher levels of animal

fat, saturated fatty acids and cholesterol are seen to be associated with a greater involvement of lesion. We found more severe lesions in non-vegetarians. LA Solberg and JP Strong in their review study on risk factors observed that dietary starch is protective against atherosclerosis which means that persons who consume more vegetables and starch eat less of the rich foods containing the commonly implicated atherogenic substances. [10]

Some people commit suicide by drowning, but many by smoking. The risk of developing atherosclerosis declines quite substantially within one year of stopping smoking and more gradually thereafter until after 10-20 years. it is the same as that of non-smokers. [4] In this study the mean level of atherosclerosis in smokers & alcoholics were higher than in non-smokers & non-alcoholics. According to Life Sic (1976), cigarette smoking was found to be associated with more severe lesions in the aorta & RCA with calcification. He attributes this association with coexisting alcohol consumption. [11] Life sic AM in his study found the association between alcohol consumption and calcified lesions in the aorta and to a lesser extent in the coronary arteries. He also stated that the increase in calcified arterial lesions associated with alcoholism is perhaps due to disturbances of liver function. [12]

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Original Research Paper

Demographic Profile of Head Injury Cases in Agra Region

*A K Rastogi, ** Ajay Agarwal, ***A K Srivastava, ****Amit Kumar, *Anil Shandil

Abstract

Head injury is a serious health problem throughout the world. Increasing vehicles on roads work as catalyst for high incidence of casualties especially of Cranio-cerebral injuries. This is an autopsy based study of head injury cases, conducted in the Department of Forensic Medicine, S.N. Medical College Agra in year 2009-2010 for their demographic and etiological profile. Majority of the victims of head injury are male (76%) and of 3rd – 4th decade of life (54.4%). 66.4% head injury cases due to accident, Road traffic accident is the single largest cause i.e. 59.2%; out of which two wheelers are responsible for one-third (33%) of the casualties. Most common external injury is laceration of the scalp with or without contusion. Fracture of skull bones (97.2% cases; mostly fissured and comminuted fracture of parietal & temporal) and intracranial hemorrhages (96.4%) are seen in almost all the cases. Contre-coup injuries seen in about 2.8% cases, contre-coup haemorrhage observe mostly fronto-temporal area. Majority of the victim died on the spot or in the way to hospital without any medical assistance where the Cause of death mostly haemorrhage and shock.

Key Words: Road traffic accident, Parieto-temporal area, intracranial haemorrhage, Fissured fracture

Introduction:

Head injury is a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of skull, produced by mechanical forces. Head injuries are responsible for more than one-fourth of all traumatic deaths and nearly two-third of road traffic accidents (RTA). Head is also an easy and successful target for homicidal injuries. It is more vulnerable to assault as it strikes first on the ground when pushed or knocked and bones & underlying tissues are comparatively delicate & damaged more easily to same degree of trauma. Acceleration and deceleration movements are another danger to human lives. Sometimes external injuries are minimal without any fracture but intra-cranial lesions are serious and responsible for fatal outcome. [1]

In this study attempt is made to find out causes & factors responsible for head injury.

Corresponding Author:

*Assistant Professor,
Department of Forensic Medicine
Subharti Medical College,
Delhi Hardwar Bye-pass road, Meerut, 250002
E-mail: ashokforensic@yahoo.com
** Prof. & Head SNMC Agra
*** Prof. & Head, SMC Meerut
****Assoc. Prof., SMC Meerut
*Assist. Prof., LLRM MC Meerut
DOR: 28.11.11 DOA: 22.5.12

Materials and Methods:

All the cases of head injury brought to mortuary of Sarojini Naidu Medical College and Hospital Agra during the period of April 2009-September 2010 are studied for Epidemiological & Forensic pathological aspects. The cases brought as head injury turned out something else on post mortem examination are not included in this study. The information regarding the case & cause of injury is collected from relatives, friends & other accompanying person & post mortem findings from direct medico-legal autopsy examination. All the data, thus collected are compiled on predesigned, pretested, and open ended semi structured schedule and analyzed with the help of M S excel program.

Result & Discussion:

Out of 250 cases of Head injury, brought to the mortuary of S. N. Medical College & Hospital Agra, were studied in this paper for their Epidemiological & Forensic pathological aspects. Majority of the victims of head injury are male (76%) and age-wise young adult to middle aged (70.4%) with maximum number (30.4%) in 21-30 years of age group followed by 31-40 (24%) and 41-50 (16%) years. (Table 1)

This is probably males & people of young age group are more exposed to RTA & other type of injuries. Such type of results is also observed in other parts of the country. [2-3] amongst the head injuries, road traffic accident is the single largest cause (59.2%) followed by injuries by blunt weapons (10.8%), fall from

height (8.8%) & firearm. (7.6%; Table 2) Amongst the RTAs heavy vehicles (34.5.2%) and motorcycles & scooters (33.1%) are responsible for more than two-third of the fatalities. Such type of observations is also recorded in separate study at Jaipur & Chandigarh. [4-5]

More than two-third (71.6%) of the cases of head injury were died within 24 hours of the casualty of which 34% died either on the spot or within an hour of the accident (table 3). Only 3.6% cases survived for more than a week then died. This is again more or less similar to findings expressed in other research papers. [4, 6] Direct trauma to the head is responsible for most of the deaths (95.6%), of which majority of them (82%) is caused by blunt forces in form of contusions or abraded contusions (18.4%) or lacerated wounds (63.6 %). Besides these firearm wounds were seen in 7.6%, incised wound in 4% and penetrating wound in 2% cases. (Table 4)

Injuries were not seen on scalp in 4.4% cases probably due to indirect trauma or acceleration – deceleration injuries. [7] Contre-coup or subarachnoid haemorrhages are seen in these cases. Fracture of skull bones is seen in almost all (97.2%) the cases mostly on the vault (94%) which extends to base of skull in 22.8% cases.(table 5) The base of skull alone was fractured in 3.2% and no fracture seen in 2.8% cases of head injury. Amongst the fractures, fissured (linear) fracture is the commonest (60.8%) followed by comminuted fracture (17.6%), depressed (3.6%) and ring fractures (1.6%; Graph 1). Fracture in form of penetrating / cut injuries on the skull areas also found in 9.6% & 4% cases respectively. This also resembles with the study done in Mangalore. [8]

Parietal & temporal bones alone or in association with surrounding bones are most often fractured in these cases. Parietal bone is involved in 181 (72.4%), temporal bone in 177 (70.8%), frontal bone in 68 (27.2%) and occipital bones only in 28 (11.2%) cases (Table 6), of which Parieto-temporal involvement is the commonest. (38.8%)

Intracranial haemorrhages again found in almost all (96.4%) the cases of fatal head injuries, of which majority (61.2 %) of them are mixed, two or three of extradural, subdural & subarachnoid haemorrhages. Among these subdural, alone or in combination, with other haemorrhages are the commonest. (62.4%; table 7) Contre-coup haemorrhages are seen only in 19 (7.6%) cases mostly below the frontal lobe of cerebrum in anterior cranial fossa. The evidence of bleeding could not ascertain in 3.6%

cases of crush injury where victims died instantaneously due to severe brain damage and expulsion of grey matter. [4, 9] Beside injuries to skull other parts of body were involved in most (93.6%) of the cases of head injury. Extremities were affected most (48.8%) followed by face & surrounding areas (23.6%) and all over the body (18.4%). Injuries on other parts of body were not seen in 6.4% cases. (Table 8) Majority (66.4%) of the head injury cases are accidental followed by homicidal (25.2%) and suicidal (5.6%). The nature/circumstances of death could not ascertain in 2.8% of the cases. (Graph 2) This also matches with the observation of other Forensic Pathologists. [7, 10]

Conclusion:

Majority victim of the head injury were male, of adult and middle age group died due to RTA. Heavy vehicles and two wheelers were equally responsible for more than two third of road traffic casualties. Use of helmets, seat belts and air bags is highly effective to decline the fatal outcome. Beside this few cases were due to injuries from heavy blunt/sharp cutting weapon and fire arm. Such cases were usually homicidal and personal rivalry & family quarrel were the main reason behind these incidents. Fracture of skull and intracranial haemorrhage were seen in almost all the cases. Among the fracture temporo-parietal bone were involved most often. Only in 2.8% cases person died due to brain injury /intracranial haemorrhage without skull fracture. Picture of ICH were mixed in majority of cases however subdural haemorrhage was the commonest. One third of the victims died on the spot or in the way to hospital without getting any medical support.

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Table 1: Head Injury: Incidence- Age and Sex

S. N.	Age Grp (yrs)	Male No. (%)	Female No. (%)	Total No. (%)
1.	1 – 10	05(02)	02(0.8)	07(2.8)
2.	11 – 20	24(9.6)	09(3.6)	33(13.2)
3.	21 – 30	55(22)	21(8.4)	76(30.4)
4.	31 – 40	47(18.8)	13(5.2)	60(24.0)
5.	41 – 50	32(12.8)	08(3.2)	40(16.0)
6.	51 – 60	18(7.2)	05(02)	23(9.2)
7.	61 – 70	08(3.2)	02(0.8)	10(4.0)
8.	71 – 80	01(0.4)	00(0)	01(0.4)
Total		190(76)	60(24)	250(100)

Table 2: Head Injury: Cause/ Etiology

S. N.	Causes	Male No. (%)	Female No. (%)	Total No. (%)
1	Road traffic accident	112(44.8)	36(14.4)	148(59.2)
2	By blunt weapon	23(9.2)	04(1.6)	27(10.8)
3	Fall from height	14(5.6)	08(3.2)	22(8.8)
4	Fire arm injury	16(6.4)	03(1.2)	19(7.6)
5	By sharp weapon	13(5.2)	02(0.8)	15(6.0)
6	Train accident	07(2.8)	05(2.0)	12(4.8)
7	Miscellaneous	05(2.0)	02(0.8)	07(2.8)
Total		190(76)	60(24)	250(100)

Table 3: Head Injury: Survival Period

S. N.	Survival Period	Cases	Percentage
1.	S.D.* / B.D.**/ <1 Hour	85	34.0
2.	1 – 6 Hour	51	20.4
3.	6 – 24 Hour	43	17.2
4.	1 – 3 Days	40	16.0
5.	3 Days – 1 Week	22	8.8
6.	> 1 Week	09	3.6
Total		250	100

S.D.*: Died at the spot; B.D. **: Brought dead

Table 4: External Injuries on Skull

S. N.	Type of injuries	cases	Percentage
1.	Contusion/ Abraded contusion	46	18.4
2.	Lacerated wound with/without contusions	159	63.6
3.	Incised wound	10	4.0
4.	Penetrating wound	5	2.0
5.	Firearm wound	19	7.6
6.	No injury	11	4.4
Total		250	100

Table 6: Head Injury: Fracture of Skull Bones

S. N.	Skull bones fracture	Cases	Percentage
1.	Frontal alone	09	3.6
2.	Parietal alone	33	13.2
3.	Frontal & Parietal	16	6.4
4.	Temporal alone	19	7.6
5.	Parietal & Temporal	97	38.8
6.	Frontal & Temporal	18	7.2
7.	Frontal, Parietal & Temporal	25	10.0
8.	Occipital alone	10	4.0
9.	Temporal + Occipital	08	3.4
10.	Parietal, Temporal & Occipital	10	4.0
11.	No fracture	07	2.8
Total		250	100

Table 5: Site of injury (fracture) on skull

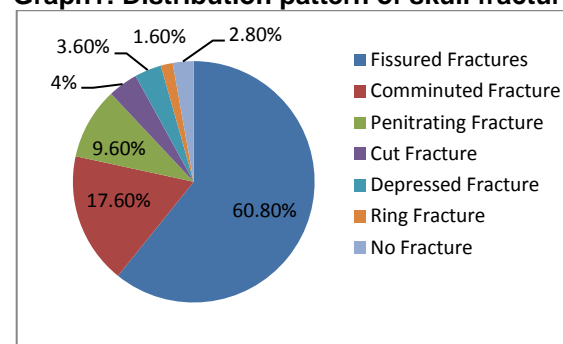
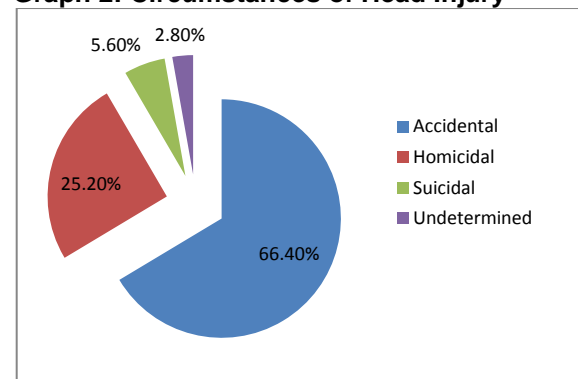
S. N.	Site of Injury	Cases	Percentage
1.	Vault	178	71.2
2.	Vault and Base	57	22.8
3.	Base	08	3.2
4.	No injury	07	2.8
Total		250	100

Table 7: Intra-cranial Hemorrhages

S.N.	Type of Hemorrhage	Cases	Percentage
1.	Extradural	28	11.2
2.	Subdural	51	20.4
3.	Subarachnoid	09	3.6
4.	Extra dual & Subdural	23	9.2
5.	Extradural & Subarachnoid	48	19.2
6.	Subdural & Subarachnoid	42	16.8
7.	Extradural& Subdural & Subarachnoid	40	16.0
8.	No hemorrhage	09	3.6
Total		250	100

Table 8: Injuries on other Parts of Body

S. N.	Parts of the Body	Cases	Percentage
1.	Lower limbs alone	48	19.2
2.	Both Upper & lower limbs	74	29.6
3.	Face	36	14.4
4.	Face, neck & chest	23	9.2
5.	Abdomen & Pelvis	07	2.8
6.	All over	46	18.4
9.	No Injury	16	6.4
Total		250	100

Graph1: Distribution pattern of skull fracture**Graph 2: Circumstances of Head Injury**

Original Research Paper

Study of Fusion of Ischial Tuberosity in Gujarati Population By using Digital X-Ray Method

*Gaurang Patel, **Pankaj Prajapati, **Dharmendra Dodiya, **Bhavik Doshi

Abstract

Forensic Medicine experts have to evaluate age in different medico legal situations, especially when the identity is not known, when the liability and punishment are related to the maturity. The study of epiphysial union of bones is considered a reasonable scientific and accepted method for estimation of age by the courts of law all over the world. The present study was carried out on 150 persons of age group between 17-21 years by using digital X-ray method in the Department of Forensic medicine and Toxicology at Govt. Medical College & New Civil Hospital, Surat. The present study possibly may generate the data giving shorter age intervals of fusion of centers of Ischial tuberosity (as compared to the standard text books or on the other end, may even positively reconfirm the evidential value of current data by using modern technique of digital X-ray). Anyhow, it will contribute to the better procurement and application of justice.

Key Words: Digital X-ray, Ischial tuberosity, Identification, Age Estimation

Introduction:

Estimation of age is an important task for the forensic medicine experts especially in developing countries, when birth records are often not well maintained. Though the general physical development (i.e., height, weight, and secondary sexual character) and eruption and development of teeth are quite reliable data for estimation of age but appearance and fusion of different ossification centers in bones is considered a reasonable scientific and accepted method for estimation of age, by the court of law all over the world. [1]

There are many factors which affect the appearance and fusion of bony centers like environmental, nutritional etc., so it is necessary to follow the latest data available for a particular place for estimation of the age of the population of that area. The Indian population differs widely from the western population in hereditary, dietary & socio-economic factors. Studies done in India are few. All are based on the fusion of ossification centres by using routine X-ray method and not using digital X-rays till now.

The advantages of digital x-rays are increased image quality, clear view and detect anomalies in dark or light areas of the film, highlight certain structures, enhance cortical outlines, change image brightness, magnify the image, no lost or damaged images, reduction of repeat x-rays (reducing the amount of radiation to the patient), no film or chemicals used (cheaper), no processor maintenance or darkroom needed, no need for film filing envelopes or physical storage space as compared to the conventional X-rays.

The present study will consider the nutritional status, socio-economic condition, type of work, height & weight etc. of the person. By comparing the results of this study with the earlier ones, the effect of these factors will be studied.

Materials and Methods:

The present study was conducted in the Department of Forensic Medicine and Toxicology at Govt. Medical College & New Civil Hospital, Surat; for the period of one year from October 2008 to September 2009. This study was carried out on 150 persons between the age group of 17-21 years attending the OPD of hospital. Only those persons who were apparently healthy having age between 17-21 years were selected.

The aim of present study was to finalise the age of epiphysial union in persons of Gujarat state by using digital x-ray method, so only those persons, who were residing in this state, since their birth & having the exact date of birth

Corresponding Author:

*Assistant Professor, Dept. of Forensic Medicine,
GMERS Medical College, Sola, Ahmadabad
E-mail: dr.gaurangp@yahoo.in

**Assist. Prof., Dept. of Forensic Medicine,
Medical College, Vadodara

**Assist. Prof., Dept. of Physiology

**Assist. Prof., Dept. of Anatomy

DOR: 30.11.11 DOA: 25.5.12

with documentary proof like birth certificate, school leaving certificate, S.S.C. mark sheet etc were selected.

Persons suffering from chronic illnesses any nutritional deficiency, endocrinal disorders, having major skeleton disease or any deformity were excluded. Written consent for X-ray was taken from all the subjects. Information for address, handedness, and native of the subject, monthly income, and number of family members, diet, and any habit was taken from the subjects himself.

Their height, weight and sex were recorded. X-ray of the pelvis bone showing Ischial tuberosity, Antero-posterior view was taken by using digital X-ray method and the cassettes was submitted. Radiological assessment of the fusion of Ischial tuberosity was done by reading the X-ray findings of soft copies of X-rays and was grouped according to stage of fusion as follows.

- A) Not Appeared
- B) Appeared
- C) Fused

Comparison of the present study was done with previous studies & critical evaluation of the results was carried out.

Observations:

In the present study we had also included few participants below 17 years and above 21 Years.

• Age and Sex Wise Distribution:

The cases were divided in the various age groups. The age group 17-18 years was considered as those who had completed 17 years and 18 years been not completed, also same for the other three age groups. We have also included few participants below 17 years and above 21 years but below 22 years. Majority of the participants were males and belonged to the age group between 19-20 Years (34 %) followed by 20-21 Years (34 %), 18-19 Years (21.3 %) and 17-18 Years (9.3 %). (Table 1)

• Distribution of Fusion of Ischial Tuberosity in Males & Females:

Majority of male participants showed complete fusion at the age 20-21 years and the majority of female participants had complete fusion at the age of 19-20 Years. (Table 2)

• Effect of Diet on Fusion of Ischial Tuberosity:

In the present study it was observed that, out of total 150 persons, 87(58%) were vegetarian and 63(42%) were non vegetarian and the observed difference between age group and diet in relation to fusion of Ischial tuberosity was statistically non significant. (Table 3)

• Occupation and Fusion of Ischial Tuberosity:

As per occupation they were divided into three groups, like Mild workers, Moderate workers and Heavy workers. Mild workers (7.4%) were those who were at home (2.7%) and housewives (4.7%). Moderate workers (77.4%) were those who were students (68.7%), compounder (0.7%), fine workers (7.3%) and watch man (0.7%). Heavy workers (11.4%) were those who were hard worker (0.7%) and laborers (10.7%). In our study majority of participants were students 103 (68.7%). (Table 4)

In the present study to know the association between type of occupation and age group in relation to fusion of Ischial tuberosity, age was divided in two groups i.e. <19 Yrs and >19 years. Chi-square χ^2 test was applied & it was observed that, difference between age group and occupation in relation to fusion of Ischial tuberosity was statistically non significant both in males and females.

• Socio-Economic Class and Fusion of Ischial Tuberosity:

According to modified Prasad classification, the subjects were distributed into five socio economic classes on the basis of their family income and no. of persons in that family. [2] it was observed that the majority of participants belonged to SE Class 1: 55(36.7%), followed by SE class 4 : 34(22.7%), SE class 2 : 32(21.3%), SE class 3 : 25(16.17%) and in the last SE class 5 : 4(2.7%).

In this study, to know the effect of socio economic class on fusion of Ischial tuberosity, the SE class were divided in two groups the upper class (class 1, 2 and 3) and Lower class (class 4 and 5) & the Age was divided in three groups <19 Yrs, 19-20 Yrs. And >20. It was found that, the relation between the age group and SE class was statistically non significant both in males and females. (Table 5)

• Body Mass Index (BMI) and Fusion of Ischial Tuberosity:

Out of total 150 persons 103 (68.7%) were averagely built, 38 (25.3%) were good and 9 (6%) were poorly built and nourished. It was observed that, the age group and Basal metabolic index in relation to fusion of Ischial tuberosity was statistically non significant It was observed that the fusion of Ischial tuberosity had no association with Height and Weight, also calculated in both males and females. (Table 6)

Discussion:

In the present study, the effect of various factors like socioeconomic status,

height, weight, basal metabolic rate, nutritional status, occupation on the fusion of Ischial tuberosity was studied.

It was found that, the fusion of Ischial tuberosity occurs at 20-21 years in males and at 19-20 years in females. As shown in the table our findings are very much in accordance with that of William Bilkey, Ch. Sangma et al and R. K. Gupta et al (Kanpur) findings except that they not found any discrimination of fusion in males and females. [4, 5] William Bilkey Ch. Sangma et al and our study have shown concurrent findings in that respect, i.e. as the age increases the degree of fusion also increases.

Other researcher has not studied the effect of diet on fusion of Ischial tuberosity except our study shown no effect. Kothari D.R. in Rajasthan and our team over here are the only who had tried to find out the effect of nature of occupation on fusion based on the assumption that higher metabolic rate in people engaged in work requiring more physical activity, may lead to early/late fusion, although we did not find any such association. [6] (Table A)

In the case of study of relationships of socio economic class with fusion of Ischial tuberosity, only we and Kalpesh shah et al studied under the assumption that higher socio economic class will lead to better nutrition and hence may cause earlier fusion but no such relationship was found in any of the study. [7]

Contrary to the widely believed/proved facts that dwarfs are because of earlier fusion of epiphysal plates, we did not find any association between height, weight and fusion, contrary to this Kalpesh shah et al found that epiphysal union occurred earlier in taller subjects. [7] All the studies like Kothari D.R. in Rajasthan, along with our study all are well in accordance with each other, i.e. there is no great disparity in ossification of iliac crest between the both sides of the same individual. [6]

Conclusions:

The complete fusion of Ischial tuberosity occurs at the age of 19-20 years in the females and 18-19 years in the males of Gujarat State population. The fusion of Ischial tuberosity occurs one year earlier in females than in the males. The fusion of Ischial tuberosity is bilaterally symmetrical. In the present study there is no association of fusion of Ischial tuberosity with diet, occupation, socio economic class, height and the weight of person in both males and females.

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Plate 1: X-Ray of Seventeen year Old Boy Showing the Not Appeared Ischial Tuberosity



Plate 2: X-Ray of Nineteen-Year-Old Boy Showing the Fusion of Ischial Tuberosity



Plate 3: X-Ray of Seventeen-Year Old Girl Showing the Appearance of Ischial Tuberosity



Plate 4: X-Ray of Eighteen-Year and Eleven Months Old Girl Showing the Fusion of Ischial Tuberosity



Table 1: Age & Sex Wise Distribution

Age Groups	SEX		TOTAL
	Females	Males	
<17 Yrs.	3(7.1%)	7(6.5%)	10(6.7%)
17-18 Yrs.	3(7.1%)	11(10.2%)	14(9.3%)
18-19 Yrs.	13(31.0%)	19(17.6%)	32(21.3%)
19-20 Yrs.	15(35.7%)	36(33.3%)	51(34.0%)
20-21 Yrs.	7(16.7%)	32(29.6%)	39(26.0%)
21- 22 yrs.	1(2.4%)	3(2.8%)	4(2.7%)
Total	42	108	150

Table 2: Distribution of Fusion of Ischial Tuberosity in Males & Females

Age Group	Not Appeared		Appeared		Fused		Total	
	Males	Females	Males	Females	Males	Females	Males	Females
<17 yrs.	4(57.14%)	0	3(42.85%)	2(66.66%)	0(0.0%)	1(33.33%)	7	3
17-18Yrs.	4(36.36%)	0	4(36.36%)	3(100%)	3(27.27%)	0	11	3
18-19Yrs.	3(15.78%)	1(7.69%)	8(42.10%)	10(76.92%)	8(42.10%)	2(15.38%)	19	13
19-20Yrs.	4(11.11%)	0	12(33.33%)	2(13.33%)	20(55.55%)	13(86.66%)	36	15
20-21Yrs.	0(0.0%)	0	10(31.25%)	0	22(68.75%)	7(100%)	32	7
<22 Yrs.	0(0.0%)	0	0(0.0%)	0	3(100%)	1(100%)	3	1
TOTAL	15(13.88%)	1(2.38%)	37(34.25%)	17(40.47%)	56(51.85%)	24(57.14%)	108	42

Table A

Ischial tuberosity	Pratik Patel(Gujarat)		William Bilkey Ch. Sangma et al	R. K. Gupta(Kanpur)		Present study	
	Males	Females		Males	Females	Males	Females
Appearance	16-17 yrs.	16-17 yrs.	—	17 yrs.	15 yrs.	—	—
Fusion	21-22 Yrs.		21 yrs.	20 yrs.		20-21 yrs.	19-20 yrs.

Table 3: Effect of Diet on Fusion of Ischial Tuberosity

Age Group	Vegetarian	Non- Vegetarian	complete Fusion (Total)
<19 yrs.	11	4	15
>19 Yrs.	40	25	65
TOTAL	51	29	80

Table 4: Occupation and Fusion of Ischial Tuberosity

Age Group	Mild workers	Moderate workers	Heavy workers	complete Fusion (Total)
<19 yrs.	1	10	1	12
>19 Yrs.	9	50	9	68
TOTAL	10	60	10	80

Table 5: Socio-Economic Class and Fusion of Ischial Tuberosity

SE CLASS	NO.OF PERSONS	PERCENT
1	55	36.7%
2	32	21.3%
3	25	16.7%
4	34	22.7%
5	4	2.7%
Total	150	100.0%

Table 6: Body Mass Index (BMI) and Fusion of Ischial Tuberosity

General Built & Nourishment	Persons	Percent
Good	38	25.3%
Average	103	68.7%
Poor	9	6.0%
Total	150	100.0%

Original Research Paper

Sexual Dimorphism among the Wormian Bones In Adult Human Skulls

*Manjula Patil, **Santosh Sheelavant

Abstract

This study was aimed at evaluating the sexual dimorphism with respect to overall incidence, number and location of wormian bones. Adult dry human skulls (n=180) of known age and sex available in the Department of Anatomy, St.John's Medical College, Bangalore were included in the study. Overall incidence of wormian bones was more in female (64.80%) than in male skulls (40.20%). They occurred more frequently at lambdoid suture (60%). Wormian bones along the coronal suture and at bregma were seen only in male skulls, while intra- orbital wormian bones were seen only in female skulls. Wormian bones along the sagittal suture showed sexual dimorphism (27.78%, $p=0.045$) while at lambda and lambdoid suture showed a good discriminating power of 17.65% ($p=0.087$) and 21.43% ($p=0.089$) respectively. This study concludes by stating that, there exists a moderate degree of sexual dimorphism among the wormian bones with respect to overall incidence, number and location.

Key Words: Skull; Sexual dimorphism; Wormian bones; Sutural bones; Ossicles

Introduction:

The Wormian bones or Sutural bones or Ossicles are islands of small bones found at the sutures of the skull. [1] They are unnamed bones because they vary from person to person in number and shape. [2] The first description of sutural bones is attributed to Paracelsus (1460 to 1541 CE [Common Era]); however, "wormian bone" is named after Olaus Worm, a Danish anatomist who described them in a letter to Thomas Bartholin in 1643. [3]

Factors Responsible For the Formation of Wormian Bones:

Wormian bones are present in both normal and abnormal cases. They can be found as normal variants and seem to be determined genetically in certain populations. [4]

1. Artificial cranial deformation:

The frequency was found to be more among the artificially deformed skulls. [5]

2. Adaptation to cranial enlargement:

According to Jeanty et al [3] the number of wormian bones increases with the capacity of the skull, regardless of the cause of enlargement.

A similar relationship exists with the total length of sutures, greater the sutural length of a skull greater the number of wormian bones. He suggests that sutural diastasis induces the formation of ectopic ossification centres. Barberini F et al [6] opined that the formation and distribution of supernumerary ossicles may reflect different stress types (tension, pressure, etc.), acting on the cranial vault during late prenatal and early postnatal periods of bone growth.

3. Genetic factors:

Torgerson [7] reported that, the wormian bones are inherited as a dominant trait with incomplete penetrance (50%) and variable expression. According to Barberini F et al [6] their formation might be under the control of a number of genes with additive action (polygenic complex) and their phenotypic expression is conditioned by developmental thresholds.

4. Metabolic disorders:

Hess [7] proposed that the formation of wormian bones could result from metabolic disorders of the mesoderm.

Significance of Wormian Bones:

In the 16th century, the anatomists Andernach and Vesale were the first to associate wormian bones with cerebral disorders. [8] Although the exact mechanisms responsible for the formation of wormian bones are unknown, some studies have shown that their presence may serve as a marker for the identification of anomalies of the central nervous system. When wormian bones occur as a

Corresponding Author:

*Assistant Professor, Department of Anatomy
S. N Medical College, Bagalkot-587102
Email: drmanjulapatil@gmail.com

** Assist. Prof., Dept. of Forensic Medicine
DOR: 16.12.11, DOA: 22.5.12

normal variant, they tend to be smaller and less numerous than when they are associated with skeletal dysplasias. [4] Pryles CV and Khan AJ [8] reported the prevalence of central nervous system abnormalities in a population with wormian bones varies from 93% to 100% in a random group and reaches 100% in a mentally retarded population.

It is important to know about these bones because they can mislead in the diagnosis of fracture of skull bones. [2] The prevalence of wormian bones was reported by various authors. But distinctive sexual dimorphism among the wormian bones is not evident. Thus, this study aimed at evaluating the possible existence of sexual dimorphism among the wormian bones with respect to overall incidence, number and location.

Material and Methods:

Well preserved 180 dry human adult skulls available in the Department of Anatomy, St.John's Medical College, Bangalore were included in the study. Aging and sexing [9, 10] was done using standard methods.

Table1: Distribution of age and sex grouped skulls

Age grps (yrs)	Male (n=92, 51.11%)	Female (n=88, 49.11%)	Total (n=180, 100%)
20-45	18(19.56%)	18(20.45%)	36(20%)
27-52	42(45.65%)	21(23.86%)	63(35.0%)
30-57	34(36.94%)	17(19.31%)	51(28.30%)
40- >60	19(20.64%)	11(12.49%)	30(16.70%)

All skulls were looked for the presence of wormian bones. Then, the number of wormian bones per skull and also the location of the wormian bones at Bregma, Lambda, Pterion, Asterion (Fig.1), Parietal notch, Occipito-mastoid notch, Intro-orbital ossicles and along the coronal, sagittal, lambdoid (Fig.2) and squamous sutures(Fig. 1) were noted.

Descriptive and Discriminate Functional Analysis were applied to test for the sexual dimorphism with respect to overall incidence, number and location of wormian bones in gender and age grouped skulls.

Results:

The incidence of wormian bone is more among the female skulls (64.80%). (Table 2)

Single wormian bone was seen in 26 (14.4%) skulls with equal distribution among male and female skulls, while 5 wormian bones were seen in 7(3.90%) skulls with more frequency in female skulls 6(6.80%). (Table 3)

Wormian bones occurred more frequently at lambdoid suture 56(60%) with incidence of 22(39.3%) in male skulls and 34 (60.7%) in female skulls. Wormian bones along the coronal suture and at bregma seen only in

male skulls, while intra- orbital seen only in female skulls. (Table 4)

Fig. 1: Wormian Bones along the Squamous Suture and at Asterion

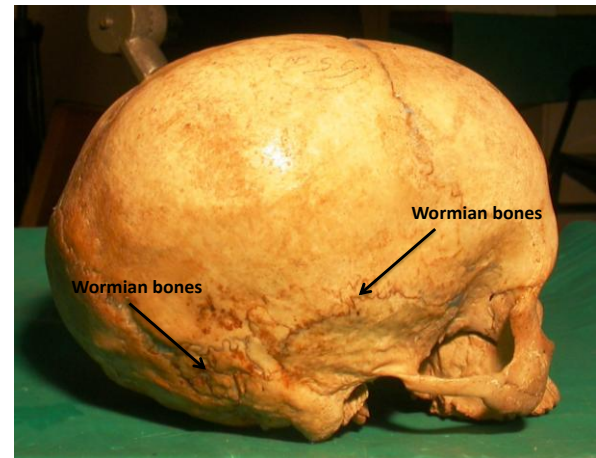
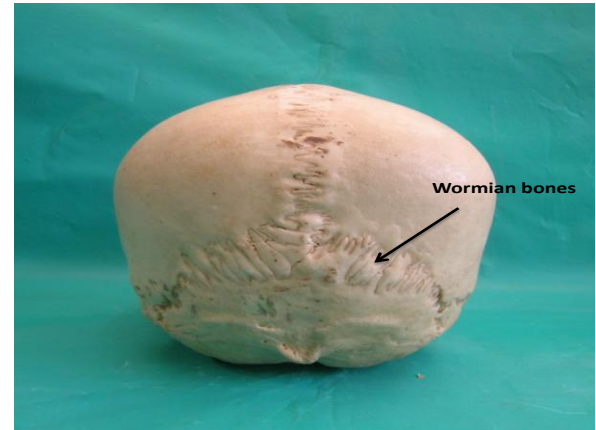


Fig. 2: Wormian Bones along the Lambdoid Suture



Wormian bone at lambda showed a discriminating power of 17.65%, with P value (0.087) suggestive of sexual dimorphism in the age group of 40 - >60 years. Ossicle at lambdoid suture also showed a discriminating power of 21.43%, with P value (0.089) suggestive of sexual dimorphism. Ossicle at sagittal suture showed a very good discriminating power of 27.78%, with P value (0.045) suggestive of moderate sexual dimorphism. (Table 5)

Discussion:

Wormian bones are seen in both normal and abnormal individuals. Wormian bones at different locations carry different significance. Pryles CV and Khan AJ [8] studied incidence and significance of Wormian bones (WBs) in a random group of infants and children. According to these authors, the prevalence of central nervous system abnormalities in a population with wormian bones varies from 93% to 100% in a random group and reaches 100% in a mentally retarded population. Thus, the presence of WBs is almost invariably associated with abnormal

development of the CNS and may serve as a useful marker for the early identification and treatment of the affected infant or child.

- **At Bregma**

The wormian bone at bregma is certainly a rare occurrence. Brasili P [11] reported that wormian bone at bregma is more frequent in male skulls which co-relates with the present study.

- **At Pterion**

A wormian bone at pterion is called "pterion ossicle" or "epipteric bone" or Flower's bone. Incidence of epipteric bone is high in Indians – 11.79%. [12] Presence of wormian bone at pterion may pose problem in making the burr holes. Mwachaka PM et al [13] studied the sutural morphology of 90 human skulls of known gender (51 male, 39 female) in Kenya and they reported epipteric bones in 6.7% which occurred more in females and this co-relates with the present study with an incidence of 12.22%.

- **At Lambda**

A possible explanation given to the occurrence of this bone is that the interparietal part of the squamous occipital bone above the highest nuchal line develops in membrane, usually from two pairs of centres. [14] Brasilli P [11] reported higher incidence of wormian bone at lambda in male skulls which is in contrast with our study where the incidence is more in female skulls ($p=0.087$).

- **At Asterion**

Brasilli P [11] and Hanihara et al [15] reported that the incidence of wormian bone at asterion is more in male skulls which co-relates with the present study ($p=0.327$).

- **At Parietal Notch**

Brasilli P et al [11] (Sassari sample) and Hanihara et al [15] reported more frequency of wormian bones among male skulls while in the present study incidence was 2.77% of skulls with no sex difference.

- **At Occipito-mastoid Notch**

In the present study, the incidence of wormian bones at Occipito-mastoid notch was 7.22% with no sex difference which co-relates with that of Hanihara T et al. [15]

- **Along the Coronal Suture**

In the present study, the incidence of wormian bones along the coronal suture was 0.55% with no sex difference while Brasilli P [11] reported incidence of 3% with more frequency among male skulls.

- **Along the Sagittal Suture**

Brasilli P et al [11] reported more frequency of wormian bones along the sagittal

suture in male skulls in Ozieri sample but in the present study, the incidence was 5.55% and more among female skulls.

- **Along the Lambdoid Suture**

Wormian bone along the lambdoid suture is more common. The sutural bone at lambdoid suture is also termed as preinterparietal bone or inca bone. The presence of series of wormian bones may lead to problems in posterior approach to the cranial cavity. These bones might lead to confusions in interpretation of the radiographs in case of head injuries. The multiple wormian bones may be mistaken for multiple fractures. [2]

Brasilli P et al [11] reported an incidence of 50.55% with more frequency among male skulls ($p=0.649$) while the present study showed an incidence of 2.5% with no sex difference.

- **Along the Squamous Suture**

Brasilli P et al [11] reported an incidence of 9.5% with more frequency among female skulls (Sessari sample) while the present study showed an incidence of 2.7% with no sex difference.

- **Intra-orbital Wormian Bones**

In the present study intra-orbital wormian bones were seen in 5% of skulls and seen solely in female skulls.

Conclusion:

The overall incidence of wormian bones was 52.22%. Incidence of wormian bones was more in female skulls (64.80%). Wormian bones occurred more frequently at lambdoid suture 56(60%) with incidence of 22(39.3%) in male skulls and 34 (60.7%) in female skulls. Wormian bones along the coronal suture and at bregma were seen only in male skulls, while intra- orbital ossicles were seen only in female skulls. Wormian bones along the sagittal suture showed sexual dimorphism (27.78%, $p=0.045$) while at lambda and lambdoid suture showed a good discriminating power of 17.65% ($p=0.087$) and 21.43% ($p=0.089$) respectively. Thus, there exists a moderate degree of sexual dimorphism among the wormian bones with respect to the overall incidence, number and location.

Acknowledgements:

1. Dr. Sanjeev Kolagi, Associate professor, Department of Anatomy, S N Medical College, Bagalkot
2. Dr. Anita Herur, Associate professor, Department of Physiology, S N Medical College, Bagalkot

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Table 2: Overall Incidence of Wormian Bone in Male and Female Skulls

SEX	PRESENT	ABSENT
Male	37 (40.20%)	55 (59.80%)
Female	57 (64.80%)	31 (35.20%)
Total	94 (52.22%)	86 (47.80%)

Table 3: Number of Wormian Bones in Male and Female Skulls

Wormian Bones (No.)	Total (n=180, 100%)	Male (n=92, 51.11%)	Female (n=88, 48.88%)
0	86 (47.8%)	55 (59.8%)	31 (35.2%)
1	26 (14.4%)	13 (14.1%)	13 (14.8%)
2	17 (9.4%)	7 (7.6%)	10 (11.4%)
3	17 (9.4%)	8 (8.7%)	9 (10.2%)
4	9 (5%)	2 (2.2%)	7 (8%)
5	7 (3.9%)	1 (1.1%)	6 (6.8%)
>5	17(9.44%)	6(6.52%)	12(13.63%)
Total	180	92	88

Table 4: Incidence of Wormian Bones at Different Locations in Male and Female Skulls

Incidence of Wormian Bones	Total	Male	Female
Bregma	1	1(100%)	0(0%)
Lambda	25	8(32%)	17(68%)
Asterion	28	12(42.9%)	16(57.1%)
Pterion	22	7(31.8%)	15(68.2%)
Parietal Notch	5	2(40%)	3(60%)
Occipito-mastoid Notch	13	5(38.5%)	8(61.5%)
Coronal suture	1	1(100%)	0(0%)
Lambdoid suture	56	22(39.3%)	34(60.7%)
Sagittal suture	10	2(20%)	8(80%)
Squamous suture	5	4(80%)	1(20%)
Intra- Orbital	9	0(0%)	9(100%)

Table 5: Sexual Dimorphism among Wormian Bones

Location	20- 45 years		27-52 years		30-57 years		40- >60 years	
	%	P value	%	P value	%	P value	%	P value
Bregma	0.00	1.000	0.00	1.000	0.00	1.000	5.26	1.000
Lambda	11.11	0.658	2.38	1.000	17.65	0.087+	18.18	0.126
Asterion	0.00	1.000	2.38	1.000	5.88	0.673	16.75	0.327
Pterion	11.11	0.691	7.14	0.735	2.94	1.000	0.00	1.000
Parietal notch	5.56	1.000	4.76	0.330	8.82	0.255	0.00	1.000
Occipito-mastoid notch	11.11	0.603	2.38	1.000	11.76	0.107	0.00	1.000
Coronal suture	0.00	1.000	0.00	1.000	2.94	1.000	0.00	1.000
Lambdoid suture	11.11	0.502	21.43	0.089+	2.94	1.000	15.31	0.417
Sagittal suture	27.78	0.045*	0.00	1.000	2.94	1.000	9.09	0.367
Squamous suture	0.00	1.000	4.76	0.330	2.94	1.000	5.26	1.000
Intra-orbital	16.67	0.229	7.14	0.545	5.88	0.330	18.18	0.126

% Percentage of discrimination; + Suggestive significance; * Moderately significant

Original Research Paper

Sex Identification from Cranial Capacity of Adult Human Skulls

*Murli Lalwani, **Jayanthi Yadav, ***Arneet Arora, ***B.P.Dubey

Abstract

Cranial capacity constitutes one of the most important characters for determining the racial differences. However, few studies exist that have evaluated the sexual dimorphism of cranial capacity and its significance in determining the sex of an individual. A craniometric study was conducted to differentiate sex from intracranial volumes of dry human skulls. The study was done on 160 dry human skulls (100 males and 60 females) in the department of forensic medicine, Gandhi Medical College, Bhopal (M.P.), during the year 2005 – 2006. Skulls chosen for the present study were of adult age only. Dry, hard mustard seed of uniform size were used to fill the cranial cavity to determine the capacity. Mean cranial capacity of male skulls was found to be 1302.95 ± 108.8 c.c. (range 1070 – 1560 c.c.), while in female skulls the mean cranial capacity was found 1179.92 ± 97.08 c.c. (range 1000 – 1420 c.c.). A highly significant difference (p value <0.01) was observed between the intracranial volume of male and female skulls were compared. This data is expected to be of Clinical, Forensic, Anthropological and Genetic Importance

Key Words: Cranial Capacity, Sex determination, Human skull

Introduction:

Determination of sex is an important criterion, for identification of an individual for medico-legal purposes. Skull and pelvis assume great importance in establishing sex of an individual. A number of dimensions and indices have been reported to be of valuable indicator in differentiation of male and female skulls.

It is well known that cranial capacity which is in correlation with brain volume reflects the racial characteristics and has been thought to be one of the commonest items in physical anthropological studies. [1, 2] It is most conveniently measured by filling the cavity with shot and measuring the contents in a graduated vessel. The rate of skeletal maturity in males and females vary during the course of growth. The female skull has a capacity about one tenth less than that of the male of the same race. [3]

Cranial capacity has been measured by many workers without differentiating male and female skulls.

Measurement of intracranial capacity was undertaken to determine if it is a significant parameter for gender differentiation. Thus, the present study was an effort for determination of sex from cranial capacity.

Materials and Methods:

The craniometric study for determination of sex from dry human crania was done in the department of Forensic Medicine Gandhi Medical College, Bhopal (M.P.), during the year 2005-2006. All the skulls used for the study were of adults. Only the intact, undamaged skulls with known sex and without any injury, pathology or congenital anomaly were selected for the study. Of the total 160 skulls studied 100 were male skulls and 60 were female skulls

The criteria to decide the skull of adult age was dental examination and suture closure between basiocciput and basisphenoid; and the records available in the department. The most elderly skulls in which skull vault suture were showing complete closure were excluded.

Dry, hard mustard seed of uniform size were used to fill the cranial cavity to determine the capacity. First the orbital fissures and major foramina of skull are plugged with cotton to rule out the possibility of slippage of seeds. Next through a glass funnel placed in the foramen magnum, mustard seeds were poured in quantity to fill the cavity about half full, and then given a vigorous shaking, so as to get the seeds settle into frontal part of the skull; then the cavity

Corresponding Author:

*Assistant Professor,
Dept. of Forensic Medicine and Toxicology,
Gandhi Medical College, Bhopal
E-mail: drmurli_30@yahoo.co.in

**Assoc. Prof.

***Prof. & Head, Gandhi Medical College, Bhopal

***Prof., Chirayu Medical College, Bhopal

DOR: 15.5.11 DOA: 19.11.12

is filled up with more seeds up to the rim of the foramen magnum while shaking the skull from time to time, the seeds are pressed gently with the right thumb at the foramen magnum, lightly shaken and tapped. This process is repeated on until, the entire cavity is filled up with seeds and there is practically no more seed could be poured into it.

After the filling process is finished, the seeds were poured from the skull into a glass jar, and from there through a glass funnel into the glass cylinders, of 500 cc capacity each. The process of shaking and tapping then went on with the cylinders as with skulls, until the subsidence of the seeds appears to come to an end, and the volume is then read on the measuring glass cylinder.

The data obtained was analysed statistically to find out the range, the mean and standard deviation. The 'p value' was determined to find out whether the sexual differences between means were significant or not. These measurements were used to study sexual dimorphism in the skulls. The observations were statistically computed and 'Z' test was used to measure the level of significance for determination of sex.

Observations and Results:

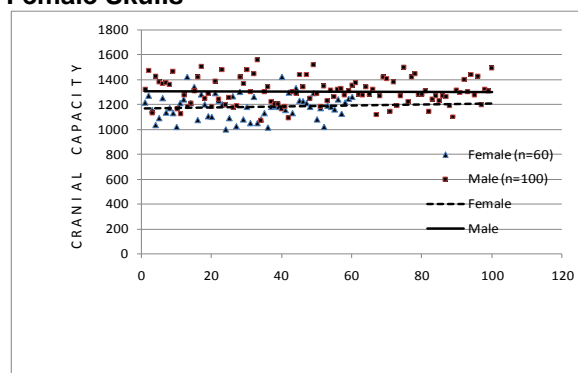
In the present study cranial capacity for male skulls varied from 1070-1560 cc with a mean of 1302.95 cc. For female skulls it was found to be between 1000-1420 cc with a mean of 1179.92 cc. 'Z' test value suggests a significant difference in the cranial capacity between male and female skulls.

Table 1: Range, Mean and Standard Deviation of Cranial Capacity in male and female skulls

S. No.	Parameter	Male (n=100)	Female (n=60)
1	Range	1070-1560 c.c.	1000-1420 cc
2	Mean	1302.95 c.c.	1179.92 cc
3	S.D.	108.08	97.082
4	Mean + 3 S.D.	978.71 – 1627.19	888.67 – 1471.17

Z test: 7.43 p<0.01 Inference – Highly Significant

Graph 1: Cranial Capacity (in cc) of Male & Female Skulls



Sexual Dimorphism Index of Cranial Capacity:

$$= \frac{\text{Male mean capacity} - \text{Female mean capacity}}{\text{Male mean capacity}} \times 100$$

$$= \frac{1302.95 - 1179.92}{1302.95} \times 100$$

$$= 9.44$$

Discussion:

In the present study done on 100 male and 60 female skulls the mean cranial capacity of male skulls was observed to be 1302.95 ± 108.8 C.C. (range 1070-1560 C.C.) and those of female skulls to be 1179.92 ± 97.08 C.C. (range 1000 – 1420 C.C.).

The sexual dimorphism in cranial capacity of male and female skulls found highly significant as the z test was 7.43 (p < 0.01).

Skulls may be classified according to their capacities (Henry Gray 1918) as follows:

1. **Microcephalic:** with a capacity of less than 1350 c.c. - e.g., those of native Australians and Andaman Islanders.
2. **Mesocephalic:** with a capacity of from 1350 c.c.-1450 c.c.-e.g., those of African Negroes and Chinese.
3. **Megacephalic:** with a capacity of over 1450 c.c.-e.g., those of Europeans, Japanese, and Eskimos. [4]

In the present study it was observed that, on the basis of overall mean cranial capacity of both sexes taken together (1256.81 cc) the skulls could be grouped as microcephalic. Classifying on the basis of cranial capacity of skulls individually a large number of skulls (68% male and 96.67% female skulls) was microcephalic. However 23% male and 3.33% female skull were mesocephalic while 9% male and no female skulls were megacephalic.

Cranial capacity has been measured by different methods in various studies. Calculation of cranial capacity from length, breadth and height of cranium is done using various formulae, but the methods are not considered to be very accurate. Direct measurement by filling the cranial capacity with lead shots, mustard seeds, etc and then pouring out into measuring flask is considered most accurate method. Several investigators have estimated the cranial capacity in the past. [5-7] Most of these studies were done on the dry skulls and used: linear dimensions, packing methods or radiological methods. [7-10]

Many of these studies showed that the cranial capacity accompanied increasing age

from birth throughout childhood. Most growth is achieved in the first 5 years. At the age of 16-20 the cranial capacity reaches its peak size. The cranial capacity of skulls belonging to different races has been determined by several authors. [2, 11-13]

According to some Indian studies the cranial volume of adult crania has been found to vary between 950 cc – 1520 cc. [14-16] Pal, Bhagawat and Routal in their further studies of 370 Gujarati (Indian) Crania have estimated the cranial volume as ranging from 1030-1620 cc (Mean: 1252 ± 112.84). [17]

In a recent study by Gohiya et al on cranial capacity in male and female population of Madhya Pradesh was reported to be as 1380.52 ± 94.63 cc and 1188.75 ± 91.16 cc respectively. The findings in this study are comparable with the present study. [1]

Manjunath KY observed that the mean cranial volume by Lee Pearson's formula was 1152.815 ± 279.16 cc in males and 1117.82 ± 99.09 cc in females. By using Spheroidal formula, values were 1169.68 ± 239.98 cc in males and 1081 ± 111.6 cc in females. This difference may be because the cranial capacity in this study was derived from the formula based on linear dimensions of the skull. [11] Chaturvedi and Harenja reported that the average cranial capacity in dry skulls of Indian origin was 1296.6 ± 13.88 cc. [18]

According to Hwang et al report, the cranial volume was 1470 ± 107 cc in males and 1317 ± 117 cc in female skull. [2] Gopalipour et al reported cranial capacity of the Turkman was 1420.60 ± 85 cc in male and 1227.2 ± 120 cc in females, and in native Fars group in male and female were 1369.4 ± 142 cc and 1215.8 ± 125 cc, respectively. [12] Also, Dekaban reported cranial volume of 1548 cc in males and 1425 cc in females. [9] Hooton (1926) observed that the racial characteristics are best defined in the skull, cranial capacity being one of the most important parameters for determining the racial difference. [19] Frazer (1946) observed that the adult cranial capacity varies from 1000 cc to 1800 cc with an average of about 1400 cc. [20]

Routal et al. observed that the endocranial volume progressively increases with the increase in area of foramen magnum, but after certain limits endocranial volume becomes almost constant irrespective of further rise in area of foramen magnum. [16]

Acer et al estimated the cranial capacity in the male and female students of the Mugla University, Mugla, Turkey. By using linear dimensions of head, the mean cranial capacity and SD in males and females were found to be

1411.64 ± 118.9 cc and 1306 ± 162.9 cc, respectively. He found that there was a significant difference between genders ($p < 0.05$). However in our study this difference was highly significant. ($p < 0.01$) [21]

In a study conducted on Sri Lankan population by Ilayperuma the mean cranial capacities of the male and female subjects were 1421.12 ± 171.69 and 1300.95 ± 158.18 respectively. He also reported a statistically significant difference between the sexes ($p < 0.05$). [13]

Sexual dimorphism is a vital component of the morphological variation among biological populations. [4,13] The index of sexual dimorphism in the present study was shown to be higher than that of the Sri Lankans (8.46%) and Caucasians: (7.95%) and lower than the Koreans: 10.3%; Turkmen: 13.61%; Native Fars: 11.22%; and Turkey population: 10.06% (Hwang et al.; Dekaban,; Gopalipour et al., 2005; Acer et al., 2007a). [2, 9, 12, 21] The sexual differences in cranial dimensions emphasize the significance of applying the anatomical variation data to an individual subject in a given population.

Furthermore, the importance of sexual determination in personal identification cannot be over emphasized in medico-legal and anthropological studies, particularly when the body is recovered in an advanced stage of decomposition.

Summary and Conclusion:

In Forensic investigation sex determination is an irrefutable criterion for identification in advanced decomposition state/ skeletal remains. The bisexual variation of cranial capacity was observed in the present study. Mean cranial capacity of male skulls was found to be 1302.95 ± 108.8 c.c. (range 1070–1560 c.c.), while in female skulls the mean cranial capacity was found 1179.92 ± 97.08 c.c. (range 1000 – 1420 c.c.). Using proper statistical methods the difference in the cranial capacity of male and female skulls was found to be highly significant thus it can be inferred that the cranial capacity is found to be a reliable craniometric method for sex identification.

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Original Research Paper

Study of Coronary Artery Atherosclerosis in Sudden Deaths and Its Medico-legal Relevance

*Anoop Kumar Verma, **Sanjeet Kumar, ***Navneet Kumar, **Rakesh Kumar Verma, **Mousmi Singh

Abstract

The coronary artery diseases can play a crucial medico- legal role to decide the cause of sudden death whether natural or unnatural. There are certain occasions, when a person dies on the operating table or soon after surgery, and a coronary attack is probably the cause of death. A final coronary episode may sometimes be associated with an operative procedure supposedly due to hypotensive state. During driving or piloting a person may go into a state of confusion because of heart attack. In this state he may lose control and an accident can happen. These conditions indicate that intervention of Forensic Pathologist is significant to decide the actual cause of death apart from injury or disease of vital organs. We examine coronary arteries for atherosclerotic changes in 50 cases of sudden deaths. We observed that there were marked intimal thickening with luminal narrowing $\leq 75\%$ of luminal diameter in 20 cases (40%) in total hearts. In natural deaths 17 cases (48.57%) showed luminal narrowing $\leq 75\%$ of luminal diameter. These findings are suggestive of medico legal intervention to clarify the mode of death in some instances.

Key Words: Coronary Artery Disease, Atherosclerotic changes, Sudden Death

Introduction:

Coronary artery diseases constitute the most important single disease state that is likely to become a serious cause of disagreement on either side of the bench, in a court of law. When an apparently normal healthy individual, dies all of a sudden, more so in the absence of any medical examination before his death, innumerable doubts may erupt up in the minds of not only the family physician and close relatives but also of the enquiring police officers.

The medico-legal opinion may be asked about the state of coronary artery in sudden death in road accidents, operations, and occupational diseases. Coronary artery disease is responsible for over 70% of sudden cardiac deaths. In the young, the primary cause of death is the non-atherosclerotic coronary abnormalities. [1] In the older patients; the most prevalent cause is atherosclerotic Coronary disease.

Among athletes, the occurrence of sudden death is calculated at 0.46 deaths per 1 lakh athletes per year. [2] Although most of these are incidental with little clinical relevance, a number do present with cardiac symptoms and tragic sudden death. The present study was undertaken to determine the pattern of postmortem pathology with special reference to atheromatous lesions in coronary arterial systems, to see the burden of atherosclerotic disease in sudden deaths.

Material and Methods:

The study was conducted on human hearts at Department of Forensic Medicine & Toxicology and associated Mortuary, C.S.M., Medical University, Lucknow, during September 2008 to August 2009. The Cases included 50 hearts of both sexes in between the age group 30-60 years, having history of deaths due to natural as well as unnatural causes (accidental, suicidal, homicidal, etc.), brought to the mortuary of the department within 12 hours of death, for the autopsy examination.

Decomposed bodies were excluded from the study. The Hearts were dissected out with a portion of ascending aorta from fresh bodies (within 12 hours after death) on which postmortems were conducted at the department mortuary. Each heart was then thoroughly washed to get rid of the blood clots from its chambers and weighed. The specimens were then fixed in 10% formalin solution for 2-5 days.

Corresponding Author:

***Professor, Department of Anatomy
C.S.M. Medical University, Lucknow (U.P.) India
Email navneetchauhan@hotmail.com

*Assoc. Prof, Dept. of Forensic Medicine & Toxicology

**Lecturer, Dept. of Forensic Medicine & Toxicology

B.R.D. Medical College, Gorakhpur, (U.P.) India

**Lecturer, Dept. of Anatomy

**Lecturer, Dept. of Forensic Medicine and Toxicology

DOR: 26.11.11 DOA: 27.5.12

The degree of atherosclerosis was taken as the percentage of the cross-sectional area of occlusion of the lumen at the maximum point of occlusion of the respective artery.

Identified segments of the coronary arteries viz. left anterior descending coronary artery, left circumflex artery and right coronary artery were sectioned at 3-mm intervals and stained with Haematoxylin & Eosin and examined microscopically at 40x magnification then each section was examined; the intimal changes, atherosclerotic changes and approximate luminal narrowing (in percentage of luminal area) were noted.

Observations:

Out of total 50 cases studied, the manner of death was Natural in 35 cases, Accidental in 7 cases, Suicidal in 5 cases and Homicidal in 3 cases.

Out of all these cases, 10 cases (20%) showed, no any pathological lesions, 8 cases (16%) showed minimal intimal thickening with luminal narrowing of $\leq 25\%$ of luminal diameter, 12 cases (24%) showed luminal narrowing $\leq 50\%$ of luminal diameter, in 20 cases (40%) there was marked intimal thickening with luminal narrowing $\leq 75\%$ of luminal diameter.

Out of 35 cases of natural deaths, 17 cases (48.57%) showed marked intimal thickening and luminal narrowing $\leq 75\%$ of luminal diameter, 8 cases (22.86%) showed luminal narrowing $\leq 50\%$ of luminal diameter, in 5 cases (14.29%) of natural death there was luminal narrowing $\leq 25\%$ of luminal diameter. In accidental, suicidal and homicidal deaths, the luminal narrowing was found $\leq 75\%$ in one, two and none of cases, $\leq 50\%$ luminal narrowing in two, one, one case and $\leq 25\%$ luminal narrowing was present in two, none, and one case respectively. (Table 1)

Discussion:

Death due to Coronary disease, accounted for nearly 50 percent deaths in Ireland (3). These deaths constituted 33.2 percent of autopsies performed by Osborne in 1967. (4) 2,709 fatalities among road users, arising from a total 59,164 accidents resulting in injury or death from year 1983 to 1992 in Singapore, showed that 1,134 and 904 deaths involved drivers of motor vehicles and motorcyclists respectively. In 13 cases of former and 2 of latter, death was deemed to have occurred naturally as a consequence of ischemic heart disease. [5]

Autopsies performed on casualties of the Korean War revealed coronary artery involvement in 77.3% of the hearts studied, and

data after the Vietnam War noted the presence of atherosclerosis in 45% of casualties with severe disease in 5%. One hundred eleven victims of non cardiac trauma underwent pathologic examination of their coronary arteries to estimate the presence and severity of coronary atherosclerosis.

Signs of coronary atherosclerosis were seen in 78.3% of the total study group. [6] Sudden coronary death (SCD) in older individuals is generally associated with extensive coronary atherosclerosis, although it may be the first manifestation of ischaemic heart disease. In younger age-groups, SCD may occur in the presence of less severe disease. Victims of SCD had significantly more in major coronary arteries per subject with luminal area narrowing $>$ or $= 75\%$. Arterial thrombosis, most often with underlying plaque rupture was the mechanism of SCD in $> 80\%$ of the cases. Considering histological sections with $>$ or $= 50$ and with $>$ or $= 75\%$ area stenosis. [7]

Our observations also support higher prevalence of coronary atherosclerosis is in non cardiac trauma. We found luminal narrowing $\leq 75\%$ of luminal diameter in 40% cases of sudden deaths. In natural deaths severe coronary intimal thickening was present in 48.57% cases.

In other words a large number of medico legal autopsy examinations reveal higher percentage of coronary artery disease in a symptomatic person also.

Instances are on the record, where a person, experiencing an impending heart attack, goes into a state of confusion, before losing consciousness, and may lose control of the vehicle that he may be driving, or aircraft he is piloting, resulting in disorders. Whether an accident by itself can cause coronary occlusion is disputed. There is no hesitation to state that atherosclerosis cannot be caused by an accident. Similarly, one can rarely accept that coronary disease is aggravated by an injury.

In cases of litigation for compensation purposes, the quantum of damage suffered by the victim due to trauma has to be carefully assessed and no misplaced humanitarian consideration should unnecessarily lead to an award of higher damages. It is not uncommon for two experts to disagree in scientific matters, of course, not out of professional jealousy, but due to genuine differences in the prevailing scientific concepts of a given issue in question. Under such circumstances, the judiciary perhaps, has no other choice than to be guided by sheer common sense coupled with the socio-economic and humanitarian factors in evaluation of quantum of compensation to be paid and the

damages to be awarded or in punishing the offender as the case may be: rather than on purely scientific and medical grounds.

It is shown that coronary artery disease is an occupational disease due to prolonged exposure to deleterious substances like carbon disulphide in industries. [8] There are certain occasions, when a person dies on the operating table or soon after surgery, and a coronary attack is probably the cause of death in such cases. A final coronary episode may sometimes be associated with an operative procedure supposedly due to hypotensive state. [9] In such circumstances, the anaesthetic procedure or surgical interference is merely a precipitating factor in already diseased, but silent coronaries. Unexplained coronary deaths were found to be eight times more common in surgical than in the medical wards. [4]

It will be realized that the very nature of the litigation completely changes, if it can be proved that a person died due to coronary disease, and not due to either the homicidal or injuries runaway accidents and the like. That is to say, the material evidence collected by the Forensic Pathologist at the postmortem examination supplemented by his expertise in deducing the actual cause of death in an alleged

or real case of sudden unexpected death involving coronary disease alone or in conjunctions with associated diseases in other vital organs, or recognizable trauma to the body of the diseased, constitutes a pertinent point in the corpus delicti.

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Table 1: Coronary Atherosclerosis in Natural and Unnatural Deaths

Histology of Coronary Arteries	Manner of Death				Total
	Natural	Accidental	Suicidal	Homicidal	
No I.T., no L.N. No Atheromatous lesions	5	2	2	1	10(20%)
Minimal I.T. with Atheromatous lesions and $\leq 25\%$ L.N.	5	2	-	1	8(16%)
Moderate I.T. with Atheromatous lesions and $\leq 50\%$ L.N.	8	2	1	1	12(24%)
Marked I.T. with Atheromatous lesions and $\leq 75\%$ L.N.	17	1	2	-	20(40%)
Total	35	7	5	3	50(100%)

I.T. = Intimal Thickening, L.N. = Luminal narrowing

Original Research Paper

Profile of Fatal Road Traffic Accidents in Rajkot City

*Hetal C. Kyada, **HariMohan Mangal, *Sadikhusen G. Momin, ***M.T.Vijapura, ****S.D.Bhuva

Abstract

Road traffic injuries are recognized as a major health problem in developing countries accounting for the maximum morbidity and mortality following trauma. The present prospective study was conducted at the Department of Forensic Medicine, P.D.U. Medical College and Associated Hospital, Rajkot from January 2008 to December 2008. The objective of this study was to analyze the trend of fatal road traffic accidents and to find out the measures for the prevention of their causative factors. During that period out of 2159 autopsies, 298 cases of Road Traffic Accidents were selected for the present study which accounts 13.8% deaths. Our study shows that 99(33.22%) victims were male of middle age group (21-30 years), male: female ratio was 10.5:1. 114(38.26%) cases were observed during working hours between 12.01 p.m. to 6.00 p.m. 101(33.89%) victims were pedestrians, followed by occupants of heavy four wheelers, two wheelers and three wheelers. Head injury in 161(54.03%) followed by hemorrhagic shock in 51(17.11%) were main causes of death. 141(47.32%) victims were died within one hour after accident.

Key Words: Fatal Road Traffic Accidents, Pedestrians, Head injury

Introduction:

Road traffic accidents (RTAs) are a major public health concern causing thousands of injuries and premature deaths each year. Globally, RTAs result in an estimated 1.2 million deaths and a further 50 million injuries per year (WHO, 2004). In 1990, RTAs were the ninth leading cause of the global burden of disease [1] and predicted to rise to the third leading cause by 2020 (WHO, 2004). The death rate is highest and still growing in lower and middle-income countries, where pedestrians, motorcyclists, cyclists and passengers are especially vulnerable. [1] Accidents represent a major epidemic of non-communicable disease in the present century. They are no longer considered accidental rather they are a part of the price we pay for technological progress. Accidents have their own natural history and follow the same epidemiological pattern as any other disease i.e. the agent, the host and the environment interacting together to produce injury or damage.

They occur more frequently in certain age groups, at certain times of day and week and at certain localities.

Some peoples are more prone to accidents than others and susceptibility is increased by the effect of alcohol and other drugs as well as physiological state such as fatigue. Lastly majority of accident are preventable. [2]

An increase in gross national product is accompanied by a greater movement of people, goods and greater investment in both vehicles and transport infrastructure. In developing world, current trends in population growth, industrialization and urbanization are putting heavy pressure on transport network in general and on road system in particular. These reveal a serious and growing problem, with absolute fatality and casualty figures rising rapidly in the majority of developing countries.

Material and Method:

The present prospective study was conducted in Department of Forensic Medicine, P.D.U. Medical College and Associated Hospital, Rajkot from 01-01-2008 to 31-12-2008. During that period out of 2159 autopsies, 298 cases of Fatal Road Traffic Accidents were selected for the present study. The relative of the victims of the accidents and accompanying police were interviewed to obtain the information about the circumstances leading to accident. A proforma specially designed for this purpose was used at the time of autopsy. The information collected consisted of age, sex, address, occupation, personal habits, socioeconomic status, time and date of accident, type of vehicles involved in RTA, position of victim during RTA

Corresponding Author:

*Assistant Professor, Dept. of Forensic Medicine,
P. D. U. Medical College, Rajkot
E-mail: hardik.kyada81@gmail.com

**Prof. & Head,

*Assist. Prof., B.J.M. C., Ahmadabad

***3rd yr Resident,

****Tutor

DOR: 6.2.12 DOA: 2.6.12

(driver/pedestrian/occupant), nature of injury and cause of death. Post mortem examination findings were also recorded in the same proforma and analyzed.

Observations:

Maximum 99(33.22%) cases were observed in the age group 21-30 years and Fatal RTAs were common in males 272(91.27%) as compared to females 26(8.73%) with male to female ratio of 10.5:1. (Table 1)

Maximum victims were pedestrians 101(33.89%) followed by occupants of heavy four wheelers 69(23.15%) and occupants or drivers of two wheelers 66(22.16%). 141(47.32%) victims were brought to hospital and declared dead within one hour of accident followed by 107(35.91%) victims died on the spot at accident site. (Table 2)

Skeletal injuries involving skull were observed in 53(52.48%) cases of pedestrians, injuries to clavicles and ribs in 40(60.61%) cases of motorcyclist, injuries to pelvis in 19(18.81%) cases of pedestrians, injuries to upper limbs in 28(42.42%) cases of motorcyclist and injuries to lower limbs in 24 (23.76%) cases of pedestrian. (Table 3)

Injuries to brain were observed in 81(80.20%) cases of pedestrians, 14(100%) cases of bicyclist, 61(92.42%) cases of motorcyclist, 27(55.1%) and 49(72.1%) cases in driver and occupant of three and four wheeler respectively. (Table 4) Head injury was observed as a single and most prominent cause of death in 161(54.03%) cases followed by death due to shock and hemorrhage on account of poly trauma in 51(17.11%) cases. (Table 5)

Out of 298 cases, 114(38.26%) cases were observed in monsoon season followed by 79(26.51%) cases in summer season. (Chart 1)

It was observed that 114(38.26%) cases were during afternoon time between 12.01 p.m. to 6.00 p.m. followed by 95(31.88%) cases in morning time of 6.01 a.m. to 12.00 noon. 128(42.95%) victims were died due to collision took place between two vehicles followed by 101(33.89%) victims were pedestrians affected by vehicles. (Chart 2)

Discussion:

Accidents constitute a modern day epidemic, a counter product of modernization and fast life. Increased urbanization and industrialization has led to tremendous growth in road transport sector. Inadequate traffic planning control is the cause in India. The rise of vehicle and rate of vehicular accident could be judged on the basis of the heavy postmortem rate, reported in India in recent years.

Present study shows majority of deceased (91.27%) were males. Similar higher incidence of traffic accidents among males has been found by many other researchers [4, 6], which suggests that male are more active in various social activities, also many of whom would have been the sole bread winner of family. Moreover, age between 21-30 years was found to be more vulnerable to RTA and is consistent with the studies other workers.[3-7]

The age group 21-30 years is the most active phase of life, physically and socially, hence outnumbers the other road users. They, therefore account for the maximum number of accidental deaths. In a study made by Biswas et al [6] and in another study by Ghosh [11] it was found that the male and female ratio among victims of RTA was 9:1 which is similar with present study (10.5:1). 38.26% cases were noted in monsoon season which is similar with Kachre et al (38.3%). [3] This is because in this part of the world, rainy season forms the predominant season and rainfall is continuous and torrential. This not only decreases the visibility on the road but also makes the roads, mud paths and footpaths very slippery which is conducive for accidents. This is in contrast to the study made by Biswas G [6] who found that the majority of the RTA cases occurred during summer. In the studies conducted in Mangalore and Kathmandu (Nepal) [9, 10] most of the accidents had taken place during the afternoon and evening hours. In our study maximum incidence of vehicular accidents are reported in working hours between 12 pm to 6 pm.

In our study pedestrian (33.89%) were most commonly affected which was similar with Pathak et al [12] (32.91%), Sharma et al (39%). [13] It can be explained due to the fact that maximum of pedestrians died while crossing the road or walking over road with carelessness on the part of pedestrian as well as on the part of the driver of the vehicle. Pedestrians usually do not use zebra crossing, drivers do not obey traffic rules and people usually avoid taking road safety measures. On account of zebra crossing they are not well marked and speed breakers with other traffic safety measures usually made without any warning signs over the road.

Skeletal injuries in different category of victims were compared with study done by Salgado. [8] Moderate to significant variation was observed in skeletal injuries of different regions. Among pedestrians injuries to skull and ribs were significant and predominant. This same pattern was observed in other categories of victims as well. Higher incidence of skeletal injuries to skull and ribs was explained due to

the fact that primary impact was usually in the region of the chest while the secondary impact and secondary injuries were invariably on the head. Skull injuries were predominant in both studies which indicate that irrespective of other injuries present over different regions, head injury was a major cause responsible for death. Salgado [8] observed injuries to pelvis amongst pedestrian and bicyclist with relatively higher incidence. Similar observation revealed in pedestrians, but no cases were observed in bicyclist. Present study observed injuries to pelvis in 20.41% of cases in drivers of three and four wheelers. In pedestrian it can be explained due to the fact that after primary impact, it was produced by vehicle to being run over in most of the instances.

Injuries to upper and lower limbs were having relatively higher incidence in almost all type of victims than observed by Salgado. [8]

Injuries to upper limbs showed significant higher incidence in the present study, due to the fact that incidence of vehicular run over observed maximally in the two wheeler drivers and occupants. Injuries to lower limbs were observed predominantly in both studies in all categories of victims. This can be explained by the fact that in pedestrians, pedal cyclist and motor cyclist primary impact with heavy vehicle, bumper plays main role.

In three and four wheelers (both light and heavy) these can be explained by forward movement following a head on collision, results in lower limbs striking the dash board or front seat in case of an occupant resulting in injuries. All types of skeletal injuries were present in pedestrians in both studies due to the fact that all of the body parts have an access to vehicle resulting in combination of primary impact, secondary impact and secondary injuries.

Visceral injuries in different categories of victims were similar with study done by Salgado. [8] All visceral injuries showed consistency with the skeletal injuries observed in different categories of victims as the possible explanation of the production of injuries given before. In cases of pedestrians and occupants of the vehicle, in spite of fewer incidences of external injuries, incidence of brain injury was higher and proved fatal in present study.

Salgado [8] (69.6%), Biswas G [6] (47.3%) and present study (54.03%) shows head injury as a major cause of death. Head injury as a cause of death can be explained by the fact that most of the cranio-cerebral injuries were not the result of primary impact but due to secondary impact or secondary injuries or both.

Conclusion:

This study showed that RTAs were more common in the younger age groups, in male sex and during working hours in 12.01 p.m. to 6.00 p.m. Majority of victims were pedestrians. Higher incidence of death observed when victims brought to hospital and declared dead within one hour. Spot death was common in pedestrians. Head injury as a cause of death was observed in majority cases of RTAs. Head injuries and pelvic injuries were common in pedestrians. Injuries to lungs, spleen and kidney were common in drivers and occupants of four wheelers.

The All India road data shows that 83.5% of the accidents were due to the driver's fault. Other contributory factors were mechanical defects in vehicles, pedestrian fault, and fault of the passenger, bad roads, and bad weather. [14] Various preventing measures like avoiding high speeding and driving under the influence of alcohol, promoting the use of helmets, seat belts and other restraints, ensuring that people walking and cycling are more easily visible, improving the design of roads and vehicles, enforcing road safety regulations and improving emergency medical services could be used to control the increasing toll of deaths due to RTA. It is important to increase awareness about road safety among road users, planners and engineers.

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Table 1: Age and Sex Wise Distribution

Age Group(yrs)	Cases (%)	Male (%)	Female (%)
01-10	18 (6.04)	13 (4.36)	5 (1.68)
11-20	28 (9.40)	28 (9.40)	00
21-30	99 (33.22)	99 (33.22)	00
31-40	67 (22.48)	67 (22.48)	00
41-50	36 (12.08)	24 (8.05)	12 (4.03)
51-60	18 (6.04)	9 (3.02)	9 (3.02)
61-70	32 (10.74)	32 (10.74)	00
Total	298 (100)	272(91.27)	26 (8.73)

Table 2: According to the Type of Victim

No.	Category Of Victim	Cases (%)
1	Pedestrian	101 (33.89)
2	Two wheeler	66 (22.16)
3	Bicycle	14 (4.70)
4	Light four wheeler	15 (5.03)
5	Heavy four wheeler	69 (23.15)
6	Three Wheeler	33 (11.07)
	Total	298 (100)

Table 5: According to the Cause of Death

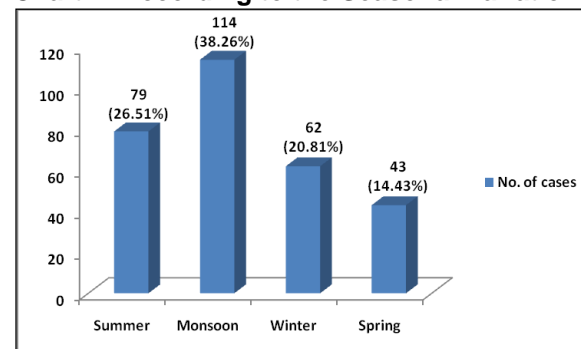
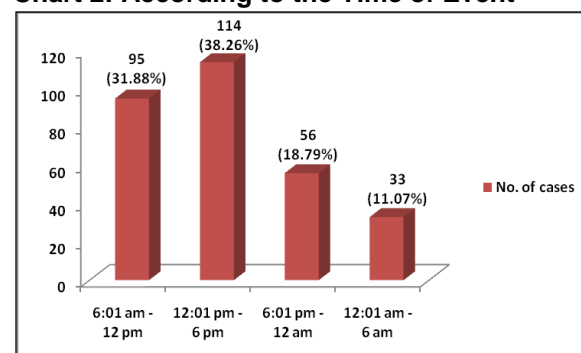
No.	Cause of Death	Cases (%)
1	Head Injury	161 (54.03)
2	S&H due to Poly trauma	51 (17.11)
3	Chest injury	44 (14.77)
4	Abdominal injury	38 (12.75)
5	Chest + Abdominal injury	4 (1.34)
	Total	298 (100)

Table 3: According to Skeletal Injuries and Type of Victim

Skeletal Parts	Pedestrian (101)	Bicyclist (14)	Motor Cyclist (66)	Three and Four Wheeler (L & H)	
				Driver (49)	Occupant (68)
Skull	53 (52.48%)	14(100%)	40(60.61%)	19(38.78%)	21(30.88%)
Spinal Injuries	18(17.82%)	0	6(9.09%)	0	0
Clavicles & Ribs	24(23.76%)	4(28.57%)	40(60.61%)	14(28.57%)	21(30.88%)
Pelvis	19 (18.81%)	0	6(9.09%)	10(20.41%)	0
Upper Limbs	13(12.87%)	0	28(42.42%)	10(20.41%)	15(22.06%)
Lower Limbs	24(23.76%)	4(28.57%)	23(34.85%)	19(38.78%)	15(22.06%)

Table 4: According to Visceral Injuries and Type of Victim

Visceral Parts	Pedestrian (101)	Bicyclist(14)	Motor cyclist (66)	Three and Four wheelers (L & H)	
				Driver(49)	Occupant(68)
Brain	81(80.20%)	14(100%)	61(92.42%)	27(55.10%)	49(72.10%)
Lungs	19(18.81%)	4(28.57%)	34(51.52%)	15(30.61%)	25(36.77%)
Heart	0	0	7(10.61%)	0	6(8.82%)
Liver	23(22.77%)	0	12(18.18%)	16(32.65%)	6(8.82%)
Kidneys	6(5.94%)	0	0	5(10.20%)	0
Spleen	23(22.77%)	0	0	14(28.57%)	0
Major Vessels	12(11.88%)	0	23(34.85%)	14(28.57%)	0
Others	0	0	7(10.61%)	14(28.57%)	0

Chart 1: According to the Seasonal Variation**Chart 2: According to the Time of Event**

Original Research Paper

Analysis of Homicidal Deaths in and Around Bastar Region of Chhattisgarh

*Dhaval J Patel

Abstract

FREEDOM FROM VIOLENCE, not necessarily proportional with development in some basic capabilities like nutrition, longevity and literacy which positively related to economic growth. So, dealing with violence in society is intrinsically a matter of public interest. In present study 79 cases of homicidal deaths due to different mechanical injuries was studied in two year period from 1/1/2009 to 31/12/2010. The incidence of homicidal death was 9.13% during this period. Males affected more in comparison to females. Majority of cases were fall in 21-40 yrs. of age comprising 50 cases (63.28%). Injuries by blunt weapons commonly observed in 30 cases (37.97%) which followed by injuries by sharp weapons 19 cases (24.05%). Totally 329 sharp injuries observed in comparison to 152 blunt injuries. Incidences were prevalent at dense forest area 26 cases (32.91%), in married persons 55 cases (69.62%), in between 6 pm to 12 midnight 24 cases (30.37%) and revenge was main motive 23 cases (29.11%).

Key Words: Homicidal death, Sharp injury, Blunt injury, Stab wound, Defence wound

Introduction:

One of the oldest crimes in human civilization is homicide which started from murder of Abel by hands of Cane. With the passage of time manner of homicide have been changing. To analyse the homicidal deaths in any civil society is the first step towards development to reduce its impact. [8] Homicide is the common end point of different behavioural pathways; it may be the result of argument between acquaintances, domestic violence, robberies, drug addiction and terrorism. Criminal homicide is to a large extent an intimate one, as demonstrated by the fact that most homicide victims are killed by close relatives, friends and acquaintances.

Day by day, incidence of homicide is increasing and probably due to rapid rise in population, industrialization, high level of unemployment, depression in every day's life, prevalent economic, social and political environment, insurgency, terrorism, drug addiction, easy availability of weapons etc. Violence and injuries are responsible for 9% of the global mortality.

5.8 million People worldwide die each year as a result of some form of injury. Globally 520K people die each year as a result of violence, which equates to 1400 deaths every single day. [11] Hence, this study has been undertaken to understand relation of homicide with factors like motive, place of occurrence, sex of person, marital status, commonest weapon/method used, injuries etc.

Material and Methods:

In present study 79 cases of homicidal deaths which came for post-mortem examination to Dept. of Forensic Medicine and Toxicology, Govt. Medical College, Jagdalpur (CG) from Jan 2009 to Dec 2010.

Criteria to consider the case as homicidal means any unnatural death resulting from act of another person. In each and every case, try to get information from PM reports, Police inquests, History given by relatives and Dead body challan. Factors like age, sex, marital status, place of occurrence, time of incidence, motive, common method or weapon, mechanical injuries and defence wound taken into consideration.

Observations:

Total 865 medico-legal autopsies were done during Jan 2009 to Dec 2010 period, Out of which 79 cases (9.13%) were of homicidal deaths. Maximum number of homicidal deaths was seen during Aug 10 cases (12.65%) followed by March 9 cases (11.39%) and Dec- 8 cases (10.12%). [Table 1] Age group of 21-30

Corresponding Author:

*Associate Professor,
Dept. of Forensic Medicine and Toxicology,
Mahatma Gandhi Medical College & Research
Institute, Piliyarkuppam, Pondy-Cuddalore main road,
Puducherry, Pin- 607 402
E-mail: drdhavaljpatel@yahoo.com
DOR: 28.11.11 DOA: 3.4.12

yrs was mostly affected, 29 cases (36.70%) followed by 31-40 yrs, 21 cases (26.58%). The least affected age group were both extreme of ages 0-10 yrs, one case (1.26%) and >60 yrs, three cases (3.79%). In all age groups males predominantly affected except 51-60 yrs where 4 female cases in comparison to lone case of male. [Table 2]

Majority of the cases taken place in dense forest area 26 cases (32.91%) followed by at road side 17 cases (21.51%) and at home 15 cases (18.98%). Lowest incidence of cases was at workplace only seven cases (8.86%). [Table 3]

Most of the victims were married 55 cases (69.62%). Unmarried victims were 13(16.45%). In age groups 0-10 yrs and below 18 yrs in 11-20 yrs considered as Not Applicable, 10 cases (12.65%). [Table 4] In almost one fourth cases 19(24.05%), time of incidence was not known. Majority of the cases observed in evening and early night hours, between 6pm to 12 midnight, 24 cases (30.75%). Least number of cases reported during first quarter of day, only 6 cases (7.59%). [Table 5]

In 16 cases (20.25%) motive couldn't be determined. Revenge was the main motive in present study, 23 cases (29.11%) followed by land dispute, 13 cases (16.45%). [Table 6]

Commonest weapon or method used was blunt force in 30 cases (37.97%), followed by sharp weapons 19 cases (24.05%) and firearms 12 cases (15.18%). Manual and ligature strangulation was least used method by accused, only one case (1.26%) and three cases (3.79%) respectively. [Table 7]

Head was the region where maximum number of injuries were observed, 65 cases (19.75%) followed by chest (18.54%), upper limbs (15.50%) and abdomen (14.58%). Chest was the preferred site for sharp injuries, 46 cases (25.98%) followed by abdomen, 41 cases (23.16%). Amongst stab injuries, use of single edged weapon (33 cases) in comparison to double edged (5 cases) was quite significant. [Table 8] Only 28 cases (35.44%) were observed with presence of defence wounds over different regions. Incised wound was commonest, in 11 cases (39.28%) followed by contusion in 5 cases (17.85%). [Table 9]

Discussion:

Incidences of homicidal deaths are always increasing and Bastar region is no exception. Tribal area, naxalite insurgency, low literacy rate, poverty are some of the prime reasons for that. In two year, 79 cases (9.13%)

observed. This findings are consistent with observations by Khanagwal and Paliwal [4] 10% but higher than P. Prajapati [10] 4.12% cases.

In 21st century, we all know females standing equally to males in each and every aspect of life. But in relation to some darker aspect of our civilised society like homicidal deaths still males were dominantly affected because they are more involved in violent activities. Present study's male dominance bears same pattern by Sinha et al [13] and O. Gambhir. [9] In present study dense forest was the commonest place of occurrence. This finding is not in agreement with findings of Rogde S et al [12] where preferred place was in-door. Chhattisgarh is one of the rare states of India in which more than 40% area is notified forest region and because of this may be dense forest is commonest place of occurrence.

Nearly 70% of cases were married persons. Findings are also consistent with works of O. Gambhir. [9] Marriage demands lot of commitment towards life partner, kids, parents and society as a whole. So, this may be the reason of very higher incidence in comparison to unmarried persons, 13 cases (16.45%) only.

Maximum no. of cases 24(30.37%) were reported between 6 pm to 12 midnight. Time of incidence of homicide happened to be similar with Sheikh MI [14] and Sinha et al. [13] Natural darkness gives favourable atmosphere to accused to commit homicidal acts and easy to execute it without being witnessed by others.

Revenge was the main motive for homicide followed by land dispute, argument, love affair and mental illness. In 16 cases (20.25%) motive was not known. The findings are not in agreement with study done by Fisher J et al [3] who observed conflict in relationship was the main motive. Schmidt [15] also noted different motives, robbery and family dispute.

Blunt force with 30 cases (37.97%) was the most common method of homicide in present study. This was followed by sharp weapons in 19 cases (24.05%) and firearms 12 cases (15.18%). Both blunt and sharp weapons availability also increased due to their location of houses in forest and their main work which is farming. Dikshit et al [2] and Kominato et al [5] observed blunt weapons as commonest type while Avis [1] and Hunt AC et al [18] observed sharp weapons as dominant method.

Highest numbers of injuries were seen over the head 65 cases (19.75%) which are followed by chest (18.54%) and upper limbs 51 cases. Skull showed maximum numbers of injuries caused by hard and blunt objects.

Similar involvement observed by Storm et al [16] and O.Gambhir. [9]

In stab injuries both abdomen and chest are registered almost same number of cases 39 and 38 respectively. In both regions single edged stabs outnumbered injuries than caused by double edged weapon. Same pattern was also observed by Murray et al. [6] Choice of site to be hit upon is depend on type of weapon used by assailant. Defence wounds were present only in 35.44% cases. Incised wound were present in highest number of cases because in present study overall incidence of sharp injuries more than blunts ones. Similar findings reported by Mohanty MK et al [7], Tечи Rekhi et al. [17] Most of the victims were attacked unaware with intention to kill.

Conclusion:

Out of 79 total homicidal death cases, 21-40 yrs of age group was mostly affected. Involvement of males was 3.5 times more than females. In relation to marital status, married ones mostly affected. Most of the cases were taken place during evening and early night hours. Revenge was the main motive. Blunt weapons were commonest but sharp injuries observed more than blunt injuries. Abdomen and chest were preferred sites for stab injuries. Defence injuries present only in 35.44% cases.

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Table 1: Cases according to Month & Year

Month	Year		Total (%)
	2009	2010	
Jan	3	2	5 (6.32%)
Feb	2	2	4 (5.06%)
Mar	5	4	9 (11.39%)
Apr	3	2	5 (6.32%)
May	4	3	7 (8.86%)
Jun	1	5	6 (7.59%)
Jul	3	3	6 (7.59%)
Aug	6	4	10 (12.65%)
Sep	3	3	6 (7.59%)
Oct	4	3	7 (8.86%)
Nov	2	4	6 (7.59%)
Dec	5	3	8 (10.12%)
Total	41	38	79 (100%)

Table 2: Age & Sex Wise Distribution

Age(yr)	Male	Female	Total (%)
0-10	1	00	1 (1.26%)
11-20	7	2	9 (11.39%)
21-30	25	4	29 (36.70%)
31-40	16	5	21 (26.58%)
41-50	8	3	11 (13.92%)
51-60	1	4	5 (6.32%)
>60	3	00	3 (3.79%)
Total	61	18	79 (100%)

Table 3: Place of Occurrence

Place of Occurrence	Cases		Total (%)
	Male	Female	
Dense Forest	23	3	26 (32.91%)
Road Side	13	4	17 (21.51%)
Home	9	6	15 (18.98%)
Market(Hat)	10	4	14 (17.72%)
Work Place	7	00	7 (8.86%)
Total	61	18	79 (100%)

Table 4: Marital status of Victims

Marital Status	Cases		Total (%)
	Male	Female	
Married	42	13	55 (69.62%)
Unmarried	10	3	13 (16.45%)
Divorced	1	00	1 (1.26%)
Not Applicable	8	2	10 (12.65%)
Total	61	18	79 (100%)

Table 5: According to Time of Incidence

Time of Incidence	Cases	Percentage
00:00 – 06:00 AM	6	7.59%
06:01 AM – 12:00 Noon	17	21.51%
12:01 PM – 06:00 PM	13	16.45%
06:01 PM – 12:00 Midnight	24	30.37%
Not Known	19	24.05%
Total	79	100%

Table 6: Motive wise distribution of cases

Motive	Cases		Total (%)
	Male	Female	
Revenge	18	5	23 (29.11%)
Land Dispute	11	2	13 (16.45%)
Love Affair	6	2	8 (10.12%)
Argument	8	4	12 (15.18%)
Mental Illness	6	1	7 (8.86%)
Not Known	12	4	16 (20.25%)
Total	61	18	79 (100%)

Table 7: Weapon or Method wise Distribution

Weapon or Method used	2009	2010	Total (%)
Blunt Force	16	14	30 (37.97%)
Sharp	8	11	19 (24.05%)
Blunt & Sharp	3	6	9 (11.39%)
Ligature Strangulation	1	2	3 (3.79%)
Manual Strangulation	00	1	1 (1.26%)
Firearms	8	4	12 (15.18%)
Not Known	5	00	5 (6.32%)
Total	41	38	79 (100%)

Table 9: According to Presence of Defence Wounds

Defence Wounds	Cases	Percentage (%)
Incised	11	39.28
Lacerated	4	14.28
Punctured	1	3.57
Abrasion	4	14.28
Contusion	5	17.85
>1 type of injury	3	10.71
Total	28	100

Table 8: Distribution of Injuries according to Sites

Body Parts	Blunt Injury					Sharp injury				Grand Total (%)
	Ab	Con	LW	Cru	Total (%)	Incised/Chop	Single Edged Stab	Double Edged Stab	Total (%)	
Head	3	14	19	1	37(24.34)	27	1	00	28(15.81)	65(19.75)
Neck	3	5	1	00	9 (5.92)	11	8	4	23(12.99)	32(9.72)
Face	7	2	16	00	25 (16.44)	14	1	1	16(9.03)	41(12.46)
Chest	6	8	1	00	15(9.86)	8	33	5	46(25.98)	61(18.54)
Upper Limbs	19	7	7	00	33(21.71)	12	6	00	18(10.16)	51(15.50)
Abdomen	5	2	00	00	7(4.60)	2	37	2	41(23.16)	48(14.58)
Lower Limbs	16	8	2	00	26(17.10)	1	4	00	5(2.82)	31(9.42)
Total	59	46	46	1	152 (100)	75	90	12	177	329(100)

(Ab : Abrasion, Con: Contusion, LW : Lacerated wound, Cru: Crush)

Original Research Paper

Exhumation: A 10-Year Retrospective Study

*Rajesh Bardale, *Vipul Ambade, ***Pradeep Dixit

Abstract

Exhumation is done for number of reason and includes establishment of identity, to know cause and manner of death, belated suspicion of an unnatural death or for medical insurance problems. It is infrequently done in India and due to cultural practice of cremation by burning to ashes the data are lacking. Compared with conventional autopsy done immediately after death, exhumation poses many problems. The present study was aimed to collect data regarding exhumation, to collect morphological findings in comparison with maximum postmortem interval and to analyze them in an attempt to formulate "catalogue of expectation" to supplement the published literature. Total 24 forensic exhumations performed at three centers of this region from 1999 to 2008 were evaluated retrospectively. Total 24 cases were analyzed and amongst them 12 were men and 12 were women and their age ranged from 3 years to 75 years (mean age 26.95). In the present series, the cause of death at exhumation could be clearly determined in 16 cases (66.6%). Amongst others, the burial practice and postmortem interval are major determining factors for possible outcome at exhumation.

Key Words: Exhumation, Autopsy, Postmortem, Death

Introduction:

Exhumation is done for number of reason and includes establishment of identity, to know cause and manner of death, belated suspicion of an unnatural death or for medical insurance problems. [1-4] Compared with conventional autopsy done immediately after death, exhumation poses many problems.

Important toxicological and osteological evidence may be preserved for decades; morphological evidence depends on the state of preservation of corpse and other factors influencing decomposition. [5] Exhumation is infrequently done in India because the bodies are disposed of by burning to ashes by most of the communities except few. [6] Therefore data regarding exhumation is lacking in India. The present study was aimed to collect data regarding exhumation, to collect morphological findings in comparison with maximum postmortem interval and to analyze them in an attempt to formulate "catalogue of expectation" to supplement the published literature.

Corresponding Author:

*Associate Professor,
Dept. of Forensic Medicine,
Govt. Medical College & Hospital, Miraj-416 410
Email: bardalerv@yahoo.co.in

* Assoc. Prof, GMCH, Nagpur

**Professor & Head

Govt. Medical College & Hospital, Nagpur

DOR: 7.2.12 DOA: 17.5.12

Materials and Methods:

Total 24 forensic exhumations performed at three centers of this region (Govt. Medical College Nagpur, Indira Gandhi Govt. Medical College Nagpur and Shri V. N. Govt. Medical College Yavatmal) from 1999 to 2008 were evaluated retrospectively. Data was collected from the autopsy report (including first autopsy report if exhumation is second autopsy), Police and Magistrate inquest papers, histology findings, toxicology findings and statements of relatives.

The cases are grouped into two categories –

- **Category I:** where first autopsy was already performed and the exhumation was done on request of relatives and Magistrate's order.
- **Category II:** where no first autopsy was done. In this series we have included the bodies under term exhumation that were clandestinely buried by the criminals to conceal the crime. The Doctors were present during exhumation. The autopsy was performed on site, if that was possible otherwise shifted to morgue of respective institute.

Results:

Amongst 24 cases, 12 were male and 12 were female. Their age ranged from 3 years to 75 years (mean age 26.95). In men, the mean age was 33 years (ranged from 10 year to 75 year) and in women, the mean age was 20.91 years (ranged from 3 year to 35 years). 16

individuals were married, 7 were unmarried and 1 was widow. As far as religion was concerned, 23 were Hindus and 1 was Muslim. 19 individuals were buried in graveyard, 3 buried in house premises and 2 were buried in riverbank.

The depth of grave varied from 1.5 feet to 7 feet (mean depth 3.39 feet). Damp, marshy and clayey soil was noted in 8 graves whereas in 16 cases the soil was dry. In 20 cases, the bodies were buried by wrapping in white cotton cloth sheet whereas rests of the bodies were buried with their clothes. The average number of days after burial for these exhumations was 21.25 days; the shortest period was 3, and the longest 70 days. As far as season was concerned, 06 bodies were buried in winter, 08 in rainy season and 10 in summer season. Putrefaction were noted in 12 bodies, adipocere formation in 8 and partial skeletonization in 4 corpses. First and second autopsy was conducted in 19 cases (category I) and the causes of death are given in table 1.

Amongst these 19 cases, the reasons for second autopsy were – the relatives of deceased believed that first autopsy was not conducted properly by doctor (7 cases, 36.84%), investigation by Police was not proper (11 cases, 57.89%) and negligence of doctor while treatment (1 case, 5.26%). The other 5 bodies where first autopsy was not done (category II) happen to be cases where criminal buried the body after killing the individuals and the causes of death are given in table 2.

The “catalogue of expectation” of morphological findings in relation to postmortem interval is presented in table 3.

Discussion:

Before an exhumation, the question of its possible success usually arises because there is constant apprehension for autopsy surgeon whether presumed morphological or toxicological findings can be detected after certain postmortem period. [7] Moreover, the number of exhumations carried out in India has never been sufficient to enable a comprehensive study of the gross findings and microscopic changes occurring in the body after burial. [6]

In the present study, the cause of death at exhumation was clearly determined in 16 cases (66.6%) and the findings are in agreement with Karger et al (2004). [8] However, other series have variable rate. In a study by Grellner et al (1997), [7] the cause of death could be provided in 78% of cases. Similarly Verhoff et al (2007) [5] were able to provide definite recommendation for medical insurance questions concerning compensation in 99.2% of

the cases. This discrepancy could be attributed to many factors such as nature of terminal illness, season of burial, burial practice, presence of coffin or other protective means, nature & temperature of the soil and duration of postmortem interval. Considering India, burial practice is major factor affecting the decomposition. Here, except for few communities, the bodies are disposed off by burning to ashes. Therefore these communities are unfamiliar about the practice of burial; the bodies are buried in improper fashion leading to early decomposition. As a result it is difficult to deduce cause of death.

Compared to an autopsy performed immediately after death, second autopsy on exhumed body brings additional problems. Here the interpretation of the findings is difficult due to various artefacts of burial & exhumation and the alterations resulted from the first autopsy. In the present series we are able to provide cause of death in 13 cases (category I, 68.42%) and in 63.15% of cases we are able to substantiate the cause of death provided in first autopsy (category I). Though the rate appears somewhat low but at least in 63.15% of cases, there would be end of hearsay and suspicions. It can be added that when taken as a whole (category I + II) in 66.6% we were able to furnish cause of death with mean postmortem interval of 21.25 days. This figure could drop further with longer postmortem interval and in the present study we had noted partial skeletonization with mean postmortem interval of 45 days as revealed in table 3. Thus it can be stated that in India along with burial practice, the postmortem interval also plays major role for possible outcome at exhumation.

Compared with previously published catalogues of expectation, the expectation of catalogues presented in table 3 appears small, but it brings the Indian work representing morphological findings in our environment. With ongoing case collections and reports, it can be supplemented and expanded accordingly.

Conclusion:

Considering the deficit of the data on exhumation in India, the present study was undertaken and here we had discussed our result over a 10-year period. The morphological and toxicological findings were obtained against the postmortem interval and presented in a format (catalogue of expectation). Here the documented maximum postmortem interval would show what would be expected findings obtained in our environment. In India, amongst others, the burial practice and postmortem

interval are major determining factors for possible outcome at exhumation. With certain reservations, the present study underlines the importance of such kind of examinations even after considerable postmortem intervals however need caution because with each passing day the morphological evidences may be deteriorated.

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Table 1: Cause of Death at First and Second Autopsy (Category I)

Case No	Cause of Death at first autopsy	Cause of Death at second autopsy
1	Electrocution	No opinion
2 & 17	Poisoning	Poisoning
3, 5, 6 & 12	Hanging	Hanging
4	Burns	Burns
7, 11 & 16	Drowning	No opinion
8 & 18	Myocardial infarction	Coronary artery disease
9	Polytrauma	Polytrauma
10	Hemorrhage	Vital organ injury
13	No opinion	Ligature strangulation
14	Injury to trunk	No opinion
15	Burns	No opinion
19	Head injury	Head injury

Table 2: Cause of Death in Category II Cases

Case No	Cause of Death
20 & 22	No opinion
21	Ligature strangulation
23 & 24	Head injury

Table 3: Synopsis of Findings (Catalogue of Expectation) in Exhumations after Certain Postmortem Periods (Own Material and Literature)

Findings	Our material	Literature
Skull fracture	10 days	11, 1.6 months Grellner 1997 40 days Ray 1966
Under scalp hematoma	10 days	40 days Ray 1966
Extradural hematoma	10 days	8 days, 4 weeks Grellner 1997
Blood tinged brain mass	10 days	40 days Ray 1966
Coronary atherosclerosis	25, 10 days	7.5, 4.8, 3.5 years Grellner 1997, 478 days Verhoff 2007
Plaques in aorta	25, 10 days	7.5 months Grellner 1997
Ligature mark	20, 19, 17, 11, 3 days	2 months Grellner 1997
Hyoid bone fracture	19 days	4.4, 1.75 months Althoff (in Grellner 1997), 8 months Walcher (in Grellner 1997)
Burn	34 days	11, 9.5 months Grellner 1997
Surface wounds	15, 11, 10, 4 days	4.7 months Althoff (in Grellner 1997)
Iatrogenic puncture mark	6 days	3.75 months Grellner 1997, 77 days Verhoff 2007
Vital injuries & hemorrhage in soft tissue	4 days	7.5, 5.75, 3.25 months Grellner 1997
Recognizable chest & abdominal organs	12 days	--
Organophosphorus poison	40, 10 days	--
Adipocere	35, 34, 19, 17, 12, 10 days	17.4, 3.75, 2.5 years Grellner 1997, 1 month Ray 1966
Partial skeletonization	70, 38, 37, 35 days	--

Original Research Paper

Asphyxial Deaths at District Hospital, Tumkur A Retrospective Study

*Srinivasa Reddy P, *Rajendra Kumar. R, **Rudramurthy

Abstract

Asphyxial death forms one of the modes of death which may be suicidal, homicidal or accidental in nature. A retrospective study of autopsies conducted between years 2006 - 2010 is an attempt to know the incidence of asphyxial deaths at district hospital, Tumkur. During this period there were 2288 deaths, out of which 438 deaths were of asphyxial deaths. The most common form of asphyxial death was hanging followed by drowning. The incidences of asphyxial deaths were more in males than females in the ratio of 1.4:1. These cases were studied to know age and sex distribution of the victims. In this study, we found that among asphyxial deaths hanging were more 268 (61.18%) followed by drowning 140 (31.96%), strangulation 19 (4.33%) and others respectively. Appropriate education, influencing the media in their portrayal of suicidal news, reporting method, involvement of young generations in encouraging activities may reduce the rate of suicidal death by hanging in future.

Key words: Asphyxial deaths, Autopsy, Hanging, Drowning

Introduction:

The term asphyxia may be defined as a state in which the body lacks oxygen, because of some mechanical interference with the process of breathing. [1] Hanging produces painless death for the victims and there is no costs involvement other than that of the ligature material. A thin rope around the neck will cause unconsciousness in 15 seconds. [2] The hanging and drowning are commonly seen in suicidal cases, while strangulation including throttling is usually homicidal. In addition, accidental compression or trauma to chest that prevent respiratory movement, which is known as traumatic asphyxia or crush injury is also one of the cause for violent asphyxial death. [3, 4]

Due to population explosion, poverty and increasing stress and strain in our daily life, we frequently come across cases of suicides, homicides and accidents. Males and females are both exposed to such stresses, but it seem that ours being a male dominated society and more exposure to external environment, such cases are commonly seen in males.

Corresponding Author:

*Associate Professor,
Department of Forensic Medicine & Toxicology,
Sri Siddhartha Medical College & Hospital, Tumkur
E-mail: drreddyfm1976@yahoo.co.in

* Associate Professor,

**S. RMO & Senior Specialist (Forensic Medicine),
District General Hospital, Tumkur
DOR: 7.2.12 DOA: 26.5.12

With urbanization, rural areas are also not left aloof and this can be seen from the increasing incidence of such cases from this areas. [5]

Material and Method:

The autopsies conducted at district general hospital, Tumkur between the years 2006–2010 were considered for this retrospective study. The data were collected from police requisition form, postmortem report, and forensic science lab report. The cases were studied to know the incidence of asphyxial deaths with respect to age group, sex, type of deaths.

Results:

The total numbers of autopsies conducted during the study period were 2288, of which 438 cases were of asphyxial deaths. The incidences of asphyxial death among males were 259 (59.14%) deaths and in females were 179 (40.86%) deaths. The asphyxial deaths were more in age group of 21–30 years (34.93%) followed by 11-20 years (20.10%) and 31–40 years (17.80%) respectively. (Table 1)

Suicidal deaths 396 (90.42%) were more compared to homicidal 42 (9.58%). (Table 2) Hanging 268 (61.19%) and drowning 140 (31.96%) were most common form of asphyxial deaths seen in both the sexes. (Table 3 & 3a)

Discussion:

The autopsies conducted during the study period were 2288, of which 438 cases were of asphyxial deaths. Table.No.1 shows

incidence of asphyxial deaths based on age and sex. The incidences among males were 259 (59.14%) deaths and in females were 179 (40.86%) deaths. The asphyxial death was more in age group of 21 – 30 years (34.93%) followed by 11-20 years (20.10%) and 31–40 years (17.80%) respectively. [6] The incidence of asphyxial deaths was more in males than females in ratio of 1.4:1. This is in accordance with other studies which showed about 68% in males (Table.No.3a) the male to female ratio is being 2:1. [6]

Among all these registered suicides cases, hanging was the commonest method used to commit suicide [7] which is found to be more prevalent among males in comparison to females 21 to 30 years of age groups, showed maximum number of cases after which age group 11-20 years. 6, 8, 11, 12] This was quite similar to the study done by Sharma et al. [9] The incidence of various asphyxial deaths was recorded and drowning was found to be commonest. The disparity between males and females in suicide rates has been most apparent in this study. Men have a higher risk of suicide than women. [10] In present study most of the victims were from the age group 20-30 years (45.51%). Study has shown that people belong to this age group were also common victims of hanging in other countries. [12] Males predominate both in hanging and drowning as these are not as commonly opted method of suicide by females as compared to poison intake and burning. [10]

Conclusion:

The number of suicidal hanging cases is increasing day by day. A well designed and comprehensive programme is needed to identify the causative factors and prevention of suicidal behaviors. Appropriate education, influencing the media in their portrayal of suicidal news, reporting method, involvement of young generations in encouraging activities may reduce the rate of suicidal death by hanging in future. Due to repeated physical and mental torture, they go beyond threshold level of self constrain and commit suicide by easily available ligature material like dopatta or sari or rope. In case of male; poverty, lack of job, family problems, defamation and alcoholism are the main reason for suicidal hanging.

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Table 1: Sex and Age wise Distribution of Asphyxial Deaths

Age Groups	Male	Female	Total	(%)
0 – 10 years	7	5	12	2.73
11 – 20 years	43	45	88	20.10
21 – 30 years	85	68	153	34.93
31 – 40 years	49	29	78	17.80
41 – 50 years	40	12	52	11.87
51 – 60 years	18	10	28	6.40
61 – 70 years	10	6	16	3.65
>71 years	7	4	11	2.52
Total	259	179	438	100%

Table 2: Manner of Asphyxial Deaths

S. N.	Manner of Asphyxial Deaths	Cases	Percentage %
1.	Suicidal	396	90.42
2.	Homicidal	42	9.58
3.	Accidental	0	0.00
4.	Total	438	100

Table 3: Type of Asphyxial Deaths

S. N.	Type of Asphyxial Deaths	Cases	Percentage (%)
1.	Hanging	268	61.19%
2.	Drowning	140	31.96%
3.	Strangulation	19	4.34%
4.	Smothering	11	2.51%
5.	Traumatic Asphyxia	0	0.00%
6.	Total	438	100%

Table 3a: Type of Asphyxial Deaths between Males and Females

S. N.	Type of Asphyxial Death	Male	Female	Total (%)
1.	Hanging	155	113	268(61.20)
2.	Drowning	97	43	140(31.96)
3.	Strangulation	4	15	19(4.33)
4.	Smothering	3	8	11(2.51)
5.	Traumatic Asphyxia	0	0	0(0.00)
6.	Total	259	179	438(100)

Original Research Paper

Need for Enhanced Punishment for Outraging the Modesty of Woman U/S 354 IPC

*Mukesh Yadav, **Ravi Gangal, ***Pooja Rastogi

Abstract

Crime against women are rising in India especially in State of Uttar Pradesh, Madhya Pradesh and Delhi and there is a need felt in every corner of India to enhance punishment to deter these crimes. India is signatories to various International treaties including related to protection of human rights of woman and children. Hon'ble Supreme Court of India and various High Courts has taken cognizance of situation on many occasions and recommended to Union of India and state Governments to amend the law to protect the faith of common man especially vulnerable groups like woman and children.

A Critical review of decisions of courts has been done for highlighting the legal situation on the issue of meaning and scope of applicability of section 354 IPC. Data base collected and compiled from the National Crime Record Bureau website to understand the rising trend of crime. This paper discusses various reasons for less punishment for molestation and need for enhanced punishment and making it non-bailable to make sense in preventing rising crimes against woman.

Key Words: Human Rights, Rape, Molestation, Outraging of modesty, Bail, Non-bailable

Introduction:

Many cases of molestation attracted the attention of media and policy makers. On August 12, 1990, SPS Rathore, then IG and President, Haryana Lawn Tennis Association (HLTA) molested Ruchika for which CBI Court sentenced six months imprisonment to him on 21.12.2009.

The family of Ruchika Girhotra, a minor girl who allegedly committed suicide after molestation by former Haryana director general of police (DGP) SPS Rathore, has given up its fight for justice in the court of law after 22 years.

The Special CBI Court Panchkula on 01.6.2012 accepted the closure report submitted by the Central Bureau of Investigation (CBI) in two cases - attempt to murder and forgery of documents, filed against former Haryana DGP SPS Rathore. Ruchika's father Subhash and brother Ashu raised no objection to the closure report.

Corresponding Author:

*Professor & HOD

Dept. of Forensic Medicine & Toxicology

School of Medical Sciences & Research

Sharda University, Greater Noida, U.P

E-mail: drmukesh65@yahoo.co.in

**Assistant Professor, Rama Medical College,

Pilkhua, Panchsheel Nagar, U.P.

***Assoc. Prof., SMS & R, Sharda University,

Greater Noida, UP

DOR: 05.05.2012

DOA: 10.06.2012

Admitting that he was not in a position to pursue the matter further, Subhash said, "I do not see any hope now. We feel cheated. My family is vulnerable. The circumstances have pushed us back by 20 years." [1]

"When Rathore was convicted in 2009, Ruchika's father met Union Home Minister, P C Chidambaram who assured him of justice.

Her father forced family into exile after Ruchika's death, fearing further harassment at the hands of the former DGP. During this period, the family shifted between several cities and returned to Panchkula many years later only to lead an inconspicuous life.[2]

Issue of Punishment:

Branch of 'Penology' deals with:

- Measure of punishment
- Factors to be considered
- Retributive aspect of punishment
- Need for-Punishment to depend upon atrocity of crime
- Appropriate punishment to be given keeping in view not only the rights of accused, but also rights of victims and society.

Purpose of Punishment:

Why a punishment is required to be given for an offence of criminal nature? The purposes for which punishment achieves or is required to achieve are four in number.

1. **Retribution**
2. **Preventive**
3. **Deterrence**

4. Reformation

First, retribution: i.e. taking of eye for eye or tooth for tooth. The object behind this is to protect the society from the depredations of dangerous persons; and so, if somebody takes an eye of another, his eye is taken in vengeance. This form of protection may not receive general approval of the society in our present state of education and understanding of human psychology.

The retributive part of sentencing object is adequately taken care of by the adverse effect which the conviction would have on the practice of the appellant. [Para 17][3]

The other purpose of sentence is preventive. That the sentence of imprisonment already undergone would be an eye-opener to the convict and he would definitely not repeat the illegal act. [Para 18][3]

Deterrence is another object which punishment is required to achieve. Incarceration of about few months undergone by the convict and upholding of his conviction by higher court which is likely to affect the practice adversely, would or should deter others to desist them from indulging in an illegal act like. [Para 19][3]

Reformation is also an expected outcome of undergoing sentence. Supreme Court in a case observed that "We do think that two months' sojourn of the appellant behind the iron bars and stone walls must have brought home to him the need of his changing the type of practice he had been doing as a homeopath. According to SC "The reformatory aspect of punishment has achieved its purpose, by keeping the appellant inside the prison boundaries for about two months having enabled him to know during this period the trauma which one suffers in jail, and so the appellant is expected to take care to see that in future he does not indulge in such an act which would find him in prison". [Para 20][3]

Sentencing for sex crimes:

In recent years, the rising crime rate-particularly violent crime against women has made the criminal sentencing by the courts a subject of concern. Today there are admitted disparities. Some criminals get very harsh sentences while many receive grossly different sentence for a essentially equivalent crime and a shockingly large number even go unpunished, thereby encouraging the criminal and in the ultimate making justice suffer by weakening the system's credibility.

Factors for Imposing Sentences:

In imposing sentences, in the absence of specific legislation, Judges must consider

variety of factors and after considering all those factors and taking an over-all view of the situation, impose sentence which they consider to be an appropriate one. Aggravating factors cannot be ignored and similarly mitigating circumstances have also to be taken into consideration. [61-G-H, 62-A-B] [Para 12] [4], [5]

The measure of punishment in a given case must depend upon the atrocity of the crime; the conduct of the criminal and the defenseless and unprotected state of the victim. Imposition of appropriate punishment is the manner in which the courts respond to the society's cry for justice against the criminals. Justice demands that courts should impose punishment fitting to the crime so that the courts reflect public abhorrence of the crime. The courts must not only keep in view the **rights of the criminal** but also the **rights of the victim of crime** and **the society at large** while considering imposition of appropriate punishment. [62-C-D] [Para 13][2, 3][4], [5]

Meaning and Scope of Modesty:

The meaning of the word "**modesty**" means, "Womanly propriety of behaviour, scrupulous chastity of thought, speech and conduct (in men or women) reserve or sense of shame proceeding from instinctive aversion to impure or coarse suggestions". - **Oxford English Dictionary** [6]

Court observed: "This obviously does not refer to a particular woman but to the accepted notions of womanly behaviour and conduct. It is in this sense that the modesty appears to have been used in section 354 of the Indian Penal Code".

The learned Judge then referred to S.509 of the Penal Code in which also the word "**modesty**" appears and then proceeded to say:

Public Morality and Decent Behavior:

"The **object of this provision** seems to have been to protect women against indecent behaviour of others which is offensive to morality. The offences created by section 354 and section 509 of the IPC are as much in the interest of the women concerned as in the interest of public morality and decent behaviour."

Court further observed that "These offences are not only offences against the individual but against public morals and society as well, and that object can be achieved only if the word "modesty" is considered to be an attribute of a human female irrespective of fact whether the female concerned has developed, enough understanding as to appreciate the nature of the act or to realize that it is offensive to decent female behaviour or sense of propriety

concerning the relations of a female with others". [7]

Global Scenario:

The fact that, the Sexual Offences Act, 1956[8] has used **much wider-language** in s. 14 which, deals with **indecent assault on women** than that used in S. 354, I.P.C.

That in one sense S. 354 can also be said to be wider than S.14 of the British Act in that it is not confined to sexual offences which is quite correct. The two provisions run thus:

Section 14 of the Sexual Offences Act, 1956:[8]

"Indecent assault on a woman:

- (1) It is an offence, subject to the exception mentioned in sub-section (3) of this section for a person to make an indecent assault on a woman.
- (2) A girl under the age of sixteen cannot in law give any consent which would prevent an act being an assault for the purposes of this section.
- (3) Where a marriage is invalid under section two of the Marriage Act, 1949, or section one of the Age of Marriage Act, 1929 (the wife being a girl under the age of sixteen), the invalidity does not make the husband guilty of any offence under this section by reason of her incapacity to consent while under that age, if he believes her to be his wife and has reasonable cause for the belief".
- (4) A woman who is a defective cannot in law give any consent which would prevent an act being an assault for the purposes of this section, but a person is only to be treated as guilty of an indecent assault on a defective by reason of that incapacity to consent, if that person knew or had reason to suspect her to be a defective".

Section 354 of the Indian Penal Code:

"Assault or criminal force to woman with intent to outrage her modesty-Whoever assaults or uses criminal force to any woman, intending to outrage or knowing it to be likely that he will thereby outrage her modesty, shall be punished with imprisonment of either description for a term which may extend to two years, or with fine, or with both". [9]

What is made an offence under S.14 is the act of the culprit irrespective of its reaction on the woman. The question is whether under S.354 the position is different. It speaks of outraging the modesty of a woman and at first blush seems to require that the outrage must be felt by the victim herself. But such an interpretation would leave out of the purview of

the section assaults, not only on girls of tender age but on even grown up women when such a woman is sleeping and did not wake up or is under anesthesia or stupor or is an idiot. [7]

It may also perhaps, under certain circumstances, exclude a case where the woman is of depraved moral character. Could it be said that the legislature intended that the doing of any act to or in the presence of any woman whom according to the common notions of mankind is suggestive of sex, would be outside this section unless the woman herself felt that it outraged her modesty?

Test for modesty:

Court observed that "Again, if the sole test to be applied is the women's reaction to particular act, would it not be a variable test depending upon the sensitivity or the upbringing of the woman? These considerations impel court to reject the test of a woman's individual reaction to the act of the accused. However, court observed that it would not be easy to lay down a comprehensive test"

As per Bachawat, L. J.:

Section 10 of the IPC explains that "woman" denotes a female human being of any age. The expression "woman" is used in S.354 in conformity with this explanation, see S.7.[7]

What then is a Woman's Modesty?

Court observed that "**that the essence of a woman's modesty is her sex.** The modesty of an adult female is writ large on her body. Young or old, intelligent or imbecile, awake or sleeping, the woman possesses modesty, capable of being outraged.

A female of tender age stands on a somewhat different footing. Her body is immature, and her sexual powers are dormant. Even if the victim is a baby, has not yet developed a sense of shame and has no awareness of sex. Nevertheless, from her very birth she possesses the modesty which is the attribute of her sex. [7]

Observation:

Incidence of molestation cases in India registered u/s 354, IPC increased by more than 100 percent since 1991, except a marginal decrease ranging between 96 to 99% in 2002, 2005 (99%), 2003 (97%) and 2009 (96%) respectively. There was phenomenal increase of more than 200% (224%) in the year 1995 over the 1994. Quinquennial Average (Q.A.) between 2005-2009 was 37730 (3.3), which is quite high and need to draw attention of the policy makers, legislatures, law commission of India, judiciary and those involved in criminal justice

administration like police, Forensic Medicine experts and social activists.

Table 1: Incidence of Molestation cases in India registered u/s 354 IPC

Year	Molestation cases	Annual increase (%)	Decadal increase (%)
1989	9934		
1990	8620	87	
1991	10283	119	
1992	10751	105	
1993	12009	112	
1995	26856	224	
1998	30959	115	
1999	32311	104	
2000	32940	102	382
2001	34124	104	
2002	33943	99	
2003	32939	97	
2004	34567	105	
2005	34175	99	
2006	36617	107	
2007	38734	106	
2008	40413	104	
2009	38711	96	
2010	40613	105	123

Source: Compiled from NCRB database

Table 2: Molestation Statistics of India

Year	Incidence and Rate	Percentage distribution
2000	32940 (3.3)*	
2005	34175 (3.1)*	
2006	36617 (3.3)*	1.9
2007	38734 (3.4)*	1.9
2008	40413 (3.5)*	1.9
2009	38711 (3.3)*	1.8
2010	40613 (3.4)*	1.8

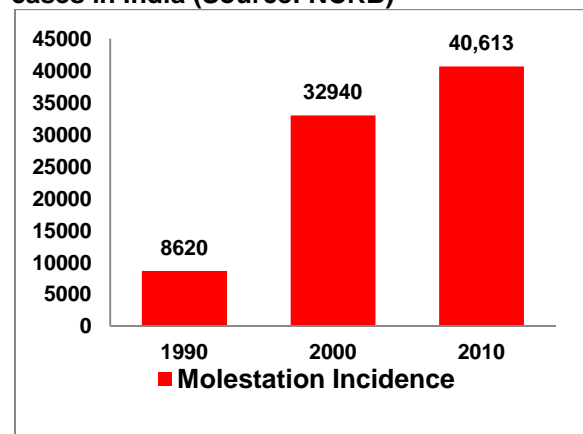
Figure in brackets indicates Rate of crime per lakhs of population. Quinquennial Average (Q.A.) (2005-2009): 37730 (3.3)

Table 3: Molestation (u/s 354 IPC) Statistics State-wise (Year 2010)

Region	Incidence	Rate
India	40613	3.4
Uttar Pradesh	2793	1.4
Madhya Pradesh	6646	9.2
Delhi	601	3.3
Sikkim	11	1.8
Daman Diu (UT)	2	1.0

Source: NCRB Database

Fig. 1: Decadal Incidence of Molestation cases in India (Source: NCRB)



Violation of Right to Privacy and Personal Integrity / Human Dignity:

Of late, crime against women in general and rape in particular is on the increase. It is an irony that while we are celebrating women's rights in all spheres, we show little or no concern for her honour. It is a sad reflection on the attitude of indifference of the society towards the violation of human dignity of the victims of sex of crimes.[Paragraph 20][10]

Constitutional Provisions:

Article 15(3) of the Constitution of India speaks of allowing the State to make special provisions for women and children.

International Obligations:

The Convention on the Elimination of All Forms of Discrimination Against Women, 1979,[11] which was ratified by India in August 1993 and the U.N. Convention on the Rights of The Child, 1989, [12] which was ratified by India on 11.12.93, especially Articles 17 (3) and 19 of the latter speaks of the need to ensure that the child has access to information and material from a diversity of national and international sources, especially those aimed at the promotion of his or her social, spiritual and moral well being and physical and mental health, and for developing appropriate guidelines for the protection of the child from information and material injurious to his or her well being.

States Parties should take all appropriate legislative, administrative, social and educational measures to protect the child from all forms of physical and mental violence, injury or abuse, neglect or negligent treatment, maltreatment or exploitation including sexual abuse, while in the care of parent(s), legal guardian (s) of any other persons who has the care of the child. [13]

Recently Allahabad High Court pointed out that because of the **mild penalty of sentence** up to two years prescribed for an offence under section 354 IPC and the fact **that the offence is bailable**, such crimes of sexual violence against women are daily on the increase, although they are usually unreported.

No woman going to college or for meeting friends or who is simply walking on the streets or travelling by a public transport vehicle for going to some place or as in the present case, even when she is present in her house, is completely safe. Victims of such sexual crimes suffer great shame and humiliation.

Reasons for Non-Reporting of Cases:

Because of the attending social stigma and personal and family dishonor the aggrieved female is usually reluctant to lodge any

complaint or FIR when she is made a victim of this sexual crime. In the rare case when she takes recourse to the law enforcing agency, an absolute mockery of justice results when the molester is let out on bail at the police station itself, as section 354 IPC is a bailable offence and he becomes free to again stalk and terrorize the victim or to commit another criminal assault on her for outraging her modesty.

Violative of Article 14 of Indian Constitution:

Such a lenient punishment appears to have been prescribed for the crime under section 354 IPC because of a patriarchal mind set which does not accord equal status with a man to a woman, and is indifferent to the psychological trauma that a woman must undergo when criminal force is applied to her for outraging her modesty. As a matter of fact if a woman or girl child is viciously molested, it can be a highly traumatic experience which can leave a permanent psychological scar on the woman or girl child as she suffers humiliation, degradation and violation in the same manner similar to that she would suffer if she were an actual victim of a rape.

Violation of Fundamental Right to Sexual Integrity and Autonomy:

It is thus a crime similar to the crime of rape, and whilst it has been argued that such crimes affect the sexual integrity and autonomy of women and children and are violative of the right to life guaranteed under Art. 21 of the Constitution of India, but the argument to this extent have not been accepted in *Sakshi v Union of India*. (14)

Trial in camera:

Supreme Court has shown considerable concern for the woman or child victim of sexual violence, and has held in paragraph 34 that the provisions of **sub-section (2) of S.327 Cr.P.C.** prescribing **in camera trials** in addition to the offences mentioned in the sub-section i.e. offences under section 376, 376 A, 376 B, 376 C, and 376 D IPC also apply in inquiry or trials of offences under Ss. 354 and 377, I.P.C. [14]

Need for appropriate legislation:

Sakshi case (2004)[14] has also emphasized in **paragraph 35** that as the cases of child abuse and rape are increasing at an alarming speed appropriate legislation by Parliament in this regard is, urgently required. Psychologically where a woman or child is subjected to criminal force or assault for outraging her modesty, the experience was considered equally traumatizing as an actual act

of rape of the woman. [13], [15]

Psychological Harm:

Apex Court of India in *State of Punjab v Gurmit*, [10] has also shown great concern for the honour of women and the psychological harm that can be caused by such crimes.

SC in another cases observed that "Intention is not the sole criterion of the offence punishable under Section 354 IPC, and it can be committed by a person assaulting or using criminal force to any woman, if he knows that by such act the modesty of the woman is likely to be affected. Knowledge and intention are essentially things of the mind and cannot be demonstrated like physical objects.

A victim of molestation and indignation is in the same position as an injured witness and her testimony should receive the same weight. In the instant case after careful consideration of the evidence, the trial court and the High Court have found the accused guilty. But the offence is Section 354 IPC". [Para 13] SC altered the conviction of the accused from Section 376 IPC to Section 354 IPC. [Para 14][16]

Role of Courts:

They must deal with such cases with utmost sensitivity. The Courts should examine the broader probabilities of a case and not get swayed by minor contradictions or insignificant discrepancies in the statement of the prosecutrix, which are not of a fatal nature, to throw out an otherwise reliable prosecution case. [13]

The testimony of the prosecutrix must be appreciated in the background of the entire case and the trial Court must be alive to its responsibility and be sensitive while dealing with cases involving sexual molestations.

Anomaly in Cr.PC:

A plain reading of the First Schedule to the Code of Criminal Procedure reveals several such anomalies, and less grave offences appear to have been made non-bailable whereas Section 354 IPC is bailable.

Thus, section 324 IPC which only speaks of voluntarily causing simple hurt by a dangerous weapon or means, and is triable by a Magistrate and does not carry the psychological harm associated with a criminal assault for outraging a woman's modesty has been made non-bailable by Act of 2005. [17] House trespass with preparation for causing hurt, assault etc. even when no hurt is actually caused punishable under section 452 IPC and triable by a Magistrate is a non-bailable offence.

Scenario in State of U.P.:

An offence of mere criminal intimidation

without any actual assault punishable under section 506 IPC has been made cognizable and non-bailable in the State of U.P., vide notification dated 31.7.89.

Scenario in State of M.P.:

It needs to be pointed out that in the State of Madhya Pradesh, by Act of 2004, [18]section 354 A IPC has been introduced which speaks of an assault or use of criminal force to a woman with intent to disrobe her.

The offence has been made punishable with imprisonment for not less than one year but which **may extend to ten years and fine. The First Schedule** to the Code of Criminal Procedure has also been amended in Madhya Pradesh and the offence has been made non-bailable and triable by a Court of Session.

Scenario in State of A.P.:

Also **the State of A.P.** [19] has made section 354 IPC punishable with a minimum sentence of five years, which could extend to seven years and fine. For adequate reasons however the Court could impose a lesser sentence, but which must not be less than two years. By Act 3 of 1992,[19] the First Schedule to the Cr.P.C has been amended and the offence has been made non-bailable and triable by a Court of Session.

Scenario in State of Orissa:

The Government of Orissa by Act 6 of 1995, [20] has also made the offence under section 354 IPC non-bailable.

Summary and Conclusions:

Court observed that "Looking to the rampant and daily increasing prevalence of such crimes of sexual violence in the **State of U.P., M.P., and in Delhi** and in other places we think that it is high time that the State of U.P. and even the Union of India should become sensitive to this grave issue, and consider imposing stringent laws for putting a check on such crimes of sexual violence against women and children."

Need For Harsher Punishment:

SC observed that "..... In fact, we feel that the sentence was too light considering the gravity of the offence." [Para 11][21]

The parade of a tribal woman on the village road in broad day light is shameful, shocking and outrageous. The dishonor is called for harsher punishment; it is surprising that the State Government did not file any appeal for enhancement of the punishment awarded by the Additional Sessions Judge. [Paras 15] [101-E-F][21]

Hon'ble High Court, therefore, recommend that the State of U.P. and the Union

of India, consider amending the provisions of section 354 IPC and the First Schedule to the Cr.P.C. by prescribing a higher sentence for the offence and for making it non-bailable and triable by a Court of Session. [13] Of course, it is not possible to lay down any cut and dry formula relating to imposition of sentence but the object of sentencing should be to see that the crime does not go unpunished and the victim of crime as also the society has the satisfaction that justice has been done to it. [3], [5]

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Original Research Paper

Situation Ethics: How relevant is 'right' versus 'useful' theory in ethical practice?

*Munawwar Husain, **Arshad Anjum, ***Mubarak Alshraim, ****Amir Usmani, *****Jawed A Usmani

Abstract

Ironically in the twenty-first century, developing countries face a pile of ever increasing burden on health care facilities. The lack of political will, redundant health policies, mismanaged health care system, and grossly inadequate health care infrastructure along with battery of other local factors, have fuelled the crisis. People depend largely on government hospitals for basic health care facilities, which usually remain saturated and long queues are a customary sight. The tremendous increase in dependence over government hospitals has drained the already fatigued health service. Under such an ambience, the people involved are often constrained to take decisions which though look agonizingly unethical, yet are defended by demand of situation. The authors present their view point under the ambit of "Situation Ethics" in an incident, reported in newspaper highlighting the plight of a victim who met with a train accident at district Malda, State of West Bengal, India, and lost both his legs, which were securely tucked under his head as 'pillow' giving a grisly sight unbecoming in an hospital situation.

Key Words: Situation Ethics, Human Rights, Medical Ethics, Patient Care, Health Service Providers

Introduction:

Developing countries still lack basic health care facilities and coupled with an ever increasing cost of health care, people have limited alternatives other than government hospitals. As of latest, Central Bureau of Health Intelligence, GOI data, public sector hospitals are approx 12760 with cumulative bed capacity as 576793 to serve approximately 1.2 billion populations. The average population served per Government hospital and bed comes out to be about 90972 and 2012 respectively. [1] Usually all Government hospitals are crowded and for even simple radiological investigations or minor surgical operations patients have to wait for weeks. Similarly, with limited hospital staff and resources the health service providers are burdened with ever increasing load of patients.

Some of the many factors that have been attributed include lack of political willingness, futile health policies, mismanaged health care system, and inadequate health care infrastructures.

Under such state of affairs, people hardly question the quality of care, as far as their treatment is going on. The cumulative problem of lack of resources and increase in patient load has created an ambience where minute errors, small mistakes and unethical practices are often overlooked. Further, a justification for such incidents is often based on inadequacies in health care system. But does this "situation" give free will to do gross unethical practice?

Opinion:

With the advent of internet, media and information technology, spate of incidents emphasizing suffering of patients is quite often reported. We are presenting an incident reported in newspaper highlighting the plight of the victim (**Fig. 1**) who met with a train accident at district Malda, State of West Bengal, India, and lost both his legs. [2]

It is amazing to see the contentment on his face – partly because he has become immune to pain, to his fate and to the insult rubbished upon him. The photograph shows both his legs which he has lost in the accident securely tucked under his head as 'pillow'. This picture is ghastly. It demonstrates the utter callousness, inhuman, unethical and animalistic

Corresponding Author:

Dr. Arshad Anjum

E-mail: arshadanjum@yahoo.com

*Associate Professor, Chairman & Formerly Medical Superintendent

**Junior Resident-III

****Senior Resident

***** Professor

Department of Forensic Medicine

****Professor Dept. of Psychiatry

J N Medical College, Aligarh Muslim University,
Aligarh, Uttar Pradesh-202 002

***Assist. Prof., Deptt. of Pathology,

King Khalid University, Abha, KSA

DOR: 12.01.2012 DOA: 02.04.2012

behaviour of the hospital staff – the so-called health service providers.

Fig. 1: Victim with his severed legs being used as Pillow [6]



However, our intent of presenting this incident to the entire educated world through this journal is to try defending the action of the hospital staff under the ambit of 'situation ethics'. Mainly three approaches to decision-making are envisaged in ethical behaviour, i.e., legalism by which decisions are made by following the whole apparatus of prefabricated rules and regulation; antinomianism, where no principles or maxim guides the decision making process, and thirdly, the situation ethics where situation itself guides the behaviour without any pre-existing guidelines.

Situation ethics is a much despised theory but then all despicable acts needs to be defended by abhorrent theories and practices. Situation demands that whereas the hospital staffs has tucked the 'ethics' as a 'pillow' under the beleaguered head of the destitute their rescue could only be procured by 'ethics' which bends to the situation.

Legs were tucked under the head as pillow reason given by the hospital staff was that in the hustle and bustle of the main emergency room they could be lost (sick). This action collaborates with the 'right' versus 'useful' theory in ethical practice. [3] But then the staff knew

that what they were doing was not 'right' but it was 'useful'. Therefore, their (mis)deed was collaborative with situation ethics.

It may be further argued by the 'notion right or wrong causing impediment to the progress of understanding' [4] thereby causing conflict within the contextual framework of reference, whether it be practiced 'within a theological frame of reference in *koinonia* or should it be tailored to fit objective circumstances of the 'situation'. [5]

Conclusion:

In our opinion, the situation ethics stands out to be the worse because though the 'illuminators' may be there the 'directors' are absent and hence the decision may be reckless in all probability. Similarly, it cannot justify the rudimentary and stunted action disregarding the situation in which it was practiced.

Situation Ethics may be fulfilling the need in debatable ethical situation; it shall never rise to the occasion thrown by medical ethics. Hence, it can be said conclusively that this practice should be abstained by doctors & medical practitioners as it contra-verses the established principles of medical ethics. Furthermore, short-term gain would contaminate the principles of strong ethical behaviour and would create commotion in the minds of amateurs.

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Review Research Paper

DNA Profiling in Forensic Dentistry

*Pankaj Datta, **Sonia Sood, ***Pooja Rastogi, *Kalyani Bhargava, *Deepak Bhargava, *Mukesh Yadav

Abstract

In last few years, DNA analysis methods are applied to forensic cases. Forensic dental record comparison has been used for human identification in cases where destruction of bodily tissues or prolonged exposure to the environment has made other means of identification impractical, i.e., after fire exposure or mass disaster. Teeth play an important role in identification and criminology, due to their unique characteristics and relatively high degree of physical and chemical resistance. The use of DNA profile test in forensic dentistry offers a new perspective in human identification. DNA is responsible for storing all the genetic material and is unique to each individual. The currently available DNA tests have high reliability and are accepted as legal proofs in courts. This article gives an overview of the evolution of DNA technology in the last few years, highlighting its importance in cases of forensic investigation.

Key Words: Forensic dentistry; DNA profiling; Teeth; Human identification

Introduction:

The established importance of Forensic Dentistry for human identification in mass disaster, mainly when there is little remaining material to perform visual identification (e.g. in fires, explosions, decomposing bodies or skeletonized bodies), has led dentists working with forensic investigation to become more familiar with the new molecular biology technologies. Disaster victim identification traditionally relies on the efforts where ante mortem information from the missing persons is compared with post mortem data of the dead persons. [1] If ante mortem data is unavailable then the exact identification becomes difficult and only the DNA profiling systems can reveal the exact identity of a person.

Matching of the DNA extracted from the teeth of an unidentified individual with DNA isolated from known ante mortem samples such as stored blood, tooth brush, hairbrush, clothing, cervical smear, biopsy, to a parent or sibling is the usual procedure in DNA analysis. [2]

This article presents a literature review on DNA analysis for human identification, and makes an overview of the evolution of this technology, highlighting the importance of molecular biology in cases of forensic investigation.

Methodology:

For this review, articles were identified by searches on electronic data bases such as Pub med database and EMBASE from 1975 through March 2011. The following search terms were used: "DNA finger printing in forensic dentistry", "Teeth and DNA analysis", "Dental pulp and DNA analysis", "DNA isolation and amplification methods", "Forensic DNA Typing".

Background:

Any type of organism can be identified by examination of DNA sequences unique to that species. Every cell of an individual carries a copy of the DNA. Order of base pairs (bp) in the DNA of every individual is different except identical twins. The uniqueness is due to the intron regions of DNA which contain sequences that are 20 - 100 bp in length that are repeated at different locations (loci) along the chromosome like AGACTAGACATT—AGATTAGGCATT which are called sequence polymorphism.

Jeffreys, et al [3] in 1985 created radioactive molecular probes that could

Corresponding Author:

*Principal & Head

Department of Prosthodontics & Dental Materials
Inderprastha Dental College & Hospital
Sahibabad, Ghaziabad, Uttar Pradesh, India
E-mail: pankajdatta97@rediffmail.com

** Post-graduate Student,

Dept. of Public Health Dentistry,
ITS-CDSR, Muradnagar, Ghaziabad, UP

***Assoc. Prof.,

Dept. of Forensic Medicine & Toxicology
SMS & R, Sharda University, Greater Noida

* Professor & HOD, Dept. of Oral Pathology,
Inderprastha Dental College & Hospital, Sahibabad

*Professor & HOD, Dept. of Oral Pathology,
SDS, Sharda University, Greater Noida

* Prof., Dept. of Forensic Medicine & Toxicology

DOR: 12. 2.11 DOA: 19.8.11

recognize highly variable regions of DNA (minisatellites in human genome) and thus determine the specific patterns of each individual. These hyper variable loci were constituted by tandem repeat of oligonucleotides sequences (from 2 to 80 bp). Depending on their size, these loci were nominated as VNTR (variable number of tandem repeat) or minisatellites, 9 to 80 pb, and STR (short tandem repeats) or microsatellites, 2 to 7 bp.

These repeated sequences were named DNA fingerprints or DNA typing (profiling) as it is now known. DNA profiling is a standard forensic DNA system used in human identification, criminal case work as well as paternity testing worldwide. [4]

Initially, the forensic community used VNTR testing; but this method requires a large amount of material and has low quality results, especially when only little biological material samples are available. Currently in most forensic samples, the study of DNA is usually performed by STR analysis. The most valuable STRs for human identification are those that present greater polymorphism (greater number of alleles), smaller size (in base pairs), higher frequency of heterozygotes (higher than 90%) and low frequency of mutations.

DNA and Forensic Dentistry:

Due to the resistant nature of dental tissues to environmental assaults, such as incineration, immersion, trauma, mutilation, decomposition and microbial action, teeth represent an excellent source of DNA material. In the tooth, dentin and pulp are rich sources of DNA which can be successfully extracted. [5] Total production of genomic DNA obtained from dental sample may range from 6 µg to 50 µg DNA. [6] Sweet stated that the PCR (polymer chain reaction) method enables differentiation of an individual from another, with a high level of reliability and with about 1 ng (one one-billionth of a gram) of the target DNA. [7] Thus, abundance of quality DNA can be extracted from a tooth which is an important advantage in DNA analysis. [8]

DNA is preserved in the teeth and bones for a very long period and thus are a valuable source of information. Ancient DNA (aDNA) analysis can be carried out in samples that are hundreds to tens of thousands of years old. [9]

Sampling of the Tooth and DNA Extraction:

Efficient DNA extraction procedures as well as accurate DNA quantification methods are

critical steps involved in the process of successful DNA analysis of such samples.

Various methods have been reported regarding the extraction of DNA from the tooth which includes sectioning of teeth horizontally at the cemento- enamel junction or vertically up to root tip, scraping and aspiration. .

Other methods include crushing of the teeth or cryogenic grinding or conventional access cavity preparation and retrieval of dental pulp. The advantages of access cavity preparation technique are its simplicity, relatively low cost and preservation of the tooth integrity which can be considered in forensic investigations. [10]

Researchers must carefully evaluate the conditions of the material to be examined, in which there is a greater risk of sample contamination and influence of environmental factors, in addition to a small amount of DNA material available in most situations, which may also include PCR-inhibitors. Environmental factors leading to the degradation of DNA include time, temperature, humidity (facilitating the growth of microorganisms), light (both sunlight and UV light) and exposure to various chemical substances. [11]

DNA extraction process is composed of 3 different stages: cell rupture or lysis (which allows use of several techniques for effective rupture of the cell membranes), protein denaturation and inactivation (by chelating agents and proteinases in order to inactive elements, such as proteins), and finally DNA extraction itself. [12]

The techniques of DNA extraction most often employed in Forensic Dentistry are the organic method (composed of phenol-chloroform and used for high molecular weight DNA, laborious, time consuming, with a higher likelihood of errors, given the use of multiple tubes and can only be done if abundance of sample is available); Chelex 100 (the fastest with the lowest risk of contamination, yet very expensive); FTA Paper (composed of absorbent cellulose paper with chemical substances, which speed up its use); and isopropyl alcohol (containing ammonium and isopropanol, which is less expensive and also an alternative to the organic method).

Types of DNA:

Genomic and mitochondrial are two types of DNA which are used in forensic sciences. The genomic DNA is found in the nucleus of each cell in the human body and represents a DNA source for most forensic applications. The teeth are an excellent source

of genomic DNA. Mitochondrial DNA (mtDNA) is another type of material that can be used when the extracted DNA samples are too small or degraded, such as those obtained from skeletonized tissues, the likelihood of obtaining a DNA profile from mtDNA is higher than that with any marker found in genomic DNA. [13] Various biological samples such as hair, bones, and teeth that lack nucleated cellular material can be analyzed with mtDNA and is very useful.

Applications of DNA Profiling in Forensic Dentistry:

The currently performed DNA profile tests are totally reliable and give details about an individual's physical characteristics, ethnicity, place of origin, and sex. These tests are also accepted as legal proofs in courts, such as for investigation of paternity and human identification.

1. Restriction Fragment Length Polymorphism (RFLP) Typing:

It is used for analyzing the variable lengths of DNA fragments that result from digesting a DNA sample with a special kind of restriction enzyme called "restriction endonuclease" which sections DNA at a specific sequence pattern known as a restriction endonuclease recognition site. RFLP requires relatively large amounts of DNA. Hence, cannot be performed with the samples degraded by environmental factors and also takes longer time to get the results. [14]

2. STRs Typing:

These are described as short stretches of DNA that are repeated at various locations throughout the human genome and this technology is used to evaluate specific regions (loci) within nuclear DNA. Each person has some STRs that were inherited from father and some from mother but however no person has STRs that are identical to those of either parent. The uniqueness of an individual's STRs provides the scientific marker of identity and hence is helpful in forensic identification and paternity testing. [15]

STR can be used for identification of bodies in the mass disasters and old skeletal remains. [16] Even though the DNA present in the ancient remains appeared much degraded, it was better conserved in tooth than in bone samples.[17] Highest success rates for human identification using STR analysis were observed with samples from dense cortical bone of weight-bearing leg bones (femur 86.9%) and intact teeth also exhibited high success rates (teeth 82.7%). [18] Based on STR, Combined

DNA Index System CODIS was established by the Federal Bureau of Investigation (FBI).

It was developed specifically for enabling public forensic DNA laboratories to create searchable DNA databases of authorized DNA profiles. The odd that two individuals will have the same 13-loci DNA profile is about one in a billion. The United States maintains the largest DNA database in the world.

3. Mitochondrial DNA (mtDNA) Analysis:

Long intervals between the time of death and examination of tissues complicate the genetic identification with nuclear DNA and sometimes only bone and teeth may be available for analysis. Teeth provide an excellent source for high molecular weight mtDNA that offer several unique advantages for the identification of human remains. [19]

mtDNA is a powerful tool for forensic identification as it possesses high copy number, maternal inheritance, and high degree of sequence variability. Each offspring have the same mtDNA as their mothers since the mitochondrion of each new embryo comes from the mother's egg cell and the nuclear DNA is contributed by father's sperm. In investigations involving missing persons, comparing the mtDNA profile of unidentified remains with the profile of a potential maternal relative can be an important technique. [20] However, mtDNA analysis is a very expensive technique and is exclusively matrilineal and hence less informative. Thus, this analysis is not usual in all forensic laboratories directed at resolution of crimes and identification of persons.

4. Y-Chromosome Analysis:

DNA-polymorphisms on the human Y chromosome are valuable tools for understanding human evolution, migration and for tracing relationships among males. [21] Majority of the length of the human Y chromosome is inherited as a single block in linkage from father to male offspring as a haploid entity. Hence Y chromosomal DNA variation has been mainly used for investigations on human evolution and for forensic purposes or paternity analysis. [22]

5. X-Chromosome STR:

Chromosome X specific STR is used in the identification and the genomic studies of various ethnic groups in the World. [23] Since the size of X-chromosome STR alleles is small, generally including 100-350 nucleotides, it is relatively easy to be amplified and detected with high sensitivity. [24] X-chromosome STR (X-

STR) markers are a powerful complimentary system especially in deficiency paternity testing.

6. Single Nucleotide Polymorphism (SNPs):

SNPs are DNA sequence variations that occur when a single nucleotide (A, T, C, or G) in the genome sequence is altered. For example an SNP might change the DNA sequence AAGGCTAA to ATGGCTAA. [25] SNPs are emerging as new markers of interest to the forensic medicine because of their small amplicon size which is useful in analyzing degraded samples, lower mutation rate compared with STRs, amenable to high throughput analysis (automation), abundant in the human genome, can provide specific information about ancestry, lineage, evolution, identity or phenotype, and also determine sex. Limitations of SNPs include such as no widely established core loci, and requirement of large multiplexing assays.

Gender Typing:

The enamel proteins that is required for the development of normal tooth enamel is encoded by the amelogenin genes. The amelogenin gene is a single copy gene, homologues of which are located on Xp22.1-Xp22.3 and Yp 11.2. [26] The variation of length in the X-Y homologous amelogenin gene (AMELX and AMELY), are used for gender identification. [27] Dental pulp is a valuable source of DNA for sex determination. Komuro T et al have identified the sex from the dental pulp DNA through the analysis of the peaks of X and Y locus by capillary gel electrophoresis (CGE).

Conclusion:

The application of DNA technology has revolutionized forensic identification procedures. Teeth represent an excellent source of DNA, which is protected by epithelial, connective, muscular and bone tissues in case of incineration. Additionally, the dental pulp cells are protected by enamel, dentin and cementum hard dental tissues. Therefore, dental professionals working on the field of Forensic Dentistry should incorporate these new technologies in their work, as several methods are available for DNA extraction from biological materials, yet standardization of the protocols adopted for such purpose has not been reached so far. Nevertheless, the field is developing at fast pace to reach new frontiers and solve many riddles hidden in the human genome.

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Review Research Paper

Right to Health Care

*Indrajit Khandekar, **B. H. Tirpude, ***P. N. Murkey

Abstract

The Constitution of India has provisions regarding the right to health. The obligation of the State to ensure the creation and the sustaining of conditions congenial to good health is cast by the Constitutional directives contained in articles 38, 39 (e) (f), 42, 47 and 48 A in Part IV of the Constitution of India. In this article following aspects are studied in the light of provisions of constitution of India and various judicial pronouncements: Medico-legal cases and Right to Health Care and Medical Assistance; Medical Examination of rape victim and Right to health care; Working of Blood Banks and Right to Health Care; Cases of HIV/AIDS and Right to health care; Living and working conditions of workers and right to health care; Mentally ill person and right to Health care; Biomedical Waste and Right to Health Care; Pollution and Right to health Care.

Key Words: Right to Health Care, Constitution, Judicial Pronouncements, Medico-Legal Cases

Introduction:

The Constitution of India has provisions regarding the right to health. The obligation of the State to ensure the creation and the sustaining of conditions congenial to good health is cast by the Constitutional directives contained in Articles 38, 39 (e) (f), 42, 47 and 48 A in Part IV of the Constitution of India. [1]

The state has to direct its policy towards securing that health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength [Article 39 (e)] and that children are given opportunities and facilities to develop in a healthy manner and in conditions of freedom and dignity and that childhood and youth are protected against exploitation and against moral and maternal abandonment [Article 39 (f)].

Article 42:

“Provision for just and humane conditions of work and maternity relief- The State shall make provision for securing just and humane conditions of work and for maternity relief”

Corresponding Author:

*Associate Professor,
Department of Forensic Medicine,
MGIMS, Sevagram, Dist: Wardha (Maharashtra)
E-mail:ilkhandekar@yahoo.co.in,
khandekar@mgims.ac.in
** Prof & Head
*** Professor
DOR: 14.10.11 DOA: 18.5.12

Article 47:

“Duty of the State to raise the level of nutrition and the standard of living and to improve public health- The State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties and, in particular, the State shall endeavor to bring about prohibition of the consumption, except for medicinal purposes, of intoxicating drinks and of drugs which are injurious to health”

Protection and improvement of environment is also made one of the cardinal duties of the State (**Article 48 A**).

The above articles act as guidelines that the State must pursue towards achieving certain standards of living for its citizens'. It also shows clearly the understanding of the State that nutrition, conditions of work and maternity benefit as being integral to health.

Article 25(1) of the Universal Declaration of Human Rights guarantees the right to a standard of living adequate for health and well-being.

Article 7(b) of the International Covenant on Economic, Social and Cultural Rights have been cited by the Supreme Court in *ES C Ltd v Subhash Chandra Bose*[2] while upholding the right to health by a worker.

Although the DPSP (Directive Principles of State Policy) quoted above are compelling arguments for the right to health, this alone is not a guarantee. There must be a clearly defined right to health so that individuals can have this right enforced and violations can be redressed.

The Indian judiciary has interpreted the right to health in many ways through public interest litigation as well as litigation arising out of claims that individuals have made on the State, with respect to health services etc. As a result there is substantial case law in India, which shows the gamut of issues that are related to health.

Article 21 of the Constitution and right to health care:

The Fundamental Right to Life, as stated in Article 21 of the Indian Constitution,[3] guarantees to the individual her/his life which or personal liberty except by a procedure established by law. The Supreme Court has widely interpreted this fundamental right and has included in Article 21 the right to live with dignity and “all the necessities of life such as adequate nutrition, clothing....” It has also held that act which affects the dignity of an individual will also violate her/his right to life.

The Constitution incorporates provisions guaranteeing everyone's right to the highest attainable standard of physical and mental health. Article 21 of the Constitution guarantees protection of life and personal liberty to every citizen. The Supreme Court in **Bandhua Mukti Morcha vs. Union of India**,[4] has held that the right to live with human dignity, enshrined in art 21, is derived from the directive principles of state policy and therefore includes protection to health.

In **Vincent Panikulangara vs. Union of India**,[5] the Supreme Court of India on the right to health care observed:

“Maintenance and improvement of public health have to rank high as these are indispensable to the very physical existence of the community and on the betterment of these depends the building of the society of which the Constitution makers envisaged. Attending to public health in our opinion, therefore is of high priority-perhaps the one at the top”.

In a historic judgment in **Consumer Education and Resource Centre Vs Union of India**,[6] the Supreme Court has held that the right to health and Medical care is a fundamental right under Article 21 of the constitution as it is essential for making the life of the workman meaningful and purposeful with dignity of person. “Right to life” in Article 21 includes protection of the health and strength of the worker. The expression ‘life’ in Article 21 does not connote mere animal existence. It has a much wider meaning which includes right to livelihood, better standard of life, hygienic conditions on workplace and leisure. The court

held that the State, be it Union or State Government or an industry, public or private is enjoined to take all such action which will promote health, strength and vigour of the workman during period of employment and leisure and health even after retirement as basic essentials to life with health and happiness. The right to life with human dignity encompasses within its fold, some of the finer facets of human civilization which makes life worth living. The court accordingly laid down the following guidelines to be followed by all asbestos industries:

In **Kirloskar Brothers Ltd v. Employees’ State Insurance Corpn.** [7] The Supreme Court, following the Consumer Education and research Center's case, has held that ‘right to health’ is a fundamental right of the workmen. The Court also held that this right is not only available against the State and its instrumentalities but even private industries to ensure to the workmen to provide facilities and opportunities for health and vigour of the workman assured in the provision of Part IV of the Constitution which are ‘integral part of right to equality under Art 14 and right to invigorated life under Article 21 which are fundamental rights to the workmen.

Further in, **State of Punjab and Others vs. Mohinder Singh Chawala**[8] “it has been held that right to health is integral to right to life. Government has a constitutional obligation to provide health facilities.” Similarly, the court has upheld the state's obligation to maintain health services.[9]

Apart from recognizing the fundamental right to health as an integral part of the Right to Life, there is sufficient case law both from the Supreme and High Courts that lays down the obligation of the State to provide medical health services.

The issue of adequacy of medical health services was also addressed in **Paschim Banga Khet Mazdoor Samity vs. State of West Bengal**.(10) The question before the court was whether the non-availability of services in the government health centres amount to a violation of Article 21? It was held that that Article 21 imposes an obligation on the State to safeguard the right to life of every person. Preservation of human life is thus of paramount importance. **The government hospitals run by the State and the medical officers employed therein are duty-bound to extend medical assistance for preserving human life.**

Failure on the part of a government hospital to **provide timely medical treatment to a person in need of such treatment results**

in violation of his right to life guaranteed under Article 21. Therefore, the failure of a government run health centre to provide timely treatment is violative of a person's right to life. Further, the Court ordered that Primary health care centres be equipped to deal with medical emergencies. It has also been held in this judgement that the lack of financial resources cannot be a reason for the State to shy away from its constitutional obligation.

In **Mahendra Pratap Singh vs. State of Orissa**,^[11] a case pertaining to the failure of the government in opening a primary health care centre in a village, the court had held "In a country like ours, it may not be possible to have sophisticated hospitals but definitely villagers within their limitations can aspire to have a Primary Health Centre. The government is required to assist people get treatment and lead a healthy life. Healthy society is a collective gain and no Government should make any effort to smother it.

Primary concern should be the primary health centre and technical fetters cannot be introduced as subterfuges to cause hindrances in the establishment of health centre." It was also stated that, "great achievements and accomplishments in life are possible if one is permitted to lead an acceptably healthy life". **Thereby, there is an implication that the enforcing of the right to life is a duty of the state and that this duty covers the providing of right to primary health care.** This would then imply that the right to life includes the right to primary health care.

Medico-legal cases and Right to Health Care and Medical Assistance:

This has been explicitly held with regard to the provision of emergency medical treatment in **Pt. Parmananda Katara vs. Union of India**.^[12] It has been held that it is the professional obligation of all doctors, whether government or private, to extend medical aid to the injured immediately to preserve life without waiting legal formalities to be complied with by the police under Cr.P.C. Article 21 of the Constitution casts the obligation on the State to preserve life. No law or State action can intervene to delay the discharge of this paramount obligation of the members of the medical profession.

The obligation being total, laws of procedure whether in statutes or otherwise which would interfere with the discharge of this obligation cannot be sustained and must, therefore give way. This is a very significant ruling of the Court. It is submitted that if this

decision of the Court is followed, in its true spirit it would help in saving the lives of many citizens who die in accidents because no immediate medical aid is given by the doctors on the ground that they are not authorized to treat Medico-legal cases. Let us hope that all doctors (Government or private) of this country should follow this ruling of the court earnestly.

Medical Examination of rape victim and Right to health care:

It was a common practice among the doctors to refuse to examine the rape victim unless she is not referred by the police.

However, the Supreme Court in **State of Karnataka vs. Manjanna**,^[13] has recognised the right of the rape victims medical examination and disapproved the refusal of some government hospital doctors, particularly in rural areas, where hospitals are few and far between, to conduct any medical examination of a rape victim unless the case of rape is referred to them by the police. Such refusal to conduct the medical examination necessarily results in a delay in the ultimate examination of the victim by which time the evidence of the rape may have been washed away by the complainant herself or be otherwise lost.

Working of Blood Banks and Right to Health Care:

The instrument of Public Interest Litigation used by Common Cause, addresses the issue of the working of commercial blood banks. The court in **Common Cause vs. Union of India and Ors.**,^[14] while recognizing that blood donation is considered as a great life saving service to humanity, it must be ensured that the blood that is available with the blood banks for use is healthy and free from infection. The Supreme Court in this case laid down a system of licensing of blood banks. **It may be inferred from the above reasoning that the State is entrusted with the responsibility in matters of health, to ensure efficient functioning all centres relating to health care.**

Cases of HIV/AIDS and Right to health care:

Recently the **Supreme Court** ^[15] has addressed the epidemic of HIV/ AIDS. In a case where the court had to decide whether an HIV positive man should disclose his condition to the woman he was to marry, the court has held that "the woman's right to health to precedence over the man's right to privacy". It found that the hospital did not error in disclosing his status to his fiancé.

Sahara House and Sankalp Rehabilitation Trust[16] filed Public Interest litigation in the Hon'ble Supreme Court for access to equitable treatment for PLHIV (Patient Living With HIV, AIDS). In this Public Interest Litigation, the Hon'ble Supreme Court of India reviewed the steps taken by National AIDS Control Organisation, Ministry of Health and Family Welfare, Government of India to combat HIV/AIDS and the services being provided to PLHIVs. In this regard, the Supreme Court has issued various directives for enhancing the extent and efficacy of treatment administered to PLHIVs.

Living and working conditions of workers and right to health care:

While the provision of health services is essential to ensure good health, there are several other factors that influence a person's health. The Supreme Court has recognized this in a number of ways. This was first addressed in **Bandhua Mukti Morcha vs. Union of India**[17] a case concerning the living and working conditions of stone quarry workers and whether these conditions deprived them of their right to life. The court held that humane working conditions are essential to the pursuit of the right to life. It laid down that workers should be provided with medical facilities, clean drinking water and sanitation facilities so that they may live with human dignity.

In **Citizens and Inhabitants of Municipal Ward vs. Municipal Corporation, Gwalior**,[18] the court deliberated on the question- Is the State machinery bound to assure adequate conditions necessary for health? The case involved the maintaining of sanitation and drainage facilities by municipal corporations. It was held that the State and its machineries (in the instant case, the Municipal Corporation) are bound to assure hygienic conditions of living and therefore, health.

Mentally ill person and right to Health care:

There is sufficient case law on the issue of health in State run institutions such as remand homes for children and "care homes". In **Sheela Barse vs. Union of India and Another**,[19] a case pertaining to the admitting of non-criminal mentally ill persons to prisons in West Bengal, the Supreme Court has held that "(1) Admission of non-criminal mentally ill persons to jails is illegal and unconstitutional.... The Judicial Magistrate will, upon a mentally ill person being produced, have him or her examined by a Mental Health Professional/Psychiatrist and if advised by such

MHP/Psychiatrist, send the mentally ill person to the nearest place of treatment and care." It has further directed the state to improve mental health institutions and integrate mental health into primary health care, among others.

Further in **Sheela Barse v Union of India and Others**,[19] the Supreme Court has entrusted to High Courts the duty to monitor the conditions of "mentally ill and insane" women and children in prisons and pass appropriate orders from time to time.

In the most recent case involving the death of 25 inmates of a mental health institution in **Erawadi, Ramnathapuram District**[20] as they were chained to poles or beds and could not escape from a fire that broke out, the Supreme Court has directed the state to implement the provisions of the mental health act as well as to undertake a survey of all institutions that provide mental health facilities and ensure that they are maintaining standards of care.

Section 81 of the Mental Health Act, 1987, has provided that mentally ill person be treated without violation of human rights.

Biomedical Waste and Right to Health Care:

The Biomedical Waste (Management and Handling) Rules, 1998 and The Biomedical Waste (Management and Handling) Amendments Rules, 2000 were notified by the Central Government in exercise of the powers conferred by Ss 6, 8 and 25 of the Environment (Protection) Act, 1986. The act makes it a duty of every occupier of an institution generating biomedical waste which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called to ensure that such waste is handled without any adverse effect to human health and the environment.

Pollution and Right to health Care:

In **Santosh Kumar Gupta vs. Secretary, Ministry of Environment, New Delhi**,[21] contended that the policy, controls / regulations and their implementations are inadequate thereby causing health hazards. In its judgments, the High Court of Madhya Pradesh has laid down that pollution from cars poses a health hazard to people and that the State must ensure that emission standards are implemented and maintained.

In the landmark **MC Mehta vs. Union of India**,[22] the Supreme Court has held that environmental pollution causes several health hazards, and therefore violates right to life.

Specifically, the case dealt with the pollution discharged by industries into the Ganges. It was held that victims, affected by the pollution caused, were liable to be compensated.

Conclusion:

From the above discussion of cases it is evident that the judiciary has clearly read into Article 21, Right to Life, the right to health. It in fact has gone deeper into the meaning of health and has substantiated the meaning of the right to life.

The question that must be discussed more thoroughly is whether an amendment to the Constitution, which will state the fundamental right to health, is desirable? Enumerated rights have an edge over wider interpretations of existing rights, as States can be held accountable for violations.

However, with the extensive case law that is available is it not possible to use what is available to ensure that health care, facilities and condition ensuring health are fundamental rights of every citizen? If the case law reflects the ability of the courts to read the meaning of 'health' in very wide sense (everything from the responsibility of the municipal corporation to provide sanitation facilities down to access to emergency medical treatment has been interpreted in the right to health) then why not use the instrument of case law to confer rights? It is this question that must be examine in the light of the recent amendment guaranteeing primary education for all. The process that led up to the amendment must be looked at critically as well as how the implementation of it is currently taking place.

Any amendment guaranteeing the right to health should have a focus on primary health care, which is preventive and curative. It should also have specific focus on the health of women-

more specifically reproductive health, children, and the disabled- both physically and mentally. Keeping this in mind there must be more detailed examination of an amendment to the Constitution, guaranteeing the right to health.

Contributions:

First author has collected the data, and prepared the draft of manuscript. Other authors revived the manuscript.

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Review Research Paper

Euthanasia Revisited: The Aruna Shanbaug Verdict

*Arsalaan. F. Rashid, **Balbir Kaur, ***O.P. Aggarwal

Abstract

Euthanasia and its procedure have long history of locking horns as a vexed issue with laws of countries across the world. Every human being of adult years and sound mind has a right to determine what shall be done with his/her own body. It is unlawful to administer treatment to an adult who is conscious and of sound mind, without his consent. In patients with Permanently Vegetative State (PVS) and no hope of improvement, the distinction between refusing life saving medical treatment (passive euthanasia) and giving lethal medication is logical, rational, and well established. It is ultimately for the Court to decide, as *parens patriae*, as to what is in the best interest of the patient. An erroneous decision not to terminate results in maintenance of the status quo; the possibility of subsequent developments such as advancements in medical science, the discovery of new evidence regarding the patient's intent, changes in the law, or simply the unexpected death of the patient despite the administration of life-sustaining treatment, at least create the potential that a wrong decision will eventually be corrected or its impact mitigated.

Key Words: Consent, Permanent Vegetative State, Passive Euthanasia, *Parens patriae*

Introduction:

Euthanasia is the intentional premature termination of another person's life either by direct intervention (active euthanasia) or by withholding life-prolonging measures and resources (passive euthanasia), either at the express or implied request of that person (voluntary euthanasia), or in the absence of such approval (non-voluntary euthanasia).

Euthanasia and Physician Assisted Dying:

In euthanasia, a physician or third party administers it, while in physician assisted suicide it is the patient himself who does it, though on the advice of the doctor. In many countries/States the latter is legal while the former is not.

Global Situation:

1. United States: Active Euthanasia is illegal in all states in U.S.A but physician assisted dying is legal in the states of Oregon, Washington and Montana.

2. Canada: In Canada, Physician Assisted Suicide is illegal vide Section 241(b) of the Criminal Code of Canada.

3. Netherlands: Euthanasia in the Netherlands is regulated by the "Termination of Life on Request and Assisted Suicide (Review Procedures) Act", 2002. It states that euthanasia and physician-assisted suicide are not punishable if the attending physician acts in accordance with the criteria of due care. These criteria concern the patient's request, the patient's suffering (unbearable and hopeless), the information provided to the patient, the presence of reasonable alternatives, consultation of another physician and the applied method of ending life. [1]

4. Switzerland: Switzerland has an unusual position on assisted suicide; it is legally permitted and can be performed by non-physicians. However, euthanasia is illegal, the difference between assisted suicide and euthanasia being that while in the former the patient administers the lethal injection himself, in the latter a doctor or some other person administers it.

5. Belgium: Belgium became the second country in Europe after Netherlands to legalize the practice of euthanasia in September 2002. Patients wishing to end their own lives must be conscious when the demand is made and repeat their request for euthanasia. They have to be under "**constant and unbearable physical or psychological pain**" resulting from an accident or incurable illness.

Corresponding Author:

*Junior Resident, Dept. of Forensic Medicine
MMIMSR, Mullana (Ambala), Haryana -133207
E-mail: afrashid@gmail.com

**Professor

***Professor and Head

DOR: 17.2.12 DOA: 19.3.12

Aruna Ramachandra Shanbaug Case:

Shanbaug, 60, a former nurse, was beaten and sexually assaulted in 1973 by a co-worker, a hospital janitor at Mumbai's King Edward Memorial Hospital, where she remains today. She suffered severe brain damage and paralysis after her attacker, Sohanlal Bhartha Valmiki, reportedly choked her with a chain. Valmiki was convicted of robbery and assault in 1974 and imprisoned for seven years. After his release, he reportedly moved, changed his name and found another hospital job.

The petition asking that Shanbaug be allowed to die was brought by Pinki Virani, an author and right-to-die activist, after Shanbaug's family abandoned her. Virani argued that with the patient unable to see or speak properly, keeping her alive violated her basic dignity. Virani expressed regret that the court didn't put an end to Shanbaug's force-feeding. "She still does not, after more than three and a half decades, receive justice, the bizarre postscript to Aruna's story is that those who claim to 'love' her and 'look after her' are the ones who want her not to rest in peace."

The Verdict

Refusing mercy killing of Aruna Shanbaug, a two-judge bench of Supreme Court comprising of justices Markandey Katju and Gyan Sudha Mishra, in a landmark judgement on 7th March 2011, allowed "passive euthanasia" of withdrawing life support to patients in (PVS) but rejected outright active euthanasia of ending life through administration of lethal substances.

The apex court while framing the guidelines for passive euthanasia asserted that it would now become the law of the land until Parliament enacts a suitable legislation to deal with the issue. The bench also asked Parliament to delete Section 309 IPC (attempt to suicide) as it has become "anachronistic though it has become constitutionally valid." "A person attempts suicide in a depression, and hence he needs help, rather than punishment," Justice Katju writing the judgement said. The Apex Court noted that though there is no statutory provision for withdrawing life support system from a person in PVS, it was of the view that "passive euthanasia" could be permissible in certain cases for which it laid down guidelines and cast the responsibility on high courts to take decisions on pleas for mercy killings. [2]

The Way to Verdict:

The Airedale case [3]

In the Airedale case [3] decided by the House of Lords in the U.K., the facts were that one Anthony Bland aged about 17 went to the

Hillsborough Ground on 15th April 1989 to support the Liverpool Football Club. In the course of the disaster which occurred on that day, his lungs were crushed and punctured and the supply to his brain was interrupted. As a result, he suffered catastrophic and irreversible damage to the higher centres of the brain. For three years, he was in a condition known as PVS.

One of the judges on jury noted that it was unlawful to administer treatment to an adult who is conscious and of sound mind, without his consent. Such a person is completely at liberty to decline to undergo treatment, even if the result of his doing so will be that he will die. This extends to the situation where the person in anticipation of his entering into a condition such as PVS, gives clear instructions that in such an event he is not to be given medical care, including artificial feeding, designed to keep him alive. He observed that the principle of sanctity of life is not an absolute one. For instance, it does not compel the medical practitioner on pain of criminal sanction to treat a patient, who will die, if he does not, according to the express wish of the patient. It does not authorize forcible feeding of prisoners on hunger strike. It does not compel the temporary keeping alive of patients who are terminally ill where to do so would merely prolong their suffering. On the other hand, it forbids the taking of active measures to cut short the life of a terminally-ill patient (unless there is legislation which permits it).

Lord Keith observed that although the decision whether or not the continued treatment and cure of a PVS patient confers any benefit on him is essentially one for the medical practitioners in charge of his case to decide, as a matter of routine the hospital/medical practitioner should apply to the Family Division of the High Court for endorsing or reversing the said decision. This is in the interest of the protection of the patient, doctors, and for the reassurance of the patient's family and the public.

Lord Goff another judge on jury observed that discontinuance of artificial feeding in such cases is not equivalent to cutting a mountaineer's rope, or severing the air pipe of a deep sea diver. The true question is not whether the doctor should take a course in which he will actively kill his patient, but rather whether he should continue to provide his patient with medical treatment or care which, if continued, will prolong his life.

Lord Browne-Wilkinson was of the view that removing the nasogastric tube in the case of Anthony Bland cannot be regarded as a positive

act causing the death. Its non removal itself does not cause the death since by itself, it does not sustain life. Hence removal of the tube would not constitute the actus reus of murder, since such an act would not cause the death.

Lord Mustill observed: "... Anthony Bland's life should now end. The doctors have done all they can. Nothing will be gained by going on and much will be lost. The distress of the family will get steadily worse. The strain on the devotion of a medical staff charged with the care of a patient whose condition will never improve, who may live for years and who does not even recognize that he is being cared for, will continue to mount. The large resources of skill, labour and money now being devoted to Anthony Bland might in the opinion of many be more fruitfully employed in improving the condition of other patients, who if treated may have useful, healthy and enjoyable lives for years to come."

Thus all the Judges of the House of Lords in the Airedale case were agreed that Anthony Bland should be allowed to die. Airedale (1993) decided by the House of Lords has been followed in a number of cases in U.K., and the law is now fairly well settled that in the case of incompetent patients, if the doctors act on the basis of informed medical opinion, and withdraw the artificial life support system if it is in the patient's best interest, the said act cannot be regarded as a crime.

Court as Parens patriae:

The question, however, remains as to who is to decide that what is the patient's best interest where he is in a PVS? Most decisions have held that the decision of the parents, spouse, or other close relative, should carry weight if it is an informed one, but it is not decisive. [4]

It is ultimately for the Court to decide, as parens patriae, as to what is in the best interest of the patient, though the wishes of close relatives and next friend, and opinion of medical practitioners should be given due weight in coming to its decision. As stated by J Balcombe [5] the Court as representative of the Sovereign as parens patriae will adopt the same standard which a reasonable and responsible parent would do.

The Glucksberg and the Vacco Cases: [6, 7]

The two most significant cases of the U.S. Supreme Court that addressed the issue whether there was a federal constitutional right to assisted suicide arose from challenges to State laws banning physician assisted suicide

brought by terminally ill patients and their physicians.

In Glucksberg's case,[6] the U.S. Supreme Court held that the asserted right to assistance in committing suicide is not a fundamental liberty interest protected by the Due Process Clause of the Fourteenth Amendment. The Court observed: "The decision to commit suicide with the assistance of another may be just as personal and profound as the decision to refuse unwanted medical treatment, but it has never enjoyed similar legal protection. Indeed the two acts are widely and reasonably regarded as quite distinct."

In Vacco's case [7] the U.S. Supreme Court again recognized the distinction between refusing life saving medical treatment and giving lethal medication. The Court disagreed with the view of the Second Circuit Federal Court that ending or refusing lifesaving medical treatment is nothing more nor less than assisted suicide. The Court held that "the distinction between letting a patient die and making that patient die is important, logical, rational, and well established". The Court held that the State of New York could validly ban the latter.

The Cruzan Case:

In Cruzan v. Director, MDH [8] decided by the U.S. Supreme Court. In that case, the petitioner Nancy Cruzan sustained injuries in an automobile accident and lay in a Missouri State Hospital in what has been referred to as a PVS, a condition in which a person exhibits motor reflexes but evinces no indication of significant cognitive function. The State of Missouri was bearing the cost of her care. Her parents and co guardians applied to the Court for permission to withdraw her artificial feeding and hydration equipment and allow her to die. While the trial Court granted the prayer, the State Supreme Court of Missouri reversed, holding that under a statute in the State of Missouri it was necessary to prove by clear and convincing evidence that the incompetent person had wanted, while competent, withdrawal of life support treatment in such an eventuality.

The only evidence led on that point was the alleged statement of Nancy Cruzan to a housemate about a year before the accident that she did not want life as a 'vegetable'. The State Supreme Court was of the view that this did not amount to saying that medical treatment or nutrition or hydration should be withdrawn. Chief Justice noted that in law even touching of one person by another without consent and without legal justification was a battery, and hence illegal. The notion of bodily integrity has been

embodied in the requirement that informed consent is generally required for medical treatment.

As observed by Court of Appeals of New York "Every human being of adult years and sound mind has a right to determine what shall be done with his own body, and a surgeon who performs an operation without his patient's consent commits an assault, for which he is liable in damages." [9]

Thus the informed consent doctrine has become firmly entrenched in **American Tort Law**. The logical corollary of the doctrine of informed consent is that the patient generally possesses the right not to consent that is to refuse treatment.

Consent in Permanent Vegetative State:

Re Quinlan Case:

Karen Quinlan suffered severe brain damage as a result of anoxia, and entered into PVS. Her father sought judicial approval to disconnect her respirator. The New Jersey Supreme Court granted the prayer, holding that Karen had a right of privacy grounded in the U.S. Constitution to terminate treatment. The Court concluded that the way Karen's right to privacy could be exercised would be to allow her guardian and family to decide whether she would exercise it in the circumstances. [10]

Re Conroy Case:

In Conroy's case, a case of an 84 year old incompetent nursing home resident who had suffered irreversible mental and physical ailments, however, the New Jersey Supreme Court, contrary to its decision in Quinlan's case, decided to base its decision on the common law right to self determination and informed consent. This right can be exercised by a surrogate decision maker when there was clear evidence that the incompetent person would have exercised it.

Where such evidence was lacking the Court held that an individual's right could still be invoked in certain circumstances under objective '**best interest**' standards. Where no trustworthy evidence existed that the individual would have wanted to terminate treatment, and a person's suffering would make the administration of life sustaining treatment **inhumane, a pure objective standard could be used** to terminate the treatment. If none of these conditions obtained, it was best to err in favour of preserving life. [11]

It is important to note in Cruzan's case [8] that there was a statute of the State of Missouri, unlike in Airedale's case [3], which

required clear and convincing evidence that while the patient was competent she had desired that if she becomes incompetent and in a PVS her life support should be withdrawn.

In Cruzan's case the learned Chief Justice observed: "Not all incompetent patients will have loved ones available to serve as surrogate decision makers. And even where family members are present, there will be, of course, some unfortunate situations in which family members will not act to protect a patient. A State is entitled to guard against potential abuses in such situations."

The learned Chief Justice further observed: "An erroneous decision not to terminate results in maintenance of the status quo; the possibility of subsequent developments such as advancements in medical science, the discovery of new evidence regarding the patient's intent, changes in the law, or simply the unexpected death of the patient despite the administration of life-sustaining treatment, at least create the potential that a wrong decision will eventually be corrected or its impact mitigated. An erroneous decision to withdraw life-sustaining treatment, however, is not susceptible of correction."

Indian Legal Scenario:

In India abetment of suicide (Section 306 Indian Penal Code) and attempt to suicide (Section 309 of Indian Penal Code) are both criminal offences. This is in contrast to many countries such as USA where attempt to suicide is not a crime. The Constitution Bench of the Indian Supreme Court in Gian Kaur vs. State of Punjab held that both euthanasia and assisted suicide are not lawful in India. [12] That decision overruled the earlier two Judge Bench decision of the Supreme Court in P. Rathinam vs. Union of India. [13] The Court held that the right to life under Article 21 of the Constitution does not include the right to die. In Gian Kaur's case the Supreme Court approved of the decision of the House of Lords in Airedale's case, and observed that euthanasia could be made lawful only by legislation.

Conclusion:

Aruna Ramachandra Shanbaug case was landmark case because it came to important conclusions:

1. The Supreme Court of India in its verdict recommended to the Indian Parliament to consider the feasibility of deleting Section 309 from the Indian Penal Code.
2. The Supreme Court of India also noted that in Gian Kaur's case [12] although the Court in its previous judgement has quoted with

approval the view of the House of Lords in Airedale's case, it has not clarified who can decide whether life support should be discontinued in the case of an incompetent person e.g. a person in coma or PVS.

3. Allowing "passive euthanasia" or withdrawing life support to patients in PVS.
4. Laying down strict procedural guidelines for "passive euthanasia" to prevent persons from taking undue advantage.
5. Rejection of "active euthanasia" or ending life through administration of lethal substances as in India because of the unfortunate low level of ethical standards to which our society has descended, its raw and widespread commercialization, and the rampant corruption, such legislation can prove counter productive.
6. Since medical science is advancing fast, doctors must not declare a patient to be a hopeless case unless there appears to be no reasonable possibility of any improvement by some newly discovered medical method in the near future.

In this connection the honorable judges of the Supreme Court have given the example of an Arkansas man Terry Wallis, in a recent news

item, who was 19 years of age and newly married with a baby daughter when in 1984 he went into coma which lasted 24 years after which he regained consciousness.

This was perhaps because his brain spontaneously rewired itself by growing tiny new nerve connections to replace the ones sheared apart in the car crash.

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Book Review

Review of Forensic Medicine & Toxicology Including Clinical & Pathological Aspects By Dr.Gautam Biswas

Second Edition of Review of Forensic Medicine & Toxicology: Including Clinical & Pathological Aspects written by **Dr.Gautam Biswas**, an young and dynamic Forensic Medicine Expert, a good teacher, researcher and an author contributed a large number of research papers to national and international scientific journals. He is currently serving as Professor and Head of Department of Forensic Medicine & Toxicology at Dayanand Medical College and Hospital, Ludhiana, Punjab.

Coverage of contents is extensive in all most all the Chapters from Undergraduate student's point of view. Presentation of study material is excellent to the point, diagrammatic representations enhancing the value of content for memorizing by the students. Language used is simple, easily understandable and lucid. Clarity of subject matter is very nice. Flow charts and excellent quality of photographs make it favorite among students especially during examination hours.

The special feature of this book is the up-to date MCQs along with answers put together from various P.G. entrance examinations after most of the chapters.it helps the students for prepration for forthcoming competitive entrance examinations as well as in viva-voce.

This book is easily understandable by the student. It is also useful for medical officers, police personals, lawyers and judges working in the medico-legal field and involved in crime investigation.

It is my pleasure to write a review of this textbook, a treasure of an exemplary piece of communication skill conglomerated with experiences and intellectual potentials.

Mukesh Yadav
Editor, J. Indian Acad Forensic Med.

Review Research Paper

The Problem of Child Sexual Abuse in India Laws, Legal Lacuna and the Bill – PCSOB-2011

*Alok Kumar, **Asha Pathak, **Sandeep Kumar, *Pooja Rastogi, *Prateek Rastogi

Abstract

Child abuse is the physical or psychological maltreatment of a child, can be differentiated into four major categories, physical abuse, emotional abuse, neglect and worst of all; the sexual abuse. Child Sexual Abuse (CSA) is a kind of physical or mental violation of a child with sexual intent, usually by a person who is in a position of trust or power vis-à-vis the child. India is the second largest child population in the world, 42% of India's total population is below eighteen years. In a shocking revelation, a Government commissioned survey has found that more than 53% of Indian children are subjected to sexual abuse / assault. Majority of these cases were perpetrated by someone known to the child or in a position of trust and responsibility, Not surprisingly, most children did not report the abuse to anyone.

There is not a single law aimed at safeguarding children and protecting them against sexual abuse & assault, which is a serious lacuna against this background and is needed urgently. This paper will focus on child sexual abuse, the laws, legal loopholes, and The Protection of Children against Sexual Offences Bill, 2011.

Key Words: Sexual abuse of children, Laws, Legal Lacuna

Introduction:

India is second most populous country in the world and latest Census 2011 reveals that it's a home to 17% of the world's population. Nearly nineteen percent of the world's children live in India, which constitutes 42 percent (more than one third) of India's total population [1] and around 50 percent of these children are in need of care and protection.

Signing up to the United Nations Convention on the Rights of the Child, India promised to protect its children from all forms of sexual exploitation and sexual abuse. Article 34 (a) enjoins state machinery to prevent the inducement or coercion of a child to engage in any unlawful sexual activity.

Yet, despite having the dubious distinction of having the highest number of sexually abused children in the world, there is no special law in India.

Child Sexual Abuse (CSA) is a form of child abuse in which an adult or older adolescent who is in a relationship of responsibility, trust or power, uses a child for sexual stimulation. [2]

CSA means contacts or interactions between a child and an older or more knowledgeable child or adult (stranger, sibling, parent, or caretaker), when the child is being used as an object of gratification for the older child's or adult's needs. Such contacts or interactions are carried out against the child using force, trickery, bribes, threats or pressure. [UNICEF, 2001]

Ironically, a majority of such cases occur in the home, school or the neighbourhood next door. In India, many gruesome incidents of CSA have been recorded in the past ranging from incest, rapes, sexual abuse, digital rape, sodomy, inappropriate touch to sexual assaults. The worst part is that such abuse is inflicted upon a child by a person in his immediate circle and a stunning majority of these cases go unnoticed. Also, reasons like shame, plain depravity and family honour contribute towards shunning and covering the cases of child abuse. Sexual abuse has immediate as well as long-term effects on the child, from emotional and behavioural problems to abnormal sexual

Corresponding Author:

*Associate Professor & Head,
Dept. of Forensic Medicine & Toxicology,
Rural Institute of Medical Sciences and Research,
Saifai, Etawah – 206301 (U.P.), India
E-mail: drsalok@rediffmail.com

**Assist. Prof.

Dept. of Pharmacology & Dept. of PSM

*Assoc. Prof., Dept. of FMT,
School of Medical Sciences & Research,
Sharda University, Greater Noida-201306 (UP)

*Assoc. Prof., Dept. of FMT,
Kasturba Medical College, Manglore, Karnataka
DOR: 13.10.11 DOA: 18.5.12

behaviour and psychiatric disorders. Studies have established a causal relationship between CSA and certain specific areas of adult psychopathology, including suicidal, antisocial behaviour, Post Traumatic Stress Disorder, anxiety and alcoholism. [3]

Sexually abused children suffer from more psychological symptoms than normal children. The risk of harm is greater if the abuser is a relative, if the abuse involves intercourse or attempted intercourse, or if threats or force are used. [4] Most importantly, these psychological effects prevent the normal developmental processes and positively correlated with mental health problems in later life.

A minor faces severe traumas after sexual assault. In court, cases become weak for several reasons, including inadequate investigation and insufficient medical evidence. The laws too are very weak & do not address the increasingly visible offence of CSA and contains serious contradictions that inhibit victims from reporting such crimes. The existing definitions of 'rape' and 'molestation' do not adequately address the various types of sexual assaults in terms of women's experience nor do they sufficiently recognize the gender specific nature of such crime. [5]

Some Common but Shocking Facts:

Abuser could be an adult of any age or an older child (adolescent), more commonly males and are often known to the child and his/her family. In most cases the abuser is a direct family member. He may be a relative, neighbour, member of household or a stranger. History of being abused as a child, record of sexual offence, and alcoholism are risk factors to be an abuser. A large number of children (40.4%) have been abused /assaulted in the offender's house. The most vulnerable age is between 3-7 years and then between 11-15 years. In 35% of the cases, the child was sexually assaulted or abused in public places like urinals, buses, local trains, etc. unfortunately only serious cases are reported to the police and more than 50% of the accused arrested are granted bail. [6]

Different forms of sexual abuse are:

A - Severe forms:

- a) Assault, including rape and sodomy
- b) Touching or fondling a child
- c) Exhibitionism- Forcing a child to exhibit his/her private body parts
- d) Photographing a child in nude

B - Other forms:

- a) Forcible kissing
- b) Sexual advances towards a child during travel

- c) Sexual advances towards a child during marriage situations
- d) Exhibitionism- exhibiting before a child
- e) Exposing a child to pornographic materials

Child Sexual Abuse in India:

CSA remains a taboo but it's a very real problem in India, and the situation is aided by the absence of effective legislation and the silence that surrounds the offence. Majority of people feel this is a largely western problem and does not happen in India. The definition of child Sexual abuse varies from country to country. Abusive acts against children fall under the purview of law in almost all developed nations. In India, it exists in many forms, but the laws are still ambiguous and most children suffer in silence. In India, which places a high premium on chastity of women and yet has the largest number of child sex workers in the world, there is no single, specific definition of child abuse. Disbelief, denial and cover-up to preserve family reputation has made child sexual abuse an invisible crime in India. In fact, in India it is as old as the joint family system and patriarchy. [7]

Statistics:

According to WHO, one in every four girls and one in every seven boys in the world are sexually abused. Virani (2000) states, the WHO found that at any given time, one of ten Indian children is the victim of sexual abuse. [8] But Lois J. Engel Recht, a researcher quotes studies showing that over 50 per cent of children in India are sexually abused, a rate that is higher than in any other country. [7]

Extent of the Problem:

Reliable estimates are hard to come since this is a furtive form of abuse, often causing victims to suffer in dark and claustrophobic silence.

To find out the extent of child abuse in India, The first ever National Study on Child Abuse was conducted by the **Ministry of Women and Child Development**, covering 12447 children, 2324 young adults and 2449 stakeholders across 13 states. In 2007 it published the report as "Study on Child Abuse: India 2007." [1] The survey, covered different forms of child abuse i.e. physical, sexual and emotional as well as female child neglect, in five evidence groups, namely, children in a family environment, children in school, children at work, children on the street and children in institutions.

This study brought out some shocking facts, [1] and its main findings in relation with sexual abuse are:

“Sexual abuse was reported by 53.22% children. **Among them 52.94% were boys and 47.06% girls 21.90% of child respondents faced severe forms of sexual abuse, 5.69% had been sexually assaulted and 50.76% reported other forms of sexual abuse”.**

- AP, Assam, Bihar and Delhi reported the highest percentage of sexual abuse among both sexes, **as well as the highest incidence of sexual assaults.**
- The highest incidence **of sexual assault** was reported in children on street, at work and in institutional care.
- 50% abusers were known to the child or in a position of trust and responsibility.
- Most Children did not report the matter to anyone.
- More than 53% children report facing one or more forms of sexual abuse and boys were equally at risk as girls.
- Almost 22% faced severe sexual abuse, 6% sexually assaulted.
- 50% of sexual offenders were known to the victim or were in positions of trust (family member, close relative, friend or neighbour).
- 5-12 year's group faced higher levels of abuse, largely unreported.
- Severest sexual abuse in age group of 11-16 years, 73% of sexual abuse victims were in age groups of 11-18years. [9]
- The age wise distribution showed that though the abuse started at the age of 5 years, it gained momentum 10 years onward, peaking at 12 to 15 years and then starting to decline.
- Another study on child abuse in Kolkata, Elaan, an NGO, found that four out of 10 boys faced sexual harassment in school. Generally the age of maximum abuse is between 9 to 12 years. The national study found that the abuse gained momentum at the age of 10 and peaked between 12 to 15.[7]
- This shows that the teenagers are most vulnerable.

Across the country, every second child was being subjected to other forms of sexual abuse and every fifth child was facing severe forms of sexual abuse. The Study also acknowledges that child sex abuse takes place in schools. One out of two children in schools has faced sexual abuse. And overall, more boys than girls face various forms of sexual abuse ranging from inappropriate touch, exposure to pornography or violent sexual assault. The abuser could be from the peer group or an older student. Senior students often

bring pornographic material to school and may force a younger boy to look at it to titillate them.

Tulir- CPHCSA's study in 2006, conducted among 2211 school going children in Chennai, indicates CSA prevalence rate of 42%. Children of all socio economic groups were found to be equally vulnerable. While 48% of boys reported having been abused, the prevalence rate among girls was 39%. 15% of both boys and girls had been severely abused. [9]

WIN News (1999) reports that in Mumbai, 60% of rape victims are between the ages of three and sixteen, with 50% below the age of ten. Unfortunately, these numbers represent only the most serious of cases. Most never get reported to the police in the first place. [10]

In a survey by Sakshi (1997) in New Delhi with 350 school girls, 63% had experienced CSA at the hands of family members; and 25% of the girls had either been raped, made to masturbate the perpetrator or engage in oral sex. [11]

Another study by RAHI (1997) on middle and upper class women from Chennai, Mumbai, Delhi, Kolkata and Goa revealed that 76% of respondents had been sexually abused as children, with 71% been abused either by relatives or by someone they knew and trusted. [11]

In 1996, Samvada in Bangalore found that 83% if girls had been subject to eve-teasing, with 13% of these under age ten. 47% had been molested, and 15% had been seriously sexually abused as children. Nearly a third was under age ten, and had been raped, forced into oral sex, or penetrated with foreign objects. [8] This study also states that 47% of the respondents had been sexually abused; 62% of whom had been raped once and 38% of whom had suffered repeated violations. [11]

Though often considered an act against lower-classes, CSA affects the upper classes as well. A study by RAHI in five major cities in India looked at the experiences of English-speaking middle- and upper-class adults. A whopping 76% reported sexual abuse as children. 35% of the attacks took place between the ages of twelve and sixteen, while 19% took place under age eight. [8]

RAHI conducted a case study entitled “Voices from the Silent Zone”. This study indicated that out of 76% of women who admitted they were sexually abused as children, 40% were survivors of incest. Some of the respondents stated that until the questionnaire was administered to them they had no idea that

they had been abused. They buried the abuse as a painful and shameful memory never to be told to anyone. Incest is by far the most common but least discussed form of sexual abuse that young girls suffer in India today. [11]

(Rahi,1997), In a study of a 1000 girls from 5 different states in India, 50% of the girls had been abused when under 12 years of age, 35% between the ages of 12- 16 years of age. One million children are trafficked into prostitution, in Asia every year. [7]

Further adding to these startling numbers are the reported "disappearances" of rape victims in Delhi found that almost 70% of Delhi's rape victims (those who reported the crime to the police), 51% of which were minors, simply disappeared. It has been suggested that "rebuks from parents, relatives, and friends; insecurity and threats from the rapist; a lengthy trial and little hope of conviction, and the fear of harassment if the rapist goes free" may be some of the reasons that girls simply leave home, or are even thrown out by parents when news of the rape comes out in the open. In the case of children, this may also be because the abuse is occurring in the home, and he or she leaves to escape the abuse when the police are inactive. [12]

According to the federal police In India around 1.2 million children are believed to be involved in prostitution.[13] A CBI statement said that studies and surveys sponsored by the ministry of women and child development estimated that about 40% of all India's prostitutes are children. [13]

According to Brown, (2000) there are an estimated 2 million child prostitutes (under the age of fifteen) at work in India. [14] Over 15 million children are working as bonded labour, in India. Twice as many girls than boys engaged in child labour. Child labourers and young domestic workers are most often abused sexually by the employers or other adults. Increased risk of HIV/AIDS from adult prostitutes, leads to an increased demand for younger child prostitutes, Sex tourism and Child marriages. [15]

Legal Aspects in India:

In India, there is not a single law that covers child abuse in all its dimensions. The Indian Penal Code (IPC) neither spells out the definition of child abuse as a specific offence; nor it offer legal remedy and punishment for it. Under the law, "child sexual abuse" is an umbrella term describing criminal and civil offenses in which an adult engages in sexual activity with a minor or exploits a minor for the

purpose of sexual gratification. [16, 17] Unlike many other countries, laws in India do not distinguish child sexual abuse from rape. Indeed, the laws against child sexual abuse are only in their developing stage. [5]

What is the Law?

By usual definition, sexual assault is defined as sexual actions or advances without the consent of one party. However, legal definitions tend to differ somewhat. Sections 375 and 376 of the IPC refer to rape. This defines rape as penile penetration of the vagina only. [8] Unfortunately, this law neglects sexual crimes that include digital, oral, or object penetration, as well as sexual crimes against men.

The IPC broadly lays out punishment for offences related to rape or sodomy or "unnatural sex." These law are too specific and do not apply to acts like fondling, kissing, filming children for pornographic purposes, etc. With boys, only proven sodomy is punishable offence but other than that, there is no clear definition of sexual abuse. The picture gets hazier when the act is committed by a child against a child. In that case, the Juvenile Justice Act comes into force that also does not specifically address the issue of child sexual abuse. [7]

Laws related with CSA in India and their shortcomings: [11]

At present CSA cases are handled under various sections of the IPC, which are laws meant for adults. There are very few sections under the IPC that deal with CSA. Some terrible home truths are:

1. The laws for women are extended to include children.
2. The major weakness of these laws is that only penile penetration is considered a grave sexual offence. Other offences are considered lesser.
3. Although Section 377, dealing with unnatural offences, prescribes seven to ten years of imprisonment, such cases can be tried in a magistrates court, which can impose maximum punishment of three years.
4. Children are more prone for repeated sexual abuse which affects them more severely, however as yet there is no law for repeated offenses against the one child.

Legal Loopholes:

Rape is an offence under the IPC, but lesser forms of sexual offences against children, are covered by grossly inadequate and inexact provisions such as "outraging the modesty of a woman." How do we define modesty and apply Section 354, on outraging the modesty of women, with respect to children? The gravity of

the offence under Section 509, dealing with obscene gestures, is less. Yet even in such cases, the child's psyche may be affected as severely as in a rape.

Hazy Laws & Lacuna:

In Indian legal system, the child has been defined differently in the various laws pertaining to children & the age of an individual in order to be determined as a "child" is NOT uniformly defined. Therefore it offers various gaps in the legal procedure which is used by the guilty to escape punishment. According to The Convention on the Rights of the Child, Article 1 defines "the child" as "every human being below the age of 18 years unless under the law applicable to the child, majority is attained earlier".

The IPC defines the child as being 12 years of age, whereas the Indian Traffic Prevention Act, 1956 defines a 'minor' as a person who has completed the age of 16 years but not 18 years. Section 376 of IPC, (punishment for rape), defines the age of consent to be 16 years of age, whereas Section 82 & 83 of the IPC states that nothing is an offence done by a child under 7 years, and further under 12 years, till he has attained sufficient maturity of understanding the nature of the Act and the consequences of his conduct on that occasion.

There also exists a differential definition for "boys and girls" as seen in the Juvenile Justice Act, which defines a male minor as being below 16 years and a female minor as being below 18 years of age.

The problem is not only with the laws but with the law enforcing agencies. The process is long drawn and conviction rate negligible. While law takes its course, the child suffers four times over - when the act is committed, while narrating the incident, during medical examination and then, in court. [7] Therefore, It is very difficult to apply the provisions of existing laws to any case of CSA as it is easy for a defence lawyer to make use of the legal loopholes to facilitate their client's escape from punishment.

The Protection of Children against Sexual Offences Bill, 2011 (PCSOB 2011):

The alarming results of "Study on Child Abuse: India 2007" and other statistical Figures are enough to convince that a special law is mandatory to effectively tackle the issue. [18] In an attempt to protect children against sexual abuse, sexual harassment and child pornography the Union Cabinet has passed a

first-of-its-kind Bill in March 2011, dealing exclusively with sexual offences against children which threatens stringent action against the offenders and providing for

- Establishment of special courts for trial of such offences
- A jail term up to 7 yrs and a fine of Rs.50,000 for such crimes

The new law will cover all new aspects of sexual offences against children not covered elsewhere. For the first time, the draft Bill distinguishes a sexual offence committed against children by persons in position of trust and authority over children. [7] The Bill provides for treating sexual assault as "aggravated offence" when:

1. It is committed by a person in position of trust or authority including a member of the security forces, police officer, public servant, management or staff of a children's home, hospital or educational institution.
2. The child victim is below 12 years or has mental or physical disability or the sexual offence causes grievous hurt or injury to the child with long term adverse effect on the child's mind and body.

The punishment for such an offence would be imprisonment of up to seven years with fine. The punishment for penetrative sexual assault has been proposed to be at least five years in jail and a minimum fine of Rs. 50,000. Sexual assault also includes fondling the child in an inappropriate way which will invite a penalty of minimum three years in jail. There is a special provision in the Bill preventing abuse of children for pornographic purpose or possessing pornographic material involving children.

Crime against children has been classified into that of "penetrative" sexual assault, which could be of aggravated nature also, and that of non-penetrative kind, which could again be of aggravated nature. [7] The media has been barred from reporting the cases without having authentic information and from disclosing the identity of the child. [19]

Discussion:

Children are the greatest gift to humanity and their sexual abuse is one of the most heinous crimes imaginable. It is an appalling violation of their trust and an ugly breach of our commitment to protect the innocent. Reliable estimates are hard to come by since this is a secretive form of abuse, often causing victims to suffer in dark and claustrophobic silence.

The offence of CSA is highly grave in nature and leaves the child in a state of mental

turmoil and physical torture. The parliament of India has been long awaited to make the law against child abuse even stricter, since the present law and order has many loopholes and thus the criminal gets discharged at a minimal punishment. We urgently need legislation that specifically addresses child abuse with its all form. The necessity for such a law is underlined in government data which shows that more than half of India's children have been subjected to such abuses. [7]

Regarding CSA, two institutions play a very important role in a Child's life: there is protection and there is prosecution. Protection is the job of the parent. Prosecution is the job of the state. [7]

Different studies and their reports indicate that there is a traditional conservative family and community structure that does not talk about this topic. This silence encourages the abuser so that he is safe to sexually abuse. With no information being available about child sexual abuse, many children are growing up not knowing their rights have been violated. In this scenario the implementation of PCSOB 2011, Bill would be of great help in checking these cases of CSA. [20]

The comprehensive bill defines a range of sexual offences against children that have been ignored and proposes more stringent punishments for offenders. A law like this will ensure necessary legal provisions for victims and will make it easier for people to recognize the crime and to help police register a case under the appropriate legal provision that applies to such crimes.

Conclusion:

Child sexual abuse is a dark reality that routinely inflicts our daily lives but in a majority of cases it goes unnoticed and unreported on account of the innocence of the victim, stigma attached to the act, callousness and insensitivity of the investigating and the law enforcement agencies, etc. Merely enacting legislation will not be enough unless this is followed by strict enforcement of the law with accountability defined.

Also, parents, teachers and others in the community have a vital role to protect children from sexual exploitation and abuse. Children are the country's greatest human resource and a measure of the country's social progress lies in the wellbeing of its children: that they are healthy, educated, safe, and happy and have access to life opportunities.

It is our duty that Child Sexual Abuse should be combated as early as possible. This will help India shine bright and develop in a crime free way, as children are the leaders of tomorrow.

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Review Research Paper

Analysis of Bite Mark Evidence

*Arvind Kumar, **Mukesh Yadav, ***Sushil Kumar, ****Navin Kumar, ****Kirtija Gupta

Abstract

Bite mark analysis casework strives to connect a biter to the teeth pattern present on an object linked in some way to a crime or event. The general public and some law enforcement may consider any "bite mark" case they develop to be a certainty in the quest to identify the biter. The ability of skin to register sufficient detail of a biter's teeth is highly variable. Bite mark casework indicates that many bite marks are not well defined in detail and possess distortion due to the physical nature of skin itself.

The current opinion is that bite mark can be useful in including or excluding possible suspects and ability to identify only one person as the biter. In mortal combat situations, such as the violence associated with life and death struggles between assailants and victims, the teeth are often used as a weapon. It is well known that assailants in sexual attacks, including sexual homicide, rape and child sexual abuse, often bite their victims as an expression of dominance, rage and animalistic behaviour. The teeth are a significant component of our natural arsenal.

Key Words: Bite mark, Recognition, Documentation, DNA analysis

Introduction:

Bite marks may possess individual tooth marks that appear as a jagged or intricate pattern or show as an amorphous bruise with diffuse detail. In mortal combat situations, such as the violence associated with life and death struggles between assailants and victims, the teeth are often used as a weapon. Indeed, using the teeth to inflict serious injury on an attacker may be the only available defensive method for a victim. [1] Alternatively, it is well known that assailants in sexual attacks, including sexual homicide, rape and child sexual abuse, often bite their victims as an expression of dominance, rage and animalistic behaviour. [2]

Corresponding Author:

*Reader,
Dept. of Pedodontics and Preventive dentistry,
Rama Dental College; Hospital & Research Center,
Kanpur

Email: drarvindverma29@rediffmail.com

**Prof. & HOD,
Dept. of Forensic Medicine & Toxicology,
School of Medical Sciences & Research Center,
Sharda University, Greater Noida, UP

***Assoc. Prof., Dept. of Forensic Medicine,
G.S.V.M. Medical College, Kanpur, UP

****Senior Lecturer,
Dept. of Oral & Maxillofacial Surgery,
Purvanchal Institute of Dental Sciences, Gorakhpur,

****Senior Lecturer,
Dept. of Pedodontics and Preventive Dentistry,
Rama Dental College; Hospital & Research Center,
Kanpur

DOR: 12.11.11 DOA: 22.5.12

The teeth are a significant component of our natural arsenal. It is suspected that many dentists have seldom considered their patients' teeth as such effective weapons! The aim of this paper is to provide information about this form of forensic evidence and to demonstrate how human bite marks are used by courts to answer important questions that may arise during the prosecution of accused suspects.

Sequence of Events in a Bite Mark Investigation:

1. Recognition:

The extra-oral and intra-oral structures are examined and significant findings are noted on a dental chart. Special attention is focused on the status of the general dental health, occlusion and mandibular articulation. [3] A human bite mark may have a variety of characteristics and so considerable variation due to incomplete marks; the surface bitten does not register physical indentations accurately. The fundamental steps in a bite mark analysis are the determination of which make specific mark e.g. six upper front teeth, two central incisors are wide & lateral incisors are narrower and the cuspids are cone shaped and lower central incisors and lateral incisors are uniform in width and cuspids are lesser conical than upper.

2. Documentation of Bite Mark:

It includes photography of the bite site before and after taking impression marking full facial and profile photographs are produced in addition to intra-oral exposures to depict the upper and lower dental arches and frontal and

lateral views of the teeth in occlusion.[4] A reference scale to enable measurements to be taken from the photographs should be included in the same plane as the teeth.

The impression material used in bite mark case must be given reinforced packing before it is removed from the object. This is to prevent twisting or other inaccuracies from being introduced through physical distortion. It is necessary to produce extremely accurate study casts of the teeth that record all of the physical traits and characteristics of the dentition. Accurate dental impression materials, such as vinyl polysiloxane or polyether should be used, although custom special trays are seldom fabricated for the suspect. It is recommended that two sets of study casts be produced using a hard stone, such as dental die stone. [5]

3. Laboratory Analysis of Bite Mark:

Serology or DNA lab work focuses on the swabbing taken from the possible bitten area. The best way to establish proper protocols is to contact the lab in your jurisdiction that will handle your casework. The best way to succeed is to plan ahead and establish collection and transport protocols that meet proper standards. During the process of biting and also during kissing and sucking, saliva is deposited on the skin's surface. It has been shown that this trace evidence is present in sufficient quantity and quality to enable PCR-based typing of the DNA that is present in saliva from white blood cells and possibly from sloughed epithelial cells. [6]

Significantly, since high-intensity alternative light sources and lasers are now widely used by the police to locate stains from bodily fluids at the crime scene, saliva stains deposited on skin even in the absence of marks from teeth can be found and recovered. After analyzing the salivary DNA and establishing the depositor's DNA profile, this result can be compared with the DNA profile of any suspects obtained from buccal swabs containing saliva or whole blood taken using a lancet. [7]

Discussion:

The most common methods to determine the suspect's teeth bite mark include techniques to compare the pattern of the teeth (shape, size, position of teeth, individually and collectively) with similar traits and characteristics present in life-sized photographs of the injury using transparent overlays. These overlays have been produced using various techniques. [8] The most accurate technique has been found to be a method using a computer. [9] Other comparison methods include the direct comparison of the suspect's study casts with

photographs of the bite mark, comparison of test bites produced from the suspect's teeth with the actual bite mark, and the use of radiographic imaging [10] and scanning electron microscopy. Some effort has been made to standardize the comparison procedures but, unfortunately, the conclusions are often based on the expert's level of personal experience and judgment. [11] The American Board of Forensic Odontology has established guidelines for independent examination of the same evidence by second and third odontologists before the primary expert submits a final report. Regardless, many cases have been disputed because of differing expert opinions, attacks on the scientific basis of physical comparisons because of the elasticity of skin and the question of uniqueness of the human dentition. [3]

Conclusion:

The bite mark analysis by dentist has 50yrs of use. The best match possible between a suspect and a bitten object has been mentioned as "the biter has teeth like the suspect because" where in an explanation is also necessary regarding the relative weight or value of the connection between the evidence and a person. This article hopefully provides the steps and rationale in the recognition, collection and preservation of this type of forensic physical evidence to person in law enforcement or other branches of investigation.

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Case Report

Extensive Soft Tissue Injuries as a Cause of Death

*Hitesh Chawla, **P.K. Paliwal, ***Basant Lal Sirohiwal

Abstract

The blunt trauma injury is the most common type, a pathologist encounter when doing medico-legal autopsies. Sometimes, while searching the main cavities of the body for the fatal injuries like lacerations and damages to the vital organs, we, the Forensic Pathologist commonly ignores the superficial small abrasions, bruises over the other parts of the body. Cutaneous injuries i.e. abrasions, contusions in most cases, are not fatal and are seemingly unimportant. However, soft tissue injuries not always are simple as mostly described in the literature but sometimes these injuries may be so extensive internally that leads to irreversible shock. In fact, these injuries prove fatal when taken collectively into consideration. Sometimes trivial circumstances lead to serious quarrel, resulting into death of the victim which apparently looking uninjured externally while conducting autopsy. Under such circumstances sometimes at primary health care centres the inexperienced autopsy surgeons are not in a position to correlate the superficial looking soft tissue injuries attributing towards death.

Key Words: Soft Tissue Injury, Contusion, Abrasion, Hemorrhagic Shock, Blunt Trauma

Introduction:

A contusion or bruise is an area of haemorrhage into soft tissue due to rupture of blood vessels caused by blunt trauma. [2] There are many variables that influence the development and absorption of bruises, as well as their appearance and extent of spread, thus adding to the difficulty in their interpretation. The type of surface and force that impacts on the body will have great effect on the intensity, size, shape, and pattern of the resultant bruising. Skin coloration modifies the appearance of a bruise to the naked eye. It is much easier to observe the extent and colour of bruising in lighter skinned individuals. Thus, it is particularly important to take extra care when examining dark skinned individuals so that any bruising is not overlooked. [3] Absence of a bruise does not indicate that there was no blunt force to that area. Deep bruises may not be visible externally and may be discovered only on incising the soft tissue. [3] Bruises do not necessarily lie at the point of impact.

Corresponding Author:

*Resident, Dept. of Forensic Medicine,
Pt. B. D. Sharma Postgraduate Institute of Medical
Sciences, Rohtak-124001 Haryana, India
E-mail: drhiteshchawla@rediffmail.com

**Sr. Professor & Head

***Professor

DOR: 17.8.11 DOA: 27.2.12

The blood may travel for a distance in the deeper tissue planes before it reaches the surface; there may also be delay in its appearance. On occasion the bleeding may remain deep-seated. [1]

Another point to remember is that a contusion might be much larger than the object that produced it. [2] As a rule, bruises are not fatal and are simple injuries. They are seldom fatal unless accompanied by the rupture of an internal organ, or by extensive crushing of the tissues and large extravasation of blood, producing sloughing and gangrene of parts. [4] However, multiple contusions with extensive soft tissue haemorrhage may produce shock and death from massive blood loss. [2] However, several bruise, though trivial individually, may cause death from shock and haemorrhage.

Death may occur from primary or neurogenic shock. Shock may result from exhaustion caused by several combined injuries; though each one of them separately may be very slight. [4] Loss of 40-50% of circulating blood volume can lead to death. [5] Thus an extensive soft tissue trauma can be a cause of death. In the case presented here there were multiple cutaneous injuries i.e. bruises and abrasions over the body which resulted into death.

Brief History:

First Information Report (FIR) speaks that the deceased was an illiterate unskilled labourer residing in a non-urban area of north India. On the evening of 23.11.2010 while he

was crossing the street near to his house, innocently, unintentionally had a soft touch of his hand with another resident of his neighbourhood. On this he got annoyed and started blaming him that he has touched him intentionally and has to face the consequences. After about 10 minutes he along with his couple of companions attacked him with stick, hands and feet and thrown him on the ground and went on attacking him with kicks and blows all over his body. On hearing noises few people gathered and mediated to separate them. On the next very day a formal compromise was also made between the parties in the local Panchayat of the village. This is a common practice in such type of cases in India. After that the deceased was in pains but didn't go to any hospital, stay at his home only. In the next morning the deceased had severe discomfort for which he was taken to General Hospital, from where he was referred to a tertiary care hospital but he was not in a position to go to tertiary care hospital, so, taken to a private practitioner. But the private practitioner showing his inability to manage him asked the relatives to take him to some big hospital. While he was being taken to a tertiary care hospital, on the way he expired.

On this the relatives requested to the police to register case against the accused and body was sent for post-mortem examination. In the primary care hospital a board of three medical officers conducted the post-mortem examination. They observed externally multiple soft tissue injuries in the form of abrasions and bruises all over the body which were not dissected to visualize the extent of extravasations of blood in the soft tissues; and internally no injury was appreciated in the vital organs in all the three cavities except the trachea which was containing some gastric contents. They were unable to correlate the injuries to be a cause of death. So the body was referred for re-post-mortem examination to the Department of Forensic Medicine, Postgraduate Institute of Medical Sciences, Rohtak, Haryana.

Repost-mortem Examination:

The re-post-mortem was carried out by a board in the Department of Forensic Medicine on 27.11.2010. It has been observed that the rigor mortis was in passing phase and post-mortem staining was faintly visible over back. The body was having an "I" shaped post-mortem stitched midline incision and stitched post-mortem incision over the head. The internal organs in the main three cavities of the body were found dissected in their respective places. No incision was made externally through the

skin on the soft tissue injuries to elucidate the condition and extent of extravasations of blood in the internal tissues during the first autopsy.

The following external injuries were marked over the body:

1. Diffuse bluish reddish contusion was found around the left eye with appreciable redness of conjunctiva of left eye;
2. A brownish scabbed abrasion (2.5×2.5 cm) situated over left side of face, 5 cm below left eyebrow and 5.5 cm away from the tip of nose;
3. A brownish scabbed abrasion (1.5×0.5 cm) situated over right lateral aspect of neck, 2 cm below right ear lobule;
4. A brownish scabbed abrasion (2.0×0.3 cm) situated over dorsum of nose, 1.5 cm above the tip of nose;
5. A brownish scabbed abrasion (3.5 × 1.0 cm) with surrounding diffuse contusion (9×7 cm) situated over posterior aspect of right shoulder, 18 cm away from the midline;
6. A brownish scabbed abrasion (1×1cm) situated over anterior aspect of right knee joint;
7. Multiple brownish scabbed abrasions (four in numbers) of size varying from 1 × 0.5 cm to 3 × 0.2 cm over anterior aspect of right leg, situated 16 cm below right knee joint;
8. Multiple brownish scabbed abrasions (two in numbers) of size varying between 0.5 × 0.3 cm to 0.5×0.5 cm over lateral aspect of right leg at its lower end, 10 cm above right heel;
9. Multiple brownish scabbed abrasions of size varying from pinhead size to 2.0×0.2 cm over medial aspect of left leg 8 cm above left heel;
10. A bluish contusion (18×10 cm) present over left calf region 16 cm below left knee joint. (Fig. 1)
11. A bluish contusion (8×8 cm) over antero-lateral aspect of left thigh situated 24 cm below antero-superior iliac spine; (Fig. 2)
12. Multiple brownish scabbed abrasions (three in numbers) of size varying between 0.5 × 0.5 cm to 2.0 × 0.7 cm over posterior aspect left elbow joint; (Fig. 3).
13. A brownish scabbed abrasion present over dorsal aspect of left ring finger;
14. A brownish scabbed abrasion (1.0 × 0.5 cm) situated over back of left shoulder 1.5 cm away from left acromion process; (Fig. 4)
15. A brownish scabbed abrasion (0.5×0.3 cm) situated over left clavicle, 6.5 cm away from midline;
16. A bluish contusion (3×2 cm) present over right side of neck 3 cm below right angle of mandible and 5 cm away from midline;

17. Multiple bluish contusions (three in numbers) of size varying from 0.5 × 0.5 cm to 1.0 × 0.5 cm in an area of 4 × 3 cm present over left side of neck 3.5 cm away from midline and 5 cm below chin; (Fig. 5)
18. A brownish scabbed abrasion (2.5 × 1.0 cm) present over frontal region of scalp, 6 cm above medial end of right eyebrow and just right to midline;
19. A bluish contusion (3 × 2 cm) over right side occipital region situated 4 cm away from midline and 4 cm above external occipital protuberance; (Fig. 6)
20. Diffuse bluish reddish contusion was found around left knee joint; and left elbow joint;
21. Diffuse bluish reddish contusion (37 × 24 cm) over whole of back of the trunk on left side extending towards right side; (Fig. 7) A brownish scabbed abrasion (1.0 × 1.0 cm) over left side of back of abdomen, 2 cm above postero-superior iliac spine and 4 cm away from midline;
22. A brownish scabbed abrasion (2.5 × 0.5 cm) in midline just above gluteal cleft. On dissection ecchymosis seen underneath in an area of 30 × 11 cm. (Fig. 8)

The cause of death in this case was injuries and their complications. All the injuries were ante-mortem and inflicted by someone else by blunt force impacts.

Discussion:

Injuries distributed on different surfaces of the body may, depending on the circumstances of injury, represent multiple concurrent impacts or repetitive trauma. Extensive soft tissue trauma can be a cause of death. The position and arrangements of bruises will be generally over the one side of body in cases of accidents with the evidence of sand, gravel or mud over them. Generally multiple and extensive cutaneous injuries imply a greater degree of force and are homicidal in manner.¹ A bruise is evidence of implication of blunt force, and usually the circumstances are those of an accident or of homicide. In attempts to assess the degree of violence from the appearance of bruises several factors must be taken into consideration. Where the tissues are closely applied to the bone it normally requires substantial violence to produce a bruise. [1]

One of the most common causes of circulatory shock is trauma to the body. Often the shock results simply from haemorrhage caused by trauma, but it can also occur even without haemorrhage, because extensive contusions of the body can damage the capillaries sufficiently to allow excessive loss of

plasma into the tissues. This results in greatly reduced plasma volume, with resultant hypovolemic shock. Traumatic shock seems to result mainly from hypovolaemia, although there might also be a moderate degree of concomitant neurogenic shock caused by loss of vasomotor tone. [6] Hypovolemic shock is characterized by diminished blood volume such that there is inadequate filling of vascular compartment. It occurs when there is acute loss of 15% to 20% of the circulating blood volume. The decrease may be caused by an extensive loss of whole blood (haemorrhage), plasma (severe burns), or extracellular fluid (severe dehydration or loss of gastrointestinal fluids with vomiting or diarrhoea). Hypovolemic shock also can result from an internal haemorrhage or from third-space losses, when extracellular fluid is shifted from the vascular compartment to the interstitial space or compartment. [8]

Shock is a progressive disorder that, if uncorrected, leads to death. Unless the insult is massive and rapidly lethal e.g. a massive haemorrhage, shock tends to evolve through three general phases. These have been documented most clearly in hypovolemic shock but are common to other forms as well. An initial non-progressive phase, during which reflex compensatory mechanisms are activated, and perfusions of vital organs are maintained. A progressive stage characterized by tissue hypo perfusion and onset of worsening circulatory and metabolic imbalance, including acidosis. An irreversible stage that sets in after the body has incurred cellular and tissue injury so severe that even if the hemodynamic defects are corrected, survival is not possible. [7]

Considering these parameters of shock the cause of death was evaluated as injuries (supra) that are extensive soft tissue injuries which were inflicted by someone else from their pattern of distribution in the instant case.

Conclusion:

Soft tissue injuries not always are simple as mostly described in the literature but sometimes these injuries may be so extensive internally that leads to irreversible shock as in the instant case; where almost all over the body was having them with extensive blood loss in the soft tissues itself. From supra it is clear, contrary to the presumption that injuries to the vital organs mostly prove fatal, even the soft tissue injuries without involving the internal vital organ may also prove fatal. So, our emphasis is to stress that even the simple looking superficial injuries should not be overlooked and should be carefully evaluated and interpreted.

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Photo 1: Post-Mortem Cut with Underneath Ecchymosis in Left Calf Region



Photo 2: Post-Mortem Cuts With Underneath Ecchymosis on Left Thigh & Knee



Photo 3: Scabbed Abrasion over Left Elbow Joint with Ecchymosis Underneath



Photo 4: Post-Mortem Cuts With Underneath Ecchymosis over Left Shoulder



Photo 5: Underneath Ecchymosis over the Left Side of Neck



Photo 6: Reflected Scalp Showing underneath Ecchymosis in Occipital Region



Photo 7: Multiple Post-Mortem Cuts with Ecchymosed Areas over Back of the Trunk



Photo 8: Multiple Post-mortem Incisions with Underneath Ecchymosis in Gluteal Region



Case Report

Landslide Fatalities: A Study of Six Cases

*Memchoubi Ph., **Mope Loyi, ***H. Nabachandra

Abstract

A mountain collapsed on National Highway-53(NH-53) on 6th July 2011 around 2:30 p.m. A minibus which was carrying Security Personnel of Manipur Rifles (MR) and Indian Reserved Battalion (IRB) was hit by the landslide. Six occupants died on the spot and seven were injured. The cases were registered under U.D. Case no. 5/2011/G-SPM-PS and were brought to the RIMS Morgue the next day for Post Mortem Examination (PME). On PME, the victims showed general features of blunt force injuries with gross deformation and one case showed clogging of the whole respiratory tract with soil debris of the landslide. The victims died almost immediately on the spot due to vital organs injuries except in one case where it was due to traumatic asphyxia. Landslides occur frequently in these National Highways due to the hilly terrain and the perpetual rains, such major fatalities have never occurred before. Therefore the cases are reported here to analyze the types of injuries sustained, the causes of death and to discuss precautionary measures for prevention of further mishaps. This will also serve as an eye-opener to the magnitude of severity such a natural disaster.

Key Words: Landslides, Crush Injury, Mutilation, Traumatic Asphyxia

Introduction:

Landslides involve great amounts of material which move at tremendous velocity and are deposited on otherwise undisturbed ground when they come to rest. Everything in the path of a large slide is destroyed. Where soil liquefaction occurs, bizarre effects are encountered. [1] Accident is defined as a non-deliberate unplanned event which may produce undesirable effects, and is preceded by unsafe, avoidable act and/or conditions. [1] The cases reported here is the outcome of an unfortunate accident. Although a goal of disaster preparedness is to protect vulnerable population from hazards, little research has explored the types of risks involved in encounters with natural disasters. Despite an increasing social emphasis on disaster preparation and response, there has been little increase in expert knowledge about how people actually perish in large-scale events like landslides, avalanches, etc. [2]

Case Report:

On 6th July 2011 at around 2.30p.m., a minibus was plying along NH-53.

Corresponding Author:

*Assistant Professor
Department of Forensic Medicine,
Regional Institute of Medical Sciences, Imphal
E-mail: mem010177@gmail.com
** P.G. Student, ***HOD
DOR: 13.9.11 DOA: 15.4.12

It was carrying security personnels of Manipur Rifles (MR) and Indian Reserved Battalion (IRB) and hit by a landslide on the highway near K. Sinam village.

Six occupants died on the spot and seven were injured. The cases were registered under U.D. Case no. 5/2011/G-SPM-PS and were brought to the RIMS Morgue the next day for Post Mortem Examination.

On Post-Mortem examination, the following findings were seen.

The victims were all males. Age group ranged from mid-twenties to late forties. Being security personnels, all were well-built.

The distribution and types of injuries sustained are shown in the following tables.

Table 1: Body Part Injured

S. N.	Body part injured	No. of cases
1.	Head only	0
2.	Head and chest	4
3.	Chest and abdomen	3
4.	Head, chest and abdomen	1
5.	Limbs and other body parts	4

Table 2: Cause of Death

S. N.	Cause of death	No. of cases
1.	Asphyxia	1
2.	Head injury	1
3.	Vital organ injury	4

Table 3: Cases with Particular Part Injured

S. N.	Body part injured	No. of cases
1.	Head	5
2.	Chest	6
3.	Abdomen	4
4.	Fracture	4 (Skull-3), (Ribs-4)

Head injury occurred in 5 cases with fracture skull in 3 cases and laceration of the brain in 2 cases associated with intracranial haemorrhages. Chest injury occurred in all the cases involving lungs in all and heart in 1 case with fracture of multiple ribs. Abdominal injury occurred in 4 cases with laceration of the internal organs. Traumatic mutilation of the limbs occurred in 4 cases.

In one case, the external injuries were not significant mainly consisting of abrasions but the whole respiratory tract was filled with soil particles. All cases died on the spot. Head injury was the cause of death in 1 case, in 4 cases injury to the vital organs i.e. either brain, lungs, heart or abdominal organs like liver etc. was the cause of death. Only in one case, mechanical asphyxia due to clogging of the respiratory tract with soil particles was the cause of death.

Discussion:

Landslides can be categorized according to their causative factors. In the slow erosion type, water, freezing and thawing and wind erosion gradually wear away supporting materials and cause two types of slides: rock falls, where overhanging material drops to the valley floor without disturbing material in between; avalanches where dry material sweeps down a mountain gathering momentum and masses of loose debris as it progresses. [1]

In the present case, the National Highway is cut along the hill ranges. Perpetual rains during the monsoons have loosened the soil of the mountains and have caused the massive landslide. The landslide crushed the minibus and the patterns of injuries are consistent with motor vehicle related trauma as well as blunt trauma of any other cause.

In San Diego County a study done during the period 1995-2004 reported that almost half (48.6%) of the motor vehicle related deaths were because of compression asphyxia, 29.7% were positional asphyxia deaths and 16.2% died of a combination of compression and positional asphyxia. Almost all occupants dying from asphyxia were involved in rollover crashes and may have been incapacitated by obesity, drug or alcohol intoxication, on blunt force trauma. [3]

In the present series, chest injury was seen in all the cases and multiple fractures of the ribs in 4 cases. Therefore, mechanical asphyxia, to be more precise, traumatic asphyxia as a very concurrent cause of death, despite the vital organ injuries, cannot be ruled out. Traumatic asphyxia results from sudden compression of the chest or upper abdomen by

a heavy object as in run over vehicular accident or being trampled in a stampede or crushed in a collapse of a building. [4]

One of the victims showed clogging of the whole respiratory tract with soil and multiple fractures of the ribs indicating compression of the chest and features of traumatic asphyxia like cyanosis of the head, neck, upper part of the chest and upper extremities.

A case was reported from Japan of a woman who was buried alive by a landslide of the earth and sand upon working at a construction site. Asphyxia death had to be taken into consideration because she was buried under the earth and sand for about 10 minutes. Among the present case, 1 case died of asphyxia. [5]

In a study in China, it was found that the main cause of death in traffic trauma is cranio-cerebral injury and that the ratio of multiple injuries is higher. [6] In the present series 5 cases showed head injury and multiple injuries were seen in all the cases.

Conclusion:

The present series of cases highlights a scenario of vehicular accident caused by a landslide. Findings of both circumstances are vividly manifested in the victims. Features of traumatic asphyxia and polytrauma produced by blunt force are inherent in all the cases.

The cause of death included asphyxia, head injury and vital organs injury as is encountered in such cases. To conclude, the injuries and causes of death in a landslide related vehicular trauma are shown by this study. Considering the tremendous loss incurred in a natural disaster, economic as well as psychological, a study like this one will help in disaster preparedness to protect the vulnerable population from these hazards.

Reinforcement of the roads and foothills with concrete may help strengthening the terrain during the rainy season and reduce such hazards. Life is precious; its value amplified even more after death. So loss of life, if preventable should be prevented by all means.

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Photo 1: Showing Fractures



Photo 2: Avulsion of Abdominal, Pelvic and Perineal Organs



Photo 3: Clogging of the Respiratory Tract with Soil Particles



Photo 4: Gross Deformation of the Body



Photo 5: Multiple Lacerations, Bruises and Abrasions



Photo 6: Deformation and Mutilation of the Body



Case Report

Sudden Death due to Arrhythmogenic Right Ventricular Dysplasia: A Medico-legal Case Report

*Amit M. Patil, **Vyankatesh T. Anchinmane, *Vikas S. Kavishwar

Abstract

Arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C) is characterized by progressive fibrofatty replacement of the myocardium that predisposes to ventricular tachycardia and sudden death in young individuals and athletes. The prevalence of ARVD/C is estimated as 1:1000 to 1:1250 in the general population. Although it is a relatively uncommon cause of sudden cardiac death, it accounts for up to one fifth of sudden cardiac death in people less than 35 years of age. Clinical presentation of ARVD/C usually consists of arrhythmias of right ventricular origin that include premature ventricular beats, sustained ventricular tachycardia and ventricular fibrillation that can lead to sudden death.

The authors present a case of a 26 year old young male, carpenter by occupation, previously healthy, with sudden death. The internal and external postmortem findings were normal except for mild right ventricular hypertrophy. But histo-pathological examination of heart tissues revealed replacement of myocardial tissue with mature fibrofatty tissue. The following medico-legal autopsy case is being reported for its rarity and the importance of histopathology to find out the cause of death.

Key Words: Arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C), sudden death

Introduction:

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 the onset of terminal illness (WHO). Some authors limit sudden death as those occurring instantaneously or within one hour of onset of symptoms. [1] Not uncommonly, medico-legal autopsies are conducted in cases of sudden and unexpected deaths primarily to establish the cause of death in cases where such deaths have occurred in apparently healthy individuals under suspicious circumstances. [2]

Arrhythmogenic right ventricular dysplasia or cardiomyopathy [ARVD or ARVC] is a heart muscle disease, often familial, characterized by structural and functional abnormalities of the right ventricle.

It is due to replacement of the myocardium by fatty and fibrous tissue. [3] Clinical presentation of ARVD usually consists of arrhythmias of right ventricle origin that include isolated premature ventricular beats, sustained ventricular tachycardia, and ventricular fibrillation that can lead to sudden death [4, 5]. Although it has been estimated that the disease afflicts about 1 in 5000 persons in the United States, the exact prevalence is unknown. [6]

Case History:

26 years-old male, carpenter by occupation had chest pain and was immediately brought to the tertiary care hospital within half an hour of onset of symptoms. But he was declared dead in the casualty before admission. As he did not have any past history suggestive of any major diseases and no obvious cause of death, medico-legal autopsy was conducted on the dead body.

Corresponding Author:

*Associate Professor

Dept. of Forensic Medicine and Toxicology,
Padmashree Dr DY Patil Medical College Hospital &
Research Centre, Nerul, Navi Mumbai 400706
E-mail: dramp1976@gmail.com

**Assist. Prof., Dept. of Pathology
Tapiwala National Medical College &
B Y L Nair Ch Hospital,
Mumbai Central, Mumbai-8

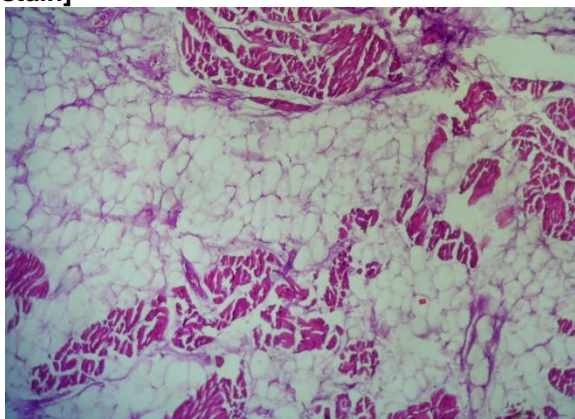
*Assoc. Prof., Dept. of Pathology
DOR: 11.11.11 DOA: 28.5.12

At autopsy, on external examination he was well built and well nourished person. There was no evidence of any injury or abnormality on external examination. Internally, there was no evidence of any trauma or injuries to the internal organs. All the organs were situated in normal anatomical position. The weight and size of all the organs were also normal. The cut sections of all the organs were showing normal anatomy except the heart which showed mild right ventricular hypertrophy. All the coronary arteries

were patent. The opinion as to the cause of death was kept preserved for report of histo-pathological examination of tissues and organs.

The organs preserved for histo-pathological examination were examined after fixation and tissues were taken for biopsy. On histo-pathological examination, except heart, all the organs showed normal histology. The right ventricular wall showed partial replacement of myocardial tissue with mature fatty tissue. The inflammatory infiltrates was not present in the fatty tissue. Focally few myocytes were showing the features of degeneration. (Figure 1)

Fig 1: Section from the right ventricular wall showing characteristic partial replacement of myocardial tissue with mature fatty tissue without any inflammatory infiltrate [H & E stain]



The right atrium, left atrium, left ventricle and all the coronaries were showing normal anatomy and histology. So after the histo-pathological examination, the final cause of death was given as, 'Death due to cardiac failure in arrhythmogenic right ventricular dysplasia (natural).'

Discussion:

Arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C) is characterized by progressive fibro fatty replacement of the myocardium that predisposes to ventricular tachycardia and sudden death in young individuals and athletes. [7] Arrhythmogenic right ventricular cardiomyopathy (ARVC) has had various names including Uhl anomaly and right ventricular dysplasia. ARVC was called as arrhythmogenic right ventricular dysplasia (ARVD) till 1996. But now the terms ARVC and ARVD are used interchangeably. [8]

The prevalence of ARVD/C is estimated as 1:1000 to 1:1250 in the general population. [9] Although it is a relatively uncommon cause of sudden cardiac death, it accounts for up to one

fifth of sudden cardiac death in people less than 35 years of age. [7]

Although ARVD may be diagnosed at any age, sudden deaths tend to occur between the ages of 15 and 45 years, with a mean age of about 30 years. [10, 11, 12] Men are affected slightly more often than women. In a series of 200 cases reported by Tabib et al. [12] the mean age was 34 years (range, 5-64 years), and 108 (54%) was male. Although ARVD is considered a rare disorder, it accounted for 10% of all cases of sudden unexpected cardiac death in the study of Tabib et al.

The development of ARVD appears to be related to the following 2 processes:

1. Myocyte degeneration (including apoptosis and transdifferentiation), which may be inherited, and
2. Interstitial inflammation, which may be infections (probably post viral) or autoimmune in origin [6].

Both processes may be operative in some patients. Fatty infiltration, which is the hallmark of the disorder, is considered to represent a secondary phenomenon. It has been postulated that myocardial cell death in ARVD might represent a programmed death ("cell suicide") known as apoptosis. [11]

The diagnosis of autosomal dominant ARVD/C is made using a combination of noninvasive and invasive tests to detect abnormalities in cardiac structure and rhythm. Noninvasive testing includes 12-lead ECG, signal-averaged ECG (SAECG), echocardiography, cardiac MRI, Holter monitoring, and exercise stress testing. [13] Invasive testing includes electrophysiologic testing, right ventricular angiography, and right ventricular endomyocardial biopsy. [14] Family history of a known diagnosis of ARVD/C, early or sudden death, and an inheritance pattern consistent with autosomal dominant inheritance support the diagnosis. Clinically the congenital heart disease like Repaired Tetralogy of Fallot, Ebstein's anomaly etc. and Acquired heart disease like Tricuspid valve disease, Pulmonary hypertension, Right ventricular infarction may mimic to ARVD/C. [13]

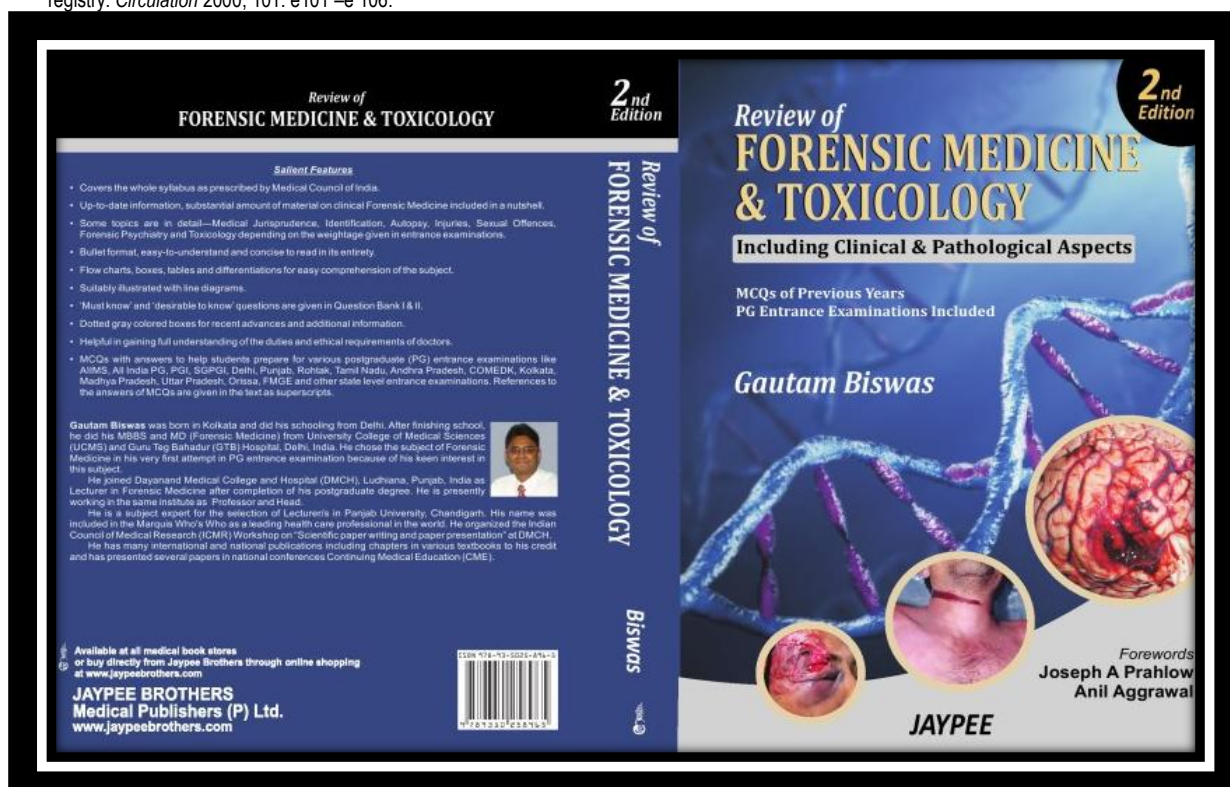
Management is individualized and focused on prevention of syncope, cardiac arrest, and sudden death through use of antiarrhythmic medication, implantable cardioverter-defibrillators, and rarely, heart transplantation. Testing of relatives at risk should be done by screening with noninvasive tests annually during puberty and every two to three years after puberty. [13]

Conclusion:

In the present case, the patient was a young person. He had no present or past or family history of cardiac diseases. Since the patient was declared dead before admission there was no clue for his cause of death. Moreover, the external examination and the internal examination of the dead body did not reveal the cause of death. But after the postmortem histopathological examination of tissues especially heart, it was revealed that he was suffering with right ventricular dysplasia in the form of fatty tissue replacement in the myocardium. Because of right ventricular dysplasia, he might have suffered with severe arrhythmia which has leads to his death. Thus postmortem histopathological examination played an important role in concluding the cause of death. Unfortunately after patient's death, his relatives never came to hospital for their checkups so we remain unaware regarding the ARVD status in their family.

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News and Views

Imran Sabri, Webmaster www.forensicindia.com

Revised Regulations on Graduate Medical Education, 2012 - for public Opinion: MCI

In a recent development, the Medical Council of India/ BOGs has announced regulation on graduate medical education. As per this announcement the Teaching hours of Forensic Medicine and Toxicology is to be increased from 100 to 125 and spread over 2 years. Total marks enhanced from 100 to 200 (Theory - 100 marks; Practical - 100 marks). Forensic Medicine and Toxicology to be graded as clinical specialty. University exam will be held along with ENT, Ophthalmology & Community Medicine. Increased emphasis is given on Toxicology & Medical Ethics.

mciindia.org

Views: Its definitely a very good news, and Forensic Medicine and Toxicology is now included in both phase II and phase III (part I) curriculum, with significant increase in number of hours for the subject. Its examination is to be conducted with clinical subjects in phase III (part I). It is really a happy moment. And hopefully faculty requirement will also be increased with increase in number of hours of the subject. Congratulations to everyone again.

Praveen Arora, Quality of Medical Education, Message #5567 of 5569

Scottish Travel Prize at 34th Annual National Conference of IAFM Forensic Medicon-2013, 1-3 Feb 2013 at KMC, Mangalore

The Centre for Forensic & Legal Medicine at the University of Dundee is announcing the "Scottish Travel Prize" for best oral presentation amongst postgraduate students at the next conference. It can be in any field related with the discipline of Forensic Medicine in India e.g. Forensic Pathology, Toxicology, Clinical Forensic Medicine etc. The award will provide return transport costs from the residence of the winner to the University of Dundee, Scotland, UK, accommodation for 2 weeks and a cash allowance.

iafmonline.com

Balding - LT DNA Software

David Balding's software for the interpretation of low template DNA profiles

described in Balding DJ, Buckleton J, Interpreting low template DNA profiles FSI Genetics, 4: 1-10, 2009 has been updated with a number of new facilities. The software can be downloaded from a new web site <https://sites.google.com/site/baldingstatisticalgenetics/software/likeltd-r-forensic-dna-r-code>

http://www.isfg.org/News;199

Quality of Medical Education Group Launched Website

Greater Noida: In a major development the well established group for Quality of Medical Education having membership of more than 7500 members globally, has launched its own website www.qme.co.in after plenty of feedbacks from its members requesting for website. The website focuses on recent issue like female foeticide, donation doctors etc. Apart from this live chatting is available on website to discuss these issues.

www.qme.co.in

Workshop on Modular Teaching in FMT at AIIMS

The First session of Workshop on Modular Teaching in Forensic Medicine and Toxicology was held on May 4, 2012, at AIIMS, New Delhi. Workshop intend to create Teaching Modules in Forensic Medicine and Toxicology in India to bridge the gap happening due to varied resource material, teaching methods, infrastructure, faculty resource, training of faculty, arbitrariness in subject coverage, and pattern of assessment etc. This will also help in reducing gap between private and government colleges and importance of increasing our teaching hours. Further sessions of workshop will be held in November 2012 onwards.

Pooja Rastogi

Judgement regarding quackery by Allahabad high court

Forwarding a latest judgement of Allahabad High Court dated 11-5-2012. According to this judgement If an Ayurvedic, Unani, Sidda or homeopathic person practice allopathic medicines his/her clinic should not only be sealed but also an FIR should also be lodged.

Anil Bansal, Message #3075, medico-legal-queries Group