

Indian Academy of Forensic Medicine (IAFM)

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



Governing Council 2013-2016

President

Dr. S.D. Nanandkar

General Secretary

Dr.C.B.Jani

Treasurer

Dr.S.K.Daddu

Vice Presidents

North Zone: Dr. A.S. Thind

South Zone: Dr. N. Srinivasa Ragavan

East Zone: Dr. Tulsi Mahto

West Zone: Dr. M.I. Sheikh

Central Zone: Dr. A.K.Srivastava

Joint Secretaries

North Zone: Dr. Pankaj Gupta

South Zone: Dr. Prateek Rastogi

East Zone: Dr. P.P.Mukhopadhyay

West Zone: Dr. Sudhir Ninave

Central Zone: Dr. Mukesh K.Goyal

Editor

Dr. Mukesh Yadav

Joint Editor

Dr. Akash Deep Aggarwal

Executive Members

Dr. D.S.Badkur (Ex. President, IAFM)

Dr. Anil Mittal

Dr. Yogender Malik

Dr.Cyriac Job

Dr. Anand

Dr.S.C. Mahapatra

Dr. Adarsh Kumar (Ex. Secretary, IAFM)

Dr. T.K. Bose

Dr. Ravi Rautji

Dr. Lavlesh Kumar

Dr. R.K. Singh

Dr.P.K.Tiwari

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: 08527063514
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 Mehmandari,
Patiala-147001, Punjab, INDIA
Cell: 9815652621
Email:toakashdeep@yahoo.co

International Advisory Board

Prof. Derrick J Pounder, Dundee, UK

Prof. D N Vieira, Coimbra Portugal

Prof. Dan Dermengiu, Romania

Prof. Peter Vanezis, London, UK

Prof. Roger Byard, Australia

Dr. Michael S. Pollanen, Canada

Prof. Leandro Duarte De Carvalho, Brazil

Dr. Shubhakar K.P. UK

Dr. BL Meel, South Africa

Dr. John Clark, Glasgow, UK

Dr. George Paul, Singapore

Dr. Serap Annette AKGUR, Turkey

Dr. Clifford Perera, Sri Lanka

Dr. B.N. Yadav, Nepal

Dr. K. P. Saha, Bangladesh

Dr. Imran Sabri Al-Ahasa, KSA

National Advisory Board

Srivastava A.K. (U.P.)

Pillay V.V. (Kerala)

Gorea R.K. (U.P.)

Jani C.B. (Gujarat)

Bose T.K (West Bengal)

Pradeep Kumar G. (Karnatka)

Verma S.K. (New Delhi)

Kaur Balbir (Haryana)

Kumar Shantha B. (Tamil Nadu)

Gupta B.D. (Gujrat)

Murty O.P. (New Delhi)

Manju Nath K.H. (Karnatka)

Das Sanjoy, (Uttarakhand)

Mahtoo Tulsi, (Jharkhand)

Ravindran K. (Puducherry)

Rastogi Prateek (Karnatka)

Potwary AJ (Assam)

Singh R.K. (Chhatisgarh)

Dongre A.P. (Maharashtra)

Sharma Aditya (H.P.)

Gupta Pankaj (Punjab)

Harish D. (Chandigarh)

Rastogi Pooja (U.P.)

Khanagwal V. (Haryana)

Khaja Shaikh (A.P.)

Basu R (W.B.)

Naik R.S. (Maharashtra)

Godhikarakar Madhu (Goa)

Job Cyriac (Kerala)

Vinita K. (U.P.)

Mohite Shailesh (Mumbai)

Yadav Jayanti (M.P.)

Kochar S.R. (Rajasthan)

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

Journal of Indian Academy of Forensic Medicine

Volume: 35

Number: 3

July-September 2013

Contents

Sr.		
I.	From the Editor's Desk	191-191
II.	Editorial: Rising Menace of False Rape Cases in India Problems and Solutions	192-194
III.	Excerpts from Ex-Presidential Address XXXIV Annual National Conference of I. A. F. M. Mangalore (Karnataka)	195-196

Original Research Paper

1.	Age Estimation from Epiphyseal Fusion of Ischial Tuberosity <i>Pardeep Singh, Virendar Pal Singh, R.K. Gorea, A.K. Kapila</i>	197-199
2.	Relevance of Semen Collection of the Accused of Rape at the Time of Forensic Medical Examination <i>Indrajit Khandekar</i>	200-202
3.	Different Presentations of Victims of Lightning During Thunderstorm <i>Chandra Prakash, Ishwer Tayal</i>	203-205
4.	Pathological Findings of Liver in Autopsy Cases A Study at Imphal <i>Ph. Madhubala Devi, Barida Ginia Myrthong, Th. Meera, H. Nabachandra</i>	206-210
5.	Unsafe Abortion: A Study in a Tertiary Care Hospital <i>Prem Chandra Srivastava, Rajesh Kumar Rai, Shikha Saxena, S. K. Roy Chaudhary, H. K. Singh</i>	211-215
6.	Correlation of Superior Extremity Length with Stature In Central Indian Populace <i>M. R. Shende, P Bokariya, R Kothari, BH Tirpude</i>	216-218
7.	A Study of Palatal Rugae Pattern among North and South Indian Population of Davanagere City <i>Shubha C., Sujatha G.P., Ashok L., Santhosh C.S</i>	219-222
8.	Regression Equation for Estimation of Femur Length in Central Indians from Inter-trochanteric Crest <i>Sandeep Singh, Shema K Nair, Vaibhav Anjankar, Vishal Bankwar, D.K. Satpathy, Yogender Malik</i>	223-226
9.	A Study of Stressors in Medical College Students (Hostelities) In Northern Maharashtra <i>Ajay T Shendarkar, Vijay Patil</i>	227-229
10.	Missed Injuries in Fatal Blunt Thoraco-Abdominal Region <i>R.K. Punia, Dhruv Singh Meena</i>	230-232
11.	Pattern of Suicidal Deaths at District Hospital Davangere: A Cross-Sectional Study <i>Santhosh. C.S, Bande Nawaz</i>	233-235
12.	Deaths due to Fatal Road Traffic Accidents: A Retrospective Study <i>Dileep Kumar R, Raju .G.M, Vijayanath. V, Shahina</i>	236-238
13.	Study of Fracture of Hyoid Bone in Hanging Cases <i>Abhishek Yadav, Manish Kumath, Sumit Tellewar, Lohith Kumar R</i>	239-241
14.	Rape or Pseudo Rape: A Five Year Study of the Medico-legal Cases in Imphal <i>Memchoubi Ph., Kh. Pradipkumar Singh, Supriya Keisam, H. Nabachandra</i>	242-244
15.	Body Height Estimation Based on Foot Length and Foot Breadth <i>Arti L. Narde, A. P. Dongre</i>	245-248
16.	Head in Homicides: A Post-mortem Study From North East India <i>Yogender Malik, Ritu Raj Chaliha, Pushpendra Malik, Kalpana Sangwan, Chhavi Rathi</i>	249-250
17.	A Medico-Legal Study of Hair dye Poisoning <i>Yadaiah Alugonda, Bala Maddileti,</i>	251-254

J. Naga Lingam, Y.K.C. Rangaiah

18. **Study of Drunkenness at Civil Hospital, Sola, Ahmedabad** Shah Jigesh, 255-258
Patel Gaurang, Patel Dharmesh, Gupta Divyesh, Jakhar Rajesh, Jadav Sanjay

Review Research Papers

19. **Death Certificate: Ignorance and Facts** B. D. Gupta, M. M. Trangadia, 259-261
Rahul A. Mehta, D. K. Vadgama
20. **Age of Criminal Responsibility of Juvenile in India vis-a-vis Global Scenario: A Critical Review** Mukesh Yadav, Pooja Rastogi 262-271
21. **Forensic Medicine in the Northeastern State of Meghalaya** A. Donna Ropmay 272-274

Case Reports

22. **Acute Severe Suicidal Poisoning by Celphos Powder: A Rare Case Report from Rural India** 275-278
Alok Kumar, C.V. Singh, Seema Dayal, V.K. Gupta, Suraj Kumar, Archana Verma
23. **Traacheostomy Associated Artefact Mimic Strangulation Injuries: A Case Report** 279-280
Jatin Bodwal, Mamta Panwar, Manish Kumath
24. **Fatal Radiation Exposure due to Careless Disposal of Cobalt-60 from a University Lab** 281-284
S.R. Singh, Karthik Krishna, C Behera, Tabin Millo, D.N Bhardwaj, R Swain
25. **Fatal Stab at an Unusual Site: A Case Report** 285-287
Garudadhri GV, Raghavendra R, Devadass PK
26. **Death due to Medical Negligence: A Case Report** 288-290
N. Srinivasaragavan, Kadhiraazhagan, K. Thunderchief, J. Magendran
27. **Sudden Death due to Ventricular Free Wall Rupture Following Acute Myocardial Infarction: A Rare One** 291-292
Abhishek Das, Sujash Biswas, Chandan Bandyopadhyay, Chittaranjan Bhattacharya, Deepsekhar Dalal
28. **Mysterious Death of a Young Adult** 293-295
Anand P. Rayamane, Pradeepkumar M. V, Ambika Prasad Patra, Chandrashekaraiaha C. S, R. B. Kotabagi, T Rajaram
29. **Autopsy Diagnosis of Thanatophoric Dysplasia** 296-298
Hemalatha A. Lingappa, Shilpa Karra, Anubha Aditya, Nishtha Batra, Neelima P. Chamrathy, K. W. D. Ravi Chander

Copy Right © All rights reserved: No part of this publication may be reprinted or publish without the prior permission of the Editor, JIAFM. Submission of all manuscripts to the journal is understood to imply that it is not being considered for publication elsewhere. Submission of multi authored papers implies that the consent of each author has been obtained. In this journal, every effort has been made NOT to publish inaccurate or misleading information. However, the Editor, Joint Editor, Peer Review Group and Advisory Board accept NO liability in consequences of such statements. The Journal of Indian Academy of Forensic Medicine is indexed in **Index Copernicus** [Poland] and **IndMED** [India]
Print ISSN: 0971-0973. Electronic ISSN: 0974-0848. IndMED www.medind.nic.in/jal/jalm.shtml

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

From Editor's Desk

JIAFM

A Quarterly Publication

Volume 35, Number 3, July-September, 2013

I feel immense pleasure to present before you the Third issue of 2013. 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**

Subscription Information

- Members of IAFM will receive the free of cost.
- Non Members and Institutions (Annual Subscription rates)
- Personal: In India, **Rs. 1000/ (Rest of the world: US\$ 200/ or equivalent)**
- Institutions: In India, **Rs. 4000/ (Rest of the world: US\$ 400/ or equivalent)**
- We Accept: Bank Cheque / Demand Drafts (Add Rs. 50/- for outstation Cheques)
- The Scope of the Journal covers all aspects of Forensic Medicine and allied fields, research and applied.

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

Claims for missing issue:

A copy will be sent free to the member / subscriber provided the claim is made within 2 months of publication of the issue & self addressed envelop of the size 9" x 12" is sent to the Editor. (Those who want the journals to be dispatched by Registered Post must affix Rs. 50/ worth postage stamps).

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

www.iafmonline.com

www.jiafm.com

www.medind.nic.in

www.indianjournals.com

<http://indmed.nic.in>

Editorial

Rising Menace of False Rape Cases in India Problems and Solutions

Menace of false rape cases on the pretext of one or other has been rising since the new amendment in rape law in the 2013 in India. The fact is evident from the study of court judgments delivered by the fast track courts constituted across the country including Delhi and news items appearing in the media. There is need to put early check on this rising menace which may destroy fabric of society and misuse of law for various motives.

A news item published on you tube website is an eye opener, it reads as "25 false rape cases in Punjab within a week after Delhi Gang rape case...Actually the women was in jail accused for giving a HIV injection to a child with a man.....the youth didn't get bail but this women got bail for such a heinous crime because she was a women.....There has been a sudden and bound to happen hike in registering of false rape cases with sensitizing of police for rape cases after Delhi Gang rape case of 16 December 2012But now after many strict laws implemented and making of strict laws against rape I welcome that but be prepared for such false cases against you and prepare to go behind bars for nothing after a bad Dowry law and new tool and is being made for women to misuse against innocent menI am not against these strict for women laws but if such is the implementation then the situation is alarming.....!!!!"

Case Laws:

Illustration 1:

Ar news items is more alarming, it reported that "A Moga woman's story of her kidnapping from Chandigarh and dumping here after gang rape in a moving car has turned out to false. She posed as victim to frame her boyfriend's wife who had got her into prison on the accusation of attempted murder by poking with HIV-infected needles. She was out on bail when she made up the story. Along with suspect Gurveer Kaur (24), the police have also arrested Rohtash Kumar, who claimed to have brought the woman to hospital in her unconscious state. Suspects Gurveer Kaur, Rohtash, Ramesh, and Sunil Kumar are charged under Sections 420 (cheating), 195 (submitting false evidence to get someone imprisoned for life), 211 (false charge with intent to injure) and 120-B (criminal conspiracy) of the Indian Penal Code (IPC). The plan also involved **consensual sex** between Gurveer Kaur and Rohtash Kumar **to make it easy to prove rape.**"

Illustration 2:

It is the case of the prosecutrix that she is a divorcee and she was working as instructor with the organization of Art of Living where alleged accused was also working. They came in contact with each other. The acquaintance had developed into love. The prosecutrix has alleged that the alleged accused had promised to marry her and she had faith in him. Hence, they had also developed sexual intimacy and were having sexual relations from May 2012 to March 2013.

The prosecutrix had insisted to marry with him. He had only assured her that he will fulfil the promise but did not fulfil the same. According to the prosecutrix, she had consented to have sexual relations with the alleged accused, subsequently he had refused to marry her & therefore she felt cheated and according to her, her consent cannot be taken into consideration. [Para 2]

Since 12th May 2013 he had started behaving indifferently with her which was the reason for suspected his bonafides. She had tried her best to seek information about him but in vain. [Para 3]

On the basis of her report Crime No.168 of 2013 is registered at Rafiq Ahamed Kidwai Marg Police Station for the offence punishable under Section 376 and 417 of IPC.

The prosecutrix further submitted that she had to gather courage to file the complaint against the alleged accused and she felt that he should be punished and sent to jail for the offences committed by him. It was an admitted position that the prosecutrix was also a divorcee she was divorced in March 2013. [Para 3]

It was submits on behalf of the alleged accused that the prosecutrix was fully aware about his status. He had no intention to cheat her. He had developed relation with her only after he was divorced.

It was submitted that the prosecutrix was working as Inspector in Central Excise Department. She was 42 years old, whereas the alleged accused was 35 years old. There was vast difference in their age. It was further submitted that the relationship was based on mutual understanding and mutual consent. There was no element of promise to marry.

Bombay High Court observed that it was further submitted on behalf of the alleged accused that he may not totally deny the relationship which he had with the prosecutrix. However, it appears that they could not pull on and hence parted ways. He got remarried on 18th May 2013 with one Divya.

Court's attention was drawn to the fact that the alleged accused has got married on 18th May 2013 and the first information report was lodged on 06/06/2013 to ventilate the grievance.

The prosecutrix stated before the High Court that the looks of the alleged accused were so deceptive that she was bound to believe that he would marry her.

It was further submitted on behalf of the alleged accused that he is no more working with the said organization i.e. Art of Living which is admitted by learned APP; therefore, there is no question of tampering evidence. The applicant is working in a private company, whereas the complainant is a Government Servant, who is working as Inspector in Central Excise Department.

The fact that the prosecutrix admits that she had consented for sexual relations, it cannot be inferred at this stage, that she was ravished by the alleged accused. The element of cheating can be considered at the trial after adducing substantive evidence. [Para 4]

Bombay High Court observed that as prima face case was made for the grant of pre-arrest bail to the alleged accused and that in-spite of sympathy with the prosecutrix, the alleged accused cannot be sent to custody as it would not serve any fruitful purpose except to satisfy vendetta of the prosecutrix. [Para 5]

Illustration 3:

This case unfolds the sad and sordid story of a frail and traumatized person; old aged 75 years who has been arrested and prosecuted for the offence of rape which he had not committed at all. The poor old man had to suffer incarceration in jail for six months before he was released on bail by this court for absolutely no fault and besides that had to suffer the ignominy and humiliation at the hands of his friends and relatives for having been arraigned as an accused in a rape case. [Para 1]

It would be limpid from the following discussion that a false rape case was slapped upon the accused, who was residing alone, his wife having already expired and children living separately, merely to extract money from him and/or to usurp his property. However, let me first describe the prosecution case. [Para 1]

Trial Court observed that "The testimony of the prosecutrix clearly demonstrates that she had levelled false allegations of rape against the accused at the instance of two other prosecution witnesses. It is amply manifest that the accused had not committed rape upon the prosecutrix and a false story of rape had been cooked up by prosecutrix and at the instance prosecution witness who lodged the complaint against the accused. It is further evident that mastermind prosecution witness wanted to usurp the house of the accused by ensuring that he remains in jail for a long time." [Para 7]

It is a matter of intense regret that even the frail and sick aged persons are not spared from the false allegations of rape. There can be nothing more discomfiting and painful than false accusation of rape against a fragile old man who has already seen 75 summers. Right since the day, when the accused was produced before me for the first time, I wondered how such a frail old man, who cannot even stand straight, would rape a young lady in her mid thirties, having lot more strength than the accused. I suspected something fishy right since day one and my suspicion came true in the deposition of the prosecutrix. A grandfatherly figure had to suffer humiliation amongst his children neighbours etc. besides suffering jail term of about six months on false charges of rape. [Para 8]

Sufferings of Accused of False Allegations of Rape:

A trial court described the sufferings of accused of false rape charges even after acquittal in following words:

"Can the lost honour and dignity of the poor old accused be restored? Can he spend the 'Sanyas Ashram' of his life as peacefully as he would have, had he not been arraigned as accused in this case. Certainly the memories of this false case, horrible days spent in jail and presence in court during hearings would hound him like a ghost for the remaining part of his life. He would not command that much respect and reverence in his family, which he used to before the present case." [Para 9]

I have earlier also observed in one of my judgments that after the infamous gang rape of a medical student in a moving bus in South Delhi on 16.12.2012, the whole nation arose from slumber suddenly for showing anger and outrage towards incidents of rape and demanding stringent punishment for rapists. [Para 10]

Consequences and Sufferings of Accused of False Charges:

In the words of trial judge of FTC "These 'victims' of false rape cases cannot be forgotten. A false allegation of rape creates havoc in the life of the accused. His whole future is shattered, his family faces

isolation & ridicule and his life destroyed. It is very difficult to come out of the shock, trauma, ridicule and humiliation of having been arraigned in a rape case, even after the acquittal by the court.” [Para 11]

Role of Media and Society:

Media, both print and visual, started highlighting the rape incidents, a commission was set up by the Govt. of India for suggesting a stern penalty for rapists and criminal laws were amended. New definition after 2013 Criminal Law Amendment has widened in scope so much so that mere statement of victim of rape may bring the alleged accused behind the bar. In the words of trial judge in a case “Such an atmosphere was created that the mere statement of a lady that she has been raped, came to be taken as gospel truth, the accused arrested and charge-sheeted.” This may lead to an unprecedented surge in filing of false rape cases, wherein accused had to be acquitted after a protracted trial. It is these false cases which play havoc with the crime statistics leading to the labelling of Delhi as a '**rape capital**'.

Nobody bothers to see in how many cases are the accused in fact convicted. Media turns a blind eye towards acquittals. The acquittal of an accused is not noticed at all and he continues to be labelled as a 'rapist' even after his honourable acquittal. [Para 10] There is need for research this aspect of misuse of the newly amended law for nefarious motives against potential accused.

Media so called fourth pillar of democracy can play an important role in creating awareness about provisions of law and consequences of filing false rape cases against innocent alleged accused. It is important to mention the observations of Fast Track Court Judge while acquitting the alleged accused and highlighted the role of media in following words:

“I hope and trust that the media, which is an important pillar of our democratic set up, would strive to highlight the plight of rape accused after their acquittal by courts in the same way in which they report filing of rape cases.” [Para 12]

Court further observed that “Be that as it may, the accused herein is acquitted. This is all what this court can do in his favour. Rest is upon the society in general and media in particular how they would treat the accused hereafter.” [Para 13]

Solutions:

Compensating the acquitted accused of false charges:

Is there need for compensation of Accused of false alleged rape?

Trial judge opined that “In my opinion, the time has come that the acquittals in rape case should be taken seriously. The acquitted accused in such cases involving disgraceful accusations of rape, which is the most hated crime in the society, too are the victims. Their lost honour, dignity and status in the society cannot be restored but they can be compensated so that they are able to start life afresh.” [Para 11]

Trial judge further suggested that the courts need to be empowered to award compensation to men acquitted in false rape cases by either amending the existing section 357 of Code of Criminal Procedure, 1973 or adding a separate section in the Code.” [Para 11]

Compensation can help in financial rehabilitation of at least poor alleged accused after acquittal of charges, but what about those victims who may suffer due to false charges of rape but financially well off.

Case of perjury can be initiated against instigators:

Taking serious view of role played by one of the witness to trial in fake rape charges Fast Track Court observed that “I hasten to say that prosecution witness (name withheld) who was the mastermind in cooking up false allegations of rape against the accused should not be let off and deserves to be prosecuted for fabricating and giving false evidence, which is being done by way of a separate order of even date.” [Para 14]

Society as a whole and various stakeholders entrusted with the responsibility maintain harmony and act in a proactive manner to fight this emerging menace of fake rape cases. There is urgent need to deal with stern action by all concern by creating awareness about consequences of fake rape cases, onus is more on woman activist and women rights commissions at state and national levels to act well in time to fight this menace of fake rape cases.

Dr.Mukesh Yadav
Editor, JIAFM

Excerpts from Ex-Presidential Address XXXIV Annual National Conference of I. A. F. M. Mangalore (Karnataka)

**Dr.D.S. Badkur,
Ex.President,
IAFM (2010-2012)
Director,
State Medicolegal Institute,
Bhopal, M.P.**



All the members, guest, ladies and gentlemen, it is a matter of great privilege to me and on behalf of Indian Academy of Forensic Medicine, I welcome you all in this grand gala for our annual meet on the occasion of 34th Annual National Conference of Indian Academy of Forensic Medicine here at Mangalore, a well known costal city of Karnataka. I must congratulate Dr. Suresh K Shetty the Organizing Secretary and his team in the department of Forensic Medicine for organizing this conference.

In last (33rd) Conference at Raipur, I emphasized on the need of modernization of Medico-legal Institutes and Forensic Medicine departments along with development of proper infrastructure related with criminal justice administration.

The gruesome Delhi gang rape case of December 16, 2012 led to formation of a Committee under chairmanship of Justice J.S. Verma (Retd.) to suggest possible amendments of the criminal law to provide for quicker trial and enhanced punishment for criminals committing sexual assault of extreme nature against women.

Now days, doctors' especially forensic experts have assumed great importance. So they have to discharge their duty with great responsibility and sense of commitment, unless all the things are observed and reported, and a clear unambiguous report thereof is not submitted, it is bound to affect the rate of conviction. Another reason for poor conviction rate is non-production of relevant and necessary medical evidence which results in acquittal of the accused. The IAFM members are deeply concerned and advocate an urgent need to take strong actions to prevent crime against women.

Most of the medico-legal work is done by M.B.B.S. doctors without specialized qualification and required experience resulting in poor quality of medico-legal services. The medical officer use "two finger test" and opine in terms of rape and habitual to sexual intercourse. Justice J.S. Verma committee has noted such observations/ conclusions including past sexual history is completely irrelevant. Now there are chances of action against medical professionals for giving inconclusive medico legal reports because a substandard medico legal report has direct bearing on criminal justice administration. The pivotal role of the Forensic experts must be highlighted.

The Sec. 53 inserted as Sec. 53 (2) & 54 Cr. P. C., where the examination of the female shall be done only by, or under the supervision of a female registered medical practitioner", and in the case female medical officer is not available, by a female registered medical practitioner." Justice Verma Committee opines advocates the supervision of a senior female Obstetrician/ Gynaecologist and a professionally qualified counselor and in case of her unavailability senior female doctor. A board of three doctors must examine a rape/ sexual assault victim for consensus of opinion.

Due to non availability of female doctor, the victim may be referred to such a place where female doctor is available resulting in unnecessarily delay in the examination of victim and disappearance of most vital findings and evidences. I would say that the committee should have made it mandatory for the government to develop adequate infra structure and qualified man power equipped with modern facilities for Forensic investigation under one roof.

The Law Commission also (84th Report), recommended the insertion of Section 164A Cr. P. C, for the examination of victim of rape, in which with her consent, she shall be sent to registered medical practitioner within 24 hours from the time of receiving the information relating to the commission of such offence without delay. In such a situation it is the need of the hour that we should create a task force of trained female doctors in each district.

In most of the cases, the rape or sexual assault victims as well as the accused are minors and many of border line age group who are sent for age verification to a radiologist, medical officer or medico legal expert. The published data and laid down guidelines in the books especially the ossification test have broad variations and margins of errors which result in limitations in determining the exact age with certainty. Hence there is an urgent need to create scientific data based on various parameters for age verification with minimum margin of error which can be accepted by our courts. The minimum and maximum age limit based on these parameters may be expressed rather than giving a range. The physical and mental maturity of juvenile offenders should also be considered. Hence, The Juvenile Justice (Care and Protection of Children) Act 2000 needs to be amended.

We should actively participate in “**Save Girl Child Mission**” i.e. **Beti Bachao Abhiyan** to prevent indiscriminate use of sex selection techniques contrary to the provisions of “The Preconception and Prenatal Diagnostic Techniques (Prohibition of Sex Selection) act, 1994 to prevent female foeticide and abortions.

IAFM is continuously perusing upon MCI, various concerned ministries and also Hon’ble Justice J.S. Verma Committee to restore and further upgrade the number of faculty in Forensic Medicine. We had also requested for the development of Clinical Forensic Medicine /Forensic Casualty Unit at every medical college and hospital well equipped with (SAFE) Kits, advanced laboratory, Rape Crisis Management cell / centers along with appointments of supportive staff to create medico-legal and forensic investigation system under one roof for speedy administration of justice. There is also a need to enforce a universal protocol and guidelines across the country for medico-legal examination of rape victims and also to establish effective medico-legal audit system to maintain the uniform standard of medico legal services and reports.

The Committee has accepted most of our recommendations but remained silent on creation of separate medico legal cadre and staff pattern of Forensic Medicine in the medical colleges as well.

The Governing Council of IAFM in my tenure as President has been actively and continuously worked to achieve our goals but the final outcome is still awaited. I extend my heartfelt gratitude and appreciation to all the members for their cooperation for over all successful upbringing of this event.

I wish you all a very Happy New Year and Glorious Future.

JAI HIND

Dr. Prof. D.S. Badkur
Former President, I.A.F.M.

Original Research Paper

Age Estimation from Epiphyseal Fusion of Ischial Tuberosity

*Pardeep Singh, **Virendar Pal Singh, ***R.K. Gorea, ****A.K. Kapila

Abstract

Radiological technique is most reliable and informative of all the available methods for assessing age i.e. physical development, secondary sex characters, height and weight measurement, eruption of teeth, especially in the young. Anatomical method and Haversian canal technique for determination of age of an individual are, however, obsolete now a days. External inspection of the dead permits only an approximate estimate of age and it is liable to error by upto 10 years in adults.

In the present study 100 individuals are studied between the age group of 16 to 25 years in male and female separately i.e. 50 males and 50 females, whose X- ray examination is done at Rajindra Hospital; Patiala, Punjab. The study is undertaken to know the time of fusion of epiphyses of ischial tuberosity. In this study, every individual's X-ray pelvis AP view is taken to know fusion of ischial tuberosity epiphysis. Epiphysis of ischial tuberosity fused in majority of cases by the age of 20-21 year in both male and female. Earliest union occurred at 18 years in males and 17 years in females.

Key Words: Epiphyseal fusion, X-ray, Age Estimation, Ischial tuberosity

Introduction:

To know the age of marriage in India for girls i.e. 18 years and for boys i.e. 21 years, the epiphyses selected for age determination are ischial tuberosity & iliac crest. Fixing up of the individuality of a person, no matter if it is new born baby in the hospital or in criminal cases and in civil cases like marriage, inheritance of property, passport, insurance claims, disputed sex and missing persons etc has got its own importance. There are many agencies for fixing the identity of a person from village Panchayat to police and usually it is the police which help most in this job. But when all other agencies fail then the medical jurist comes into picture and he is able to do this job by virtue of his knowledge and experience. So he is able to supply to the police and law enforcing agencies certain facts about an individual, dead body or fragmentary remains which will enable them to complete the identification. [1, 2, 6, 8]

Corresponding Author:

**Associate Professor,
Department of Forensic Medicine & Toxicology
DayanandMedicalCollege and Hospital, Ludhiana,
Punjab,
E-mail:singhvp@gmail.com
*Assoc. Prof, Department of Forensic Medicine
People's College of Medical Sciences, Bhopal,
***Director Principal,
Guru Nanak Mission Medical College & Hospital
Dhahan Kaleran, Distt. Sbs Nagar, Punjab 144505
****Prof (Retd.), GMC, Patiala
DOR: 24.4.13 DOA: 17.8.13

Material and Method:

In present study, 100 cases were studied including male and female differently. The cases studied are between age group of 16-25 years that are exposed to x-ray at Rajindra Hospital Patiala. Male and Female individuals are studied with age interval of two years and ten cases from each age interval were taken.

The cases are studied with the help of X-ray pelvis- antero-posterior view for ischial tuberosity for epiphysis fusion. Status of epiphyseal union was divided into following four stages. (Table A)

Table A: Stages of Epiphyseal Union (1)

Stage	Appearance and fusion	Grade
I	Centre not appeared	A
II	Centre appeared but no union	+
III	Union started but incomplete	++
IV	Complete union	+++

Age of each individual studied is confirmed from birth certificate, driving license, passport, ration card or voter's card etc.

Study has been carried out by Roentgenographic technique. The technique included standardization of -

1. Time of exposure
2. Positioning of the part
3. Distance of film from X- Ray tube and
4. Processing and time of developing the films.

Positioning of the Epiphyses during X- Ray:
[2] Clark's radiographic technique has been followed in this investigation

AP View for Pelvis:

1. Patient lying supine with the median sagittal plane adjusted to coincide with the central

longitudinal axis of the couch. Anterior superior iliac spines should be equidistant from the couch top. This distance may be assessed by placing a thumb on each iliac spine and the fingers in contact with the couch necessary using non-opaque pads.

The knees should be flexed over foam pads for comfort. The heels should be separated and the limbs rotated medially so that the long axis of the feet is approximately 5-10 degrees to the vertical. The limbs are maintained in position using sandbags.

The film is centred at a level midway between anterior superior iliac spines and superior border of the symphysis pubis.

2. Direction and Centering of the X-ray Beam:

Centre in the midline midway between the level of the anterior superior iliac spines and the superior border of the symphysis pubis with the central ray perpendicular to the film.

Observations:

This Study showed that in five cases (50%) of age group of 16-17years in males centre not appeared and in 50% centre appeared but no union occurred.

In age group 18-19 years, in three cases (30%) centre appeared but no union, in 40% union started but incomplete and in 30% complete union occurred.

In our study 20-21 years category showed that in 40% union started but incomplete & in 60% complete union occurred. In age group 22-23 years, all ten cases (100%) showed complete union. In age group 24-25 years in only one case (10%) union started but incomplete & in 90% complete union occurred. (Table 1) Present study showed that in females in age group 16-17 years, in four cases (40%) centre appeared but no union occurred, in 50% union started but incomplete & in 10% complete union occurred.

In age group 18-19 years, in 50% union started but incomplete & in 50% complete union occurred. In age group 20-21 years, 10% showed starting of union but incomplete & 90% showed complete union. In age group 22-23 years, in 10% centre appeared but no union occurred, in 10% union started but incomplete & in 80% complete union occurred.

We observed that 100% cases showed complete union in age group of 24-25 years in this study. (Table 2)

Discussion:

In this study, males show epiphyseal union at 20-21 years age group and earliest

union occurred at 18 years. Females also show epiphyseal union at 20-21 years age group and earliest union occurred at 17 years and one month. The present study findings are close to other authors. [3-5, 9] (Table 3)

In our study for males in 18-19 years age group three cases (30%) showed complete union, in 20-21 years age group six cases (60%) showed complete union and in 22-23 years age group all ten cases (100%) had complete union and in 24-25 years age group nine cases (90%) showed complete union. (Table 4)

For females in 16-17 years age group one case (10%) showed complete union, in 18-19 five cases (50%) had complete union, in 20-21 nine cases (90%) showed complete union, in 22-23 eight cases (80%) had complete union and in 24-25 years age group ten cases (100%) showed complete union. (Table 4)

Conclusion:

From the present study it can be concluded that Epiphysis of ischial tuberosity fused in majority of cases by the age of 20-21 year in both male and female. Earliest union occurred at 18 years in males and 17 years in females.

References:

1. **Chhokar Virender, Aggarwal S.N. and Bhardwaj D.N.** Estimation of age of 16 years in females by Radiological and dental examination: Journal Forensic Medicine and Toxicology. Vol. IX (1& 2) Jan-June 1992, 25-30.
2. **Clark.** Pelvis; Positioning in radiography, CBS Publishers and Distributors, (ed.) 11th, 1986, 134.
3. **Galstaun G.** A study of ossification as observed in Indian subject. Indian journal of Medical Research 1937; 25(1):267-324.
4. **Govindiah D.** Medicolegal radiological age determination, Forensic Radiology, Paras Medical publisher. Edition 1st 2003, 28.
5. **Jain Sheetal.** Estimation of age from 13 to 21 years. Journal of Forensic Medicine and Toxicology; 1999; 16(1): 27-30.
6. **Knight Bernard.** Identity of the living and dead, Simpson's Forensic Medicine: ELBS with Edward Arnold educational low-priced books scheme funded by the British Government, (edition) 10th 1991, 54-55.
7. **Krogman.** Skeletal age: Earlier years, skeletal age: Later years I. Suture closure and Skeletal age: Later years II. The Pelvis; The Human skeletal in Forensic Medicine, Charles C.Thomas [ed] First 1962; 18-71, 76-89,92-111.
8. **Parikh.** Personal identity, Parikh's Textbook of Medical Jurisprudence and Toxicology. C.B.S. [edition] 6th; 1999, 2.9.
9. **Vij Krishan.** Identification, Text book of Forensic Medicine, Principle and Practice B.I. Churchill Livingston, [edition] First 2001; 74-82.

Table 4: Age Incidence of Complete Union of Ischial Tuberosity Epiphysis

Age grps(Yrs)	Cases Examined	Complete Union (%)	
		Males	Females
16-17	20	0(0)	1(10)
18-19	20	3(30)	5(50)
20-21	20	6(60)	9(90)
22-23	20	10(100)	8(80)
24-25	20	9(90)	10(100)

Table 1
Incidence and Extent of Fusion of the Ischial tuberosity in Different Age Groups for Male

Extent of fusion	Age Group (Yrs.)				
	16-17	18-19	20-21	22-23	24-25
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
Centre not appeared	5(50)	0(0)	0(0)	0(0)	0(0)
Centre appeared but no union	5(50)	3(30)	0(0)	0(0)	0(0)
Union started but incomplete	0(0)	4(40)	4(40)	0(0)	1(10)
Complete union	0(0)	3(30)	6(60)	10(100)	9(90)

Table 2
Incidence and Extent of Fusion of the Ischial tuberosity in Different Age Groups for Female

Extent of fusion	Age Group (Yrs.)				
	16-17	18-19	20-21	22-23	24-25
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
Centre not appeared	0(0)	0(0)	0(0)	0(0)	0(0)
Centre appeared but no union	4(40)	0(0)	0(0)	1(10)	0(0)
Union started but incomplete	5(50)	5(50)	1(10)	1(10)	0(0)
Complete union	1(10)	5(50)	9(90)	8(80)	10(100)

Table 3
Comparison of Time of Fusion of Ischial Tuberosity (in Years) with that Shown by Other Authors

Author	Year	Race	Sex			Earliest Union (years)
			Male	Female	Mixed	Male/Female
Galstaun (3)	1937	Bengalis (Indians)	20	20	-	-
Krogman (7)	1962	U.S.A.	-	-	19-20	-
Parikh (8)	1990	Indian	-	21-22	-	-
Jain (5)	1999	Indian	20-21	19-20		18 yr 3 M/ 18 yr 2 M
Krishan Vij (9)	2001	Indian	-	-	19-21	-
D. Govindiah (4)	2003	Indian			20-21	
Present	2001	Punjab (Indian)	20-21	20-21	-	M = 18, F = 17

Original Research Paper

Relevance of Semen Collection of the Accused of Rape at the Time of Forensic Medical Examination

*Indrajit Khandekar

Abstract

In India it is prevalent practice that whenever the allegation of sexual assault or rape is made, the suspected or alleged accused is medically examined by the doctors on the request of investigating officer. Relevance of the most archaic practice, collection of semen of the alleged accused by the doctors needs debate and discussion. This practice causes wastage of time and resources of the health and home department and delay in disposal of cases leading to backlog and huge burden on judiciary.

This study is pertaining to the various queries asked in the requisition letter given by the police officials to the doctors at the time of Forensic Medical Examination of the alleged accused and the collection of semen sample of the accused for the identification of blood group at the request of police. Various forensic samples are collected from the accused to link them with the crime. This study discusses the purpose and relevance of collection of semen of the alleged accused of rape and also discusses the suggestion to overcome the problems.

Key Words: Police Requisition, Medical Examination, Rape Accused, Semen, Relevance

Introduction:

In India it is routine practice that whenever the allegation of sexual assault or rape is made, the suspected or alleged accused is medically examined by the doctors on the request of investigating police officer. While making request, the police officers submit a requisition letter to the doctor to carry out such examination, which may contain various queries or questions for the doctors.

The various Forensic samples are collected from the accused during medical examination to link the accused with the crime. This study does not present the whole range of problems that exist in Forensic Medical Examination of the alleged accused of rape in Indian criminal justice and health care system.

This study also does not cover the whole range of problems pertaining to requisition letter written by police officers to doctors to carry out medical examination of alleged accused of sexual assault.

Instead, it discusses the:

- Relevance of collection of semen of the alleged accused of rape by the doctors during his medical examination

Corresponding Author:

*Associate Professor, Dept. of Forensic Medicine, MGIMS, Sevagram, Dist: Wardha (Maharashtra)
E-mail: ilkhandekar@yahoo.co.in,
khandekar@mgims.ac.in
DOR: 14.10.11 DOA: 15.8.13

- Relevance of the most archaic practice of police officers requesting the doctors to collect the semen of alleged accused of rape at the time of his medical examination in their requisition letter
- Problem causing the wastage of time and resources of the health and home department by this unnecessary practice.

The corresponding author has submitted the detailed report along with various suggestions to various Central and State Government agencies.

Aims and Objectives:

1. To study the present practice of asking queries or questions in police requisition letter to doctors at the time of Forensic Medical Examination of alleged accused of Sexual Assault.
2. To study the purpose of semen collection of the rape accused
3. To study the relevance of semen collection.
4. To take steps to improve the present situation & to bring some uniformity in such examinations.

Materials Studied:

- Various requisition letter written by the police officials to doctors requesting for forensic medical examination of survivor of sexual assault (45 in number).
- Analysis of around 69 Judgments- **67 from High Courts** (Table 1) across the country and **2 Supreme Court** Judgments in order to study the prevalence of the practice of

collection of semen sample of the accused. Medical examination report written by the doctors (52 in number).

- Information collected from the various police officials of Maharashtra through conducting workshops and also from the queries asked by the police officers telephonically.
- Opinion and information collected from the doctors including doctors from the forensic medicine field from various states of the country.
- WHO Manual (2003) [1]
- The various international and national literatures available on this aspect.
- The various standard textbooks of Indian Forensic Medicine Experts and manuals. [2-11]

The routine Request by the Investigating Police Officials in Police Requisition Letters to Doctors during Forensic Medical Examination of Alleged Accused of Rape:

The police officials/ investigating police officer asks various queries or questions/ or request in police requisition letter to doctors while requesting the forensic medical examination of alleged accused of rape. Out of these queries **following request need urgent attention:**

- ✓ Kindly collect the semen sample of the accused for chemical analysis?

Observations:

1. The said semen sample which is collected from the accused during the medical examination by the doctor was utilized for the purpose of blood grouping. In some cases it was used to confirm the presence of semen and human spermatozoa [12, 13], which is of no use for the offence of rape. It is not understandable why to analyze the collected semen sample for the further confirmation of it. [14]
2. In most of the cases both blood and semen sample of the accused was collected and both were utilized for the same purpose i.e. to detect blood group. This suggests that analyzing the two samples from the single person for the same purpose is clear wastage of time, money & resources of the government.
3. It further reveals that police department and doctor has wasted there lot of time for semen collection as it was not possible for them to collect the specimen at first visit. In this case accused was sent to the hospital for medical examination, but the accused did not discharge his semen, therefore, doctor asked him to send the accused again. On 3

to 4 occasions, the accused was taken to the Doctor but they could not take his sperm sample as he did not discharge. [12-14]

4. It has been found that the alleged accused was referred from one hospital to another hospital for collection of semen sample as first hospital was unable to collect the semen sample.
5. Even in some cases it has been observed that accused were produced before the Court for obtaining police custody remand, on the various grounds including for collecting the semen sample of the accused. [15]
6. In some cases the glass slide was prepared from the collected semen and it appears that these slides were used for the detection of semen and human spermatozoa. [16] What medico-legal purpose the detection of human spermatozoa is going to serve in rape trials is not understandable? In a case [16] doctor opined that- he could not give sample of semen, as he was not competent to do so. However, the doctor opined that the appellant was capable of intercourse.
7. In some cases where semen was not collected doctors has also given the reason for not collecting the same. For example in one case in the medical report, it has further been mentioned that semen was not taken as the accused had already taken bath and washed the clothing. [17] The reason given by the doctor in this case for not collecting the semen is not understandable.
1. It has also been observed that in some cases doctors tried to collect the semen sample but they could not collect it. [18]
2. The study of various judgments reveals that this practice is prevalent since so many years (more than 27 years)
3. From the study it appears that this practice of collection of semen is prevalent almost all over the country with few exceptions.
4. This practice is not prevalent only in hospitals of rural places but also present in hospitals of big cities including metros. (Table 2)

References:

1. Guidelines for medico-legal care for victims of sexual violence. World Health Organization: 2003.
2. Dogra TD, Rudra A. Lyons Medical Jurisprudence & Toxicology; Delhi Law House, 2005: 491-516.
3. Mathiharan K, Patnaik AK. Modi's Medical Jurisprudence and Toxicology, 23rd edition, LexisNexis Butterworths, 2005: 895-951.
4. Medicolegal Manual of Indian Academy of Forensic Medicine, 1988-1989.
5. Nandy Apurba. Principles of Forensic Medicine, New Central Book Agency Calcutta, 2004: 422.
6. Parikh CK. Parikh's Simplified Text Book of Medical Jurisprudence & Toxicology, Medical Publications, Bombay, 1976: 470-483.

7. **Pillay VV.** Textbook of Forensic Medicine and Toxicology, 15th edition, Paras, 2010.
8. **Rao NG.** Textbook of Forensic Medicine and Toxicology, 1st edition, Jaypee Brothers New Delhi, 2000: 298.
9. **Reddy KSN.** Essentials of Forensic Medicine and Toxicology, 23rd edition, Suganadevi, Hyderabad, 2004: 333-34.
10. **Vij Krishan.** Textbook of Forensic Medicine and Toxicology-Principles and Practice, second edition, B.I Churchill Livingstone, New Delhi, 2002: 582.
11. **Shah D, Wani R, Agrawal.** Youth Connect. Published by FOGSI (The Federation of Obstetrics & Gynecology Societies of India). 2005.
12. Tiharu And Anr. v/s. State of Chhattisgarh. Decided on 9 March, 2006. 2006CriLJ.2358. (Chattisgarh High Court);
13. Tonta Pochaiiah and Ors. v/s. The State of A.P. decided on 13 October, 2004. (Andhra High Court).
14. State of Gujarat vs. Surendrapal Shivabalakpal. (2004) 3 GLR 628.
15. State of Mizoram vs Rualhleithanga. 2005 CriLJ 3184 (Gauhati High Court)
16. Shantibhai Dhanaji Bhagora - vs State Of Gujarat. Decided on 22 October, 2008. Criminal Appeal No. 1323 of 2006. (Gujarat High Court)

17. Mohinder Singh Bhatti vs. State (NCT of Delhi) CrI. A. 171/2009 (Delhi High Court).
18. Bhagwan Dass @ Mittu vs State. Decided on 24.03.2001. Delhi High Court. Criminal Appeal No. 222/2001 & 262/2001.

Table 1: Judgements of Various Courts

Sr. No.	Name of Court	No. of Judgments
1	Andhra	1
2	Chhattisgarh	3
3	Chennai	4
4	Delhi	14
5	Gauhati	2
6	Gujarat	7
7	MP	4
8	*Mumbai	25
9	Orissa	3
10	Panjab- Haryana	2
11	Rajasthan	2
12	Supreme Court	2
Total		69
*Including Aurangabad and Nagpur Bench		

Table 2

List of Hospitals Where Medical Examination was done and Semen was Collected

S. N.	Name of the State/ District/ Police Station	Name of the hospital & Place
1.	Andhra Pradesh (Medak Assit Session Court)	Govt. Hospital, Narsapur
2.	Kandili Police Station; Vellore	Govt. Hospital at Tiruppattur
3.	Delhi	R.M.L. Hospital
4.	Delhi	GTB hospital
5.	Delhi	DDU Hospital
6.	Delhi (PS: Vasant Vihar)	Safdarjung Hospital
7.	Delhi (PS: Khajoori Khas)	S.D.N. Hospital, Shahdara
8.	PS: Serchhip, Aizawl District, (Gauhati HC)	Serchhip Hospital
9.	Vijaynagar Police Station (HC- Gujarat)	Community Health Centre, Vijaynagar,
10.	Petlad Town Police Station; (HC- Gujarat)	S.S.G. Hospital, Petlad
11.	Chhatarpur, PS- Isha Nagar (HC- MP)	PHC. Isha Nagar, Chhatarpur
12.	Police Station, Waraseoni. (dist- Balaghat) MP	Govt. Hospital, Waraseoni.
13.	Pune (MH)	Pune Hospital
14.	Satara (MH)	General hospital Satara
15.	Pune (MH)	Sasson Hopsital
16.	Pandharpur- Solapur (MH)	Cottage Hospital, Pandharpur,
17.	Amravati (MH)	GH, Amravati,
18.	Wardha (MH)	CH Wardha
19.	Dist-Wardha (MH)	RH, Arvi,
20.	Bhandara (MH)	GH, Bhandara.
21.	Yavatmal- (MH)	Yavatmal
22.	Parbahani	Parbhani
23.	Ahemadnagar	Ahemadnagar
24.	Bhandara Dist	RH, Paoni
25.	Amraoti Dist	Achalpur RH
26.	Nagpur	Govt. Medical College, Nagpur
27.	MH	Parali- Ambajogai
28.	Orissa	Athagarh Region
29.	Orissa	Bhuban Police Station
30.	Punjab-Haryana HC	Kurukshetra
31.	Rajasthan	Jaipur
32.	Rajasthan	Mettur Govt. H.

GH: General Hospital; CH: Civil Hospital; RH: Rural Hospital; Govt. H: Government Hospital; HC: High Court; MH: Maharastra; PS: Police Station

Original Research Paper

Different Presentations of Victims of Lightning During Thunderstorm

*Chandra Prakash, **Ishwer Tayal

Abstract

Thunderstorms are classic weather events. Huge electrical forces are involved, producing millions of amperes and phenomenal voltages within microseconds of time. Hundreds of deaths occur each year from atmospheric lightening stroke, especially in tropical countries. Understanding lightning related casualties is more than just reporting numbers of deaths. As death takes place immediately, no signs of vital reaction are to be expected in connection with bizarre presentations of victims and torn clothing further arouse suspicions of foul play and sometime person at a considerable distance from the spot of lightning, is killed with no mark of injury due to 'return shock' i.e. discharge of charged cloud induced electricity from his own body. More people are struck by lightning in hilly states blessed with heavy rains than in all other states on average both indoor and open fields. This article reveals a series of such cases brought to the Government Medical College, Haldwani.

Key Words: Lightning, Cause of Death, Filigree Burns, Injury Patterns

Introduction:

In many cultures, lightning has been viewed as part of a deity or a deity itself including the Hindu God Indra. In French and Italian culture it express "Love at first sight". For some political parties such as the People's Action Party in Singapore and the British Union of Fascists lightning flashes are symbol of power. It is also a common insignia for military communications units throughout the world.

Lightning is a massive electrostatic discharge caused by the circulation of warm moisture-filled air through unbalanced electric field in the atmosphere, accompanied by the loud sound of thunder. A typical cloud to ground lightning strike can be over 5 km long. [2] A typical thunderstorm may have three or more strikes per minute at its peak. [3] Lightning strikes 40–50 times a second worldwide, for a total of nearly 1.4 billion flashes per year. [4]

Cloud-to-ground (CG) lightning accounts for 25% of lightning globally. Lightning is not distributed evenly around the planet. [5] About 70% of lightning occurs on land in the tropics, where most thunderstorms occur.

Corresponding Author:

**Assistant Professor

Department of Forensic Medicine,
Government Medical College, Haldwani

E-mail: tayalishwer45@yahoo.com

*Prof. & HOD

DOR: 30.10.12 DOA: 21.7.12

The north and south poles and the areas over the oceans have the fewest lightning strikes. The place where lightning occurs most often is near the small village of Kifuka in the mountains of eastern Democratic Republic of the Congo [6], where the elevation is around 975 meters (3,200 ft). On average this region receives 158 lightning strikes per square kilometer a year. [7]

During thunderstorm the lightening flash/stroke discharge many current peaks varying from 10,000-200,000 Amp occurring in fraction of a second affecting an area of about 30m distance. [8] Because lightning can travel through air, plumbing systems, and land phone lines it can struck people working in open fields or in their houses until 30 minutes after the final thunderclap is heard. Victims may present with minor injuries with no loss of consciousness to severe cardiopulmonary arrest or fatal injuries, however, the long-term effects on their lives and the lives of their family members can be devastating. Lightning causes human injury by 4 distinct mechanisms: [8]

1. The direct effect of electric current;
2. Burning by superheated air;
3. Effects of expanded and repelled air around flash and
4. The "sledge hammer blow" death by compressed air pushed before the current.

Case 1: Direct Lightning Strike:

It was a case of 25 year old male laborer brought by the police for post mortem

examination with alleged on the spot death as a result of Thunderstorm when the deceased was returning from his work with three friends near Gola gate forest area of Lalkuan, Nainital.

External Examination:

Shirt was torn and burnt mostly around shoulder and collar. In pocket there were 2-3 coins which were distorted and melted. Superficial to deep Burn injuries were present on the right lateral aspect of upper half of the body (involving the right side of head, neck, shoulder, chest, abdomen and right upper limb). Base of the burnt area was reddish and parchmented.

Laceration of scalp was accompanied with burning and singeing of scalp hair on the right side of head. Typical leaf like erythematous **filigree burn marks was present on** chest and abdomen mostly on the right side up to right shoulder region. Clotted blood was present in the left ear canal along with hemorrhagic congestion of the left eye.

Internal Examination:

Diffuse Sub-galeal Hematoma was present under the scalp with extensive sub dural hemorrhage over the fronto-lateral aspect of the both cerebral hemispheres and all the internal organs were congested.

The cause of death in this case was **failure of functions of brain as a result of electrical discharge due to lightning which is sufficient to cause death.** [9]

Case 2: Indirect Lightning Strike:

This is a case of 13 years old male child alleged to have died due to lightning during thunderstorm on 16th September 2012, while eating maize (Bhutta) inside kitchen at ground floor of his house. History of thunderstorm in the locality and evidence of damage to houses, trees, cattle etc in the vicinity and smell of singeing was present as per inquest papers.

External Examination:

Clothing was intact, eyes were suffused with blood, face was livid, lips and nails were cyanosed, fecal matter was present at anal orifice, no mark of injury was present. Fern like pattern of erythema was present on the front of chest and shoulders. Putrefactive changes were present in the form of greenish discoloration of distended abdominal wall etc.

Internal Examination:

Stomach was found to be full of undigested maize grains and was weighting 712 grams, lungs were congested and weighting 174 and 197 grams, no other significant finding was present other than visceral congestion.

The cause of death was **Asphyxia as a result of lightening during thunderstorm.**

Case 3: The Strike Survivors:

Mother of the child (reported in case no 2) was handling Woodstock inside the house due to water leaking from terrace and was thrown away by the struck of lightning during thunderstorm. She suffered severe shock and was admitted in hospital in unconscious condition for twenty four hours, after which she recovered with complaint of weakness/parasthesia in left upper and lower limb. She had retrograde amnesia and described a sensation of being struck on the back of the neck. No residual symptoms were left.

Other members of family were sleeping on the first floor of the house and sustained minor injuries with no need of hospitalization.

Discussion:

The effects of lightning are extremely bizarre and unpredictable. While two persons standing side by side during a stroke, one may be struck and killed whereas the other remains unharmed. Converse may also be true as was seen in case of 23 climbers caught in a thunderstorm while climbing up a steep mountain in Japan. Only one of them was struck but all were dead. [10] Most fatalities occur in open, while persons in the building may be affected if they are carrying or wearing something which may attract lightning or are present in living room with a chimney or television aerial.

Objects at a distance of 100 feet or more may be struck as was in case of an African reported by Skan in which a large hole in the neck, fractures in skull and tearing away of left shoulder inside hut due to lightning was reported. [10] A person may be killed by lightning and yet the clothing may not be damaged. On the contrary, the clothing may be burnt without causing any injury to the person. As was seen in case of a girl riding a horse and killed by lightning which struck her through a metal stud on the top of her hat, melting her nylon panties and tore her jodhpurs as described by Mant. [10]

Arborescent markings/ Filigree burns are pathognomonic for injury by lightning. It is not associated with burning but indicates the path taken by the electrical discharge. It appears within 1 hour and disappears in 24 hours if the person survives. The primary burn is usually on the head and may be diffuse as in case 1 it extends to back. There are obvious flash burns in 70% of cases but they may be absent. Injury may in the form of bruise or lacerated wound usually located at head and may be attributed to 'sledge-hammer blow' by the compressed air.

Internal signs are not very characteristic. Death can be instantaneous due to ventricular fibrillation as a result of electrical discharge or asphyxia and delayed as a result of burns or occasionally from thrombosis of cerebral or coronary arteries. Those who survive may have the long term side effect. The strike survivors may have:

1. Memory loss
2. Personality changes
3. Difficulty carrying on more than one task at a time
4. Fatigue
5. Irreparable nerve damage
6. Chronic pain and/or headaches
7. Difficulty sleeping
8. Dizziness

Cause of Death:

Death is always due to accident. Sometimes appearances left on human body closely resemble those produced by criminal violence. Thus a person may be found dead in an open field or on highway with torn clothes, contusions, lacerations and fractures raise doubt of foul play. In such cases, the diagnosis should be based on:

1. History of thunderstorm in the locality.
2. Evidence of damage to houses, trees, cattle etc in the vicinity.
3. Absence of wounds indicating homicidal death.
4. When the lightning current path passes through rock, soil, or metal these materials become permanently magnetized. Even metals with very high melting points such as Gold may volatilize and the melted metal may be implanted into the skin, producing distinctive coloring.

References:

1. **Lyon.** Textbook of Medical Jurisprudence and Toxicology; 11th ed, P.1009-10; Delhi Law House Publisher.
2. **Uman, Martin A.** "All About Lightning"; p. 55,81; Dover Publications N.Y.; 1986; ISBN- 2-486-25237-x
3. **Jason Payne-James, Busuttil, William S. Smock.** Forensic Medicine Clinical and Pathological Aspects, Cambridge University Press, First Ed; 2003, pp.8.
4. **John E. Oliver.** Encyclopedia of World Climatology. National Oceanic and Atmospheric Administration, 2005; ISBN 978-1-4020-3264-6. Retrieved February 8, 2009.
5. **Uman, Martin A.** (1986). All about Lightning. Dover Publications, Inc. pp. 103–110. ISBN 978-0-486-25237-7
6. **P.R. Field, W.H. Hand, G. Cappelluti et al.**"Hail Threat Standardisation". European Aviation Safety Agency. November 2010; RP EASA.2008/5.
7. "Kifuka – place where lightning strikes most often". Wondermondo. Retrieved November 21, 2010.
8. "Annual Lightning Flash Rate". National Oceanic and Atmospheric Administration. Retrieved February 8, 2009.
9. "Where Lightning Strikes". NASA Science. News. December 5, 2001. Retrieved July 5, 2010.
10. **Chao. T.C., Pakiam J.E., Chia J.A.** Study of lightning death in Singapore. Singapore Medical Journal vol 22(3) June 1981

11. **Spitz,W.U. and Fisher R.S.** Medico-legal investigation of death pp.316.chales c thomas1973.
12. **Chandra Parkash.** 2010. Medico-legal Update Journal. Jan-June, vol.10, issue.1.pp. 09-11.
13. **Dominick J., Di Maio.** Forensic Pathology, P.374-6; 1993
14. **Vij Krishna.** Textbook of Forensic Medicine and Toxicology, 3rd Edition, page no.279-81.
15. **Biswas Gautam.** Review of Forensic Medicine, P. 198; 2010
16. **Shepherd Richard.** Simpson's Forensic Medicine, 12th Edition.
17. **Subrahmanyam B. V.** Modi's Medical jurisprudence & Toxicology, 22nd Ed.2001.pp.320-3.
18. **Reddy Narayan K.S.** The essentials of Forensic Medicine & Toxicology, 24th ed. p.282-3; 2005.
19. **V.V.Pillay.** Text book of Forensic Medicine and Toxicology, 13th ed. P.168; Paras Publications; 2003.
20. **P.V.Guharaj.** Forensic Medicine. 2nd ed. 2003.p. 201-2.

Case 1: Victim with Torn Clothing due to Direct Lightning Stroke



Case 1: Typical Leaf like Filigree Burns in Direct Lightning Stroke



Case 2: Victim of indirect Lightning Stroke



Case 2: Fern like pattern of erythema present on the front of chest and shoulders



Original Research Paper

Pathological Findings of Liver in Autopsy Cases A Study at Imphal

*Ph. Madhubala Devi, **Barida Ginia Myrthong, ***Th. Meera, ****H. Nabachandra

Abstract

It is a known fact that silent liver diseases are common amongst apparently healthy individuals and are sometimes diagnosed only at autopsy. The present study was conducted in the Department of Pathology and Forensic Medicine during the period from September 2010 to August 2012 on 100 medico-legal autopsy cases brought to the mortuary of Regional Institute of Medical Sciences, Imphal. The liver specimens from these cases were examined grossly as well as microscopically to establish presence of liver diseases and also to find out the types of liver diseases in relation to the age and sex of the studied cases. Maximum number of cases was in the 41-50 years age group (29%). Males predominated the study with a male: female ratio of 6: 1. Cirrhosis was the commonest finding comprising 25% of the cases, followed by chronic hepatitis 22%. Hepatomegaly was seen in 19% of the cases. Hepatic steatosis was the commonest cause of hepatomegaly followed by chronic hepatitis. The study was conducted only on specimens collected from the mortuary and may not reflect the actual pattern of liver diseases in the local population.

Key Words: Autopsy, Histopathology, Liver Disease, Cirrhosis, Chronic Hepatitis, Portal Triaditis

Introduction:

Liver is vulnerable to a variety of metabolic, toxic, microbial and circulatory insults. In some instances, the disease is primary while in others the hepatic involvement is secondary, which can be due to cardiac decompensation, alcoholism or extra hepatic infections. Alcohol is implicated in more than 50% of liver related deaths in the United States and complications of alcoholism contribute to a quarter of million deaths annually. [1]

Alcohol abuse generally leads to three pathologically distinct liver diseases viz. fatty liver, hepatitis and alcoholic cirrhosis. One or all of the three can occur at the same time and in the same patient. [2] Fatty change (steatosis) is a very common finding both in biopsies and at post mortem examination. Liver cell involvement may be focal, diffuse, or zonal. [3]

Fatty liver develops within a short period (days) of alcohol abuse whereas more severe liver injury requires prolonged alcohol abuse for a period of years. Nonalcoholic fatty liver disease (NAFLD) includes a spectrum of liver diseases, ranging from simple steatosis to steatohepatitis, advanced fibrosis and cirrhosis. [3]

Chronic hepatitis is usually due to hepatotropic viruses, or conditions like autoimmune chronic hepatitis or chronic idiosyncratic drug-induced hepatitis. Similar features (like presence of piecemeal necrosis) are also found in Wilson's disease, primary biliary cirrhosis and primary sclerosing cholangitis.

It varies in different geographic areas and is based on various factors such as socio-economic status, life style, diet, local or regional infections, and other endemic disease. Most of the chronic liver diseases even in advanced stages may cause no prominent clinical signs or symptoms and are undiagnosed or found incidentally during general checkups, investigations for other diseases or during autopsy. [3] Hepatocellular carcinoma and tumors arising from the bile duct epithelium are common tumors of the liver. [4]

Extra hepatic bacterial infections, particularly sepsis can induce mild hepatic inflammation and varying degrees of hepatocellular cholestasis.

Parasitic and helminthic infections like malaria, Schistosomiasis, Leishmaniasis,

Corresponding Author:

***Associate Professor,
Department of Forensic Medicine
Regional Institute of Medical Sciences,
Imphal, Manipur- 795004
E-mail:- meera_th@yahoo.com
*Associate Professor, Dept. of Pathology
**P.G trainee, Dept. of Pathology
Prof & Head, Dept. of Forensic Medicine
DOR: 14.12.12 DOA: 13.8.13

Cryptosporidiosis also involve the liver frequently. [5] Tuberculosis was declining in the West but has now shown a reverse trend after the appearance of the AIDS epidemic, making it a global health problem once again. Liver involvement in tuberculosis, though common both in pulmonary and extra-pulmonary tuberculosis, it is usually clinically silent. Liver involvement in AIDS usually reflects disseminated rather than primary disease. [6]

Many chemicals including drugs and toxins can produce liver damage. Acute injury may produce parenchymal damage, arrested blood flow and jaundice. Drugs can also produce chronic active hepatitis, fatty liver, cirrhosis, several vascular lesions and rarely neoplasm lesions of the liver. Metabolic disorders like Galactosaemia, hereditary fructose intolerance, tyrosinaemia, Zell weger's syndrome, glycogen storage diseases, lipid storage diseases (Gaucher disease, Niemann Pick disease, Fabry's disease) and disorders of copper metabolism such as Wilson's disease and Indian childhood cirrhosis also affect the liver. [4]

Hence, determination of the prevalence of silent liver diseases and its correlation with age, sex, life style and other risk factors has become an important ongoing study.

The present study has been undertaken to establish presence of liver diseases and also to find out the types of liver diseases in relation to the age and sex of the studied autopsy cases from the local populace.

Materials and Methods:

A cross sectional study was carried out in the Department of Pathology and Forensic Medicine, Regional Institute of Medical Sciences (RIMS), Imphal on 100 cases brought for medico-legal autopsy to the mortuary of Regional Institute of Medical Sciences, Imphal during the period of September 2010 to August 2012. Following recording of history and a thorough postmortem examination, gross examination of the liver specimen was done as regards the weight, surface, capsule, colour, consistency, etc. Formalin fixed liver tissues stained with Hematoxylin and Eosin (H &E) along with some special stains like Reticulin, van Gieson, Periodic acid Schiff (PAS) and Congo red in selected cases, were examined under the microscope. The findings of the examination were recorded and analysed.

Results and Observations:

• Sex and Age Incidence:

In this study, it was observed that out of 100 cases, 85% were males and 15% were females; the male: female ratio being 6:1. (Fig.1)

The age group of 41-50 years recorded the maximum number of cases for males with 28 cases and the 21-30 years age group for females with 7 cases. (Fig. 2)

• Frequency of Liver Diseases (Histopathological Diagnosis):

Cirrhosis was the commonest liver disease (25%) followed by chronic hepatitis (22%). Hepatic steatosis accounted for 17% of the cases, portal triaditis for 15%, congestive liver and miscellaneous cases accounted for 5% each. (Table 1)

• Distribution of Weight of Liver:

Majority (74%) of the livers were of normal weight between 1000-1500 grams, followed by 19 cases of hepatomegaly i.e. 14 cases weighing between 1501-2000 grams and 5 cases weighing between 2001-2500 grams. Only 7 cases weighed less than 999 grams. (Fig. 3)

• Distribution of Cases in Hepatomegaly:

Out of the 19 cases of hepatomegaly (livers weighing more than 1500 grams) the most common liver disease was hepatic steatosis (31.6%) followed by chronic hepatitis (26.3%), portal triaditis (21.1%) and cirrhosis (21.1%). Out of the 4 cases of cirrhosis 1 was a case of early cirrhosis and 3 were cases of chronic hepatitis associated with cirrhosis. (Fig.4)

• Age and Sex Distribution of Cases of Cirrhosis:

Cirrhosis was the most predominant liver disease which accounted for 25% of the total cases and maximum of these cases occurred in the age group of 41-50 years in males whereas in females there was one case each in the age group of 31-40 years, 41-50 years and 51-60 years. (Table 3)

• Age and Sex Wise Distribution of Chronic Hepatitis:

The disease was common in the 21- 30 years age group with 7 cases (32%) followed by the age group 41-50 years with 23%. 61-70 years age group 2 cases and 71- 80 years age group with only one case (5%). (Fig. 5)

• Age and Sex Wise Distribution of Hepatic Steatosis:

In this study, hepatic steatosis was observed in 17 cases and the highest number of cases was in the age group of 21-30 years (41%) with a male: female ratio of 3:1.

In females most of the cases were seen in the age group of 21-30 years. (Table 4) Out of the 17 cases, 11 showed micro vesicular and macro vesicular steatosis, 5 with micro

vesicular steatosis and 1 with macro vesicular steatosis.

- **Frequency and Distribution of Portal Triaditis by Age and Sex:**

The occurrence of portal triaditis in this study was found to be highest in the age group of 41-50 years with 6 cases followed by 21-30 years age group with 4 cases (27%). (Fig 6)

- **Miscellaneous Cases:**

There were 5 miscellaneous cases. Submissive necrosis accounted for 3 cases and Hepatic granulomatous lesion accounted for 2 cases. (Fig 7)

Discussion:

The importance of silent liver disease in the overall perspective of pathology and clinical medicine cannot be overemphasized. Histopathology is the most important and useful way of diagnosing liver diseases as some may remain silent and diagnosed only at autopsy. In studies conducted by Bal MS et al [2] and Fubara S et al [7], it was observed that the commonest affected age group was 41-50 years (53.85%) and 41-49 years (28%) respectively which is comparable to the findings of the present study. In concurrence with the findings of several workers [2, 3, 7-9] liver diseases predominated in males in the present study and this may be attributed to the fact that men indulge themselves more to alcohol and smoking as compared to women.

In a study conducted by Ghosh CK et al [10] it was observed that liver abscess was the commonest cause of hepatomegaly and it was due to amoebiasis, followed by congestive cardiac failure and viral hepatitis, fatty liver and hepatocellular carcinoma were seen only in a few cases. In contrast to this, we found that out of the 19 cases of hepatomegaly, the most common disease was hepatic steatosis, followed by chronic hepatitis, portal triaditis and cirrhosis. As regards the pattern of liver diseases, in a study conducted by Tsokas M and Tusk EE [11], where 45 cases of sudden death were autopsied, cirrhosis was observed in all cases (100%) with a male: female ratio of 1.6:1. Hence, cirrhosis was found to be much higher compared to the present study and the probable cause of cirrhosis was alcohol as the toxicological analysis in these patients showed high alcohol content in the venous blood.

The present study also observed cirrhosis to be the commonest liver disease but with a higher M: F ratio of 7:1. Sobaniec-Lotonska M et al. [12] also found that out of 19,094 autopsies carried out between 1976-1990, cirrhosis was the commonest liver

disease with males (64%) affected more than females, which is in agreement with our findings. Liver cirrhosis was coincidentally diagnosed in 13.5-40% of patients at autopsy by Iwamura K and Inaba R. [13]

This could be due to the fact that the morphologic changes in the liver do not occur suddenly in a short span of time and that the morphogenesis goes on insidiously. Voinova LV [14] observed that steatosis was the most common alcohol related damage in the liver and cirrhosis in case of viral diseases. Hence detailed examination and periodic follow-ups are necessary for early diagnosis of cirrhosis.

Kringsholm B et al [15] and Passarino G et al [16] found chronic hepatitis to be the second most common liver disease in their study which is comparable to our study. Out of the 22 cases of chronic hepatitis, 5 were associated with steatosis and one case showed features suggestive of hepatitis B infection and one with features suggestive of hepatitis C infection even though the serological markers were not available for confirmation.

Saha MK et al [17], observed that a high prevalence of hepatitis C virus infection (HCV=92%) and hepatitis B virus infection (HBV=100%) among Manipuri couples whose husbands were intravenous drug users and HIV positive. Similarly Ray G et al [18] also found HBV to be the commonest cause of chronic liver disease in eastern India. Burke KP and Cox AL [19] also observed that acute HCV infection results in chronic carriage in 70-80% of cases which ultimately develop cirrhosis, liver failure or hepatocellular carcinoma and hence this could be the reason for the high incidence of cirrhosis in this present study.

Many workers [2, 8, 9, 15, 20] have observed that hepatic steatosis was the commonest finding with a male predominance whereas the present study found hepatic steatosis to be the third commonest liver disease with the maximum cases in the 21-30 years age group and a male: female ratio of 3:1. Rakha EA et al. [21] in their study observed that portal inflammation was a common component of histologic spectrum of both alcoholic fatty liver disease and non alcoholic fatty liver disease which could also be the probable cause in this present study.

Kringsholm B et al [20] in their study of liver pathology in drug addicts found that non-specific portal inflammation was the commonest finding accounting for 65% of the cases which was much higher than our present study. As details about the history of drug intake could not be obtained from the cases in the present

study, there is a possibility that the portal inflammation could be the result of intake of certain drugs like anti-tubercular drugs especially Rifampicin and Ionized as was also found by Tassaduq I et al. [22]

There were 2% cases of hepatic granulomatous lesions and 3% of sub massive necrosis. Soutoudehmanesh R et al [3] observed granulomatous hepatitis in only 0.2%, which was lower as compared to our study, whereas much higher incidence was observed by Amarapurkar A and Agarwal V (42%). [23]

Regular intake of alcohol between 40-80 grams increases the liver weight, frequency of fatty change and cirrhosis. Most of the cases in this study were collected from the mortuary with maximum cases being RTA and the details of the personal history were not fully available.

Conclusion:

It may be concluded from the present study that cirrhosis, chronic hepatitis and steatosis are the common liver diseases in India. silent liver diseases are very common amongst the apparently healthy individuals and if not detected early some of these conditions may lead to serious outcomes. Hence, steps should be taken up for the early detection and treatment of such ailments. The study was conducted only on specimens collected from the mortuary and may not reflect the actual pattern of liver diseases and emphasizes the need for further studies for early detection and treatment of the vulnerable group of people in the local populace.

References:

1. **Shah VS.** Alcoholic Liver Disease. In: Hauser S, editors. Mayo Clinic Gastroenterology and Hepatology Broad Review. 4th ed. New York: Oxford University Press; 2011.p 295-303.
2. **Bal MS, Singh SP, Bodal VK, Oberoi SS, Surinder K.** Pathological findings in liver autopsy. Journal of Indian Academy of Forensic Medicine 2004; 26(2):971-73.
3. **Sotoudehmanesh R, Sotoudeh M, Asgari A, Abedi-Ardakani B, Tavangar SM, Khakinejad A et al.** Silent Liver Diseases in Autopsies from Forensic Medicine of Tehran. Archives of Iranian Medicine 2006 Oct; 9(4):324-28.
4. **Wight GD editor.** Systemic Pathology. Liver, biliary tract and exocrine pancreas. 3rd ed. Great Britain: Churchill Livingstone; 1994. p 1-48.
5. **Crawford JM, Lui C.** Liver and Biliary Tract. In: Kumar V, Abbas KA, Fausto N, Aster J, editors. Pathologic Basis of Disease. 8th ed. New Delhi: Elsevier; 2010.p 833-90.
6. **Bach N, Theise ND, Schaffner F.** Hepatic Histopathology Acquired Immunodeficiency Syndrome. Seminars in Liver 1992; 12(2): 205-12.
7. **Fubara DS, Jebbin NJ.** Hepatocellular carcinoma in Port Harcourt, Nigeria: Clinicopathologic Study of 75 Cases. Annals of African Medicine 2007; 6(2):54- 7
8. **Selvi RT, Selvam V, Subramanium PM.** Common Silent liver Diseases In and Around of Salem Population: An Autopsy study. Journal of Clinical and Diagnostic Research 2010 Apr; 6(2):207-10.
9. **Merat S, Sotoudehmanesh R, Nouriaie M, Peikan-Heirati M, Sepanlou SG, Malekzadeh R et al.** Sampling Error in Histopathology Findings of Nonalcoholic Fatty Liver Diseases: A

Postmortem Liver Histology Study. Archives of Iranian Medicine 2012 July; 7:418-20.

10. **Ghosh CK, Islam F, Ahmed E, Ghosh DK, Haque A, Islam QT et al.** Etiological and Clinical Patterns of Isolated Hepatomegaly at Rajshahi, Bangladesh. Euroasian Journal of Hepato-Gastroenterology.2012 Jan-June;2(1):1-4.
11. **Tsokos M, Turk EE.** Esophageal variceal haemorrhage presenting as sudden death in outpatients. Archives Pathol Lab Med 2000 Oct; 126:1197-00.
12. **Sobaniec-Lotowska M, Barwijuk M, Baltaziak J, Dzieciol J, Sulkowski S, Debek W et al.** Coexistence of some Diseases and Analysis of Death Causes Based on Autopsy Examinations carried out in Liver Cirrhosis patients based on Autopsy. Pol Merkur Lekarski 1996 Sept; 1(3):187-9.
13. **Iwamura K, Inaba R.** Clinical study on latent cirrhosis of the liver. Tokai Journal Exp Clin Med 1983 Jul; 8(3):281-91.
14. **Voinova LV.** Etiological and Nosological structure of liver diseases (on autopsy data of clinics of I. M. Sechenov Moscow Medical Academy in 1988-1997). Arkh Patol 2000 Mar-Apr; 62(2): 45-7.
15. **Kringsholm B, Christoffersen P.** Liver pathology in fatal drug addiction. Forensic Science International 1982 Sep-Oct; 20(2): 141-51.
16. **Passarino G, Ciccone G, Siragusa R, Tappero P, Mollo F.** Histopathological Findings in 851 Autopsies, with Toxicological and Virological Correlations. American Journal of Forensic Medicine and Pathology 2005 June; 26(2):106-16.
17. **Saha MK, Chakrabarti S, Panda S, Naik TN, Manna B, Chatterjee A et al.** Prevalence of HCV and HBV infection amongst HIV seropositive intravenous drug users and their non-injecting wives in Manipur, India. Indian Journal Med Res.2000 Feb; 111: 37-9.
18. **Ray G, Ghoshal UC, Banerjee PK, Pal BB, Dhar K, Pal AK et al.** Aetiological spectrum of chronic liver diseases in eastern India. Trop Gastroenterol 2000 Apr- Jun; 21(2):60-2.
19. **Burke KP and Cox AL.** Hepatitis C Virus Evasion of Adaptive Immune Response - A model for viral persistence. Immunol Res.2010 July; 47(1-3):216-227.
20. **Elayassi H.** Fatty Liver, a postmortem study. Medical Journal of Iran Hospital 2000 Jul; 5(1):28-29.
21. **Rakha EA, Adamson L, Bell E, Neal K, Ryder SD, Kaye PV et al.** Portal inflammation is associated with advanced histological changes in alcoholic and non-alcoholic fatty liver disease. Journal of Clinical Pathology 2010 Sep; 63(9):790-5.
22. **Tassaduq I, Butt SA, Saeed M.** Role of Ascorbic Acid in Portal Inflammation Induced By Rifampicin. Journal of Rawalpindi Medical College 2012;16(1):22-24.
23. **Amarapurkar A, Agarwal V.** Liver involvement in Tuberculosis: An autopsy Study. Trop Gastroentrol 2006 Apr – Jun; 27(2):69- 74.

Table 4: Frequency of Hepatic Steatosis by Age And Sex

Age (Yrs)	Male	Female	Total Cases	Percentage
10 - 20	0	0	0	0%
21 - 30	4	3	7	41%
31 - 40	4	1	5	29%
41 - 50	3	0	3	18%
51 - 60	2	0	2	12%
61 - 70	0	0	0	0%
71 - 80	0	0	0	0%
Total	13	4	17	100%

Fig 1: Sex Distribution of Cases

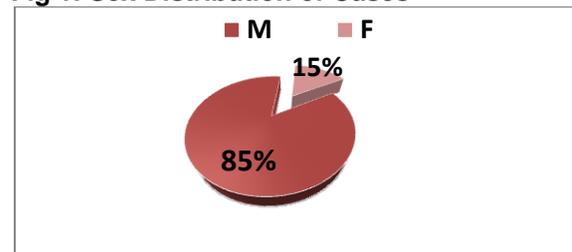


Fig 2: Age Distribution of Cases

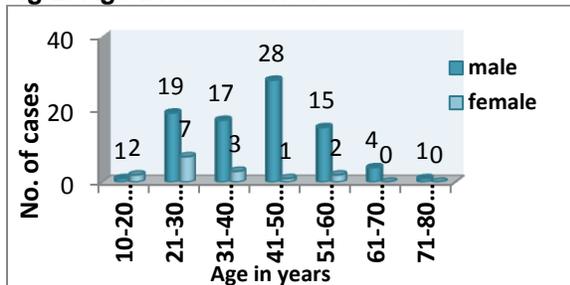


Fig 3: Sex Wise Distribution of Liver Weight

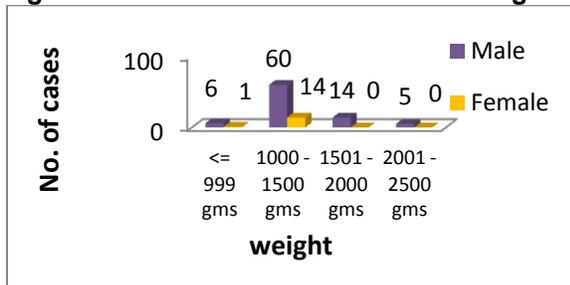


Fig 4: Distribution of Cases in Hepatomegaly

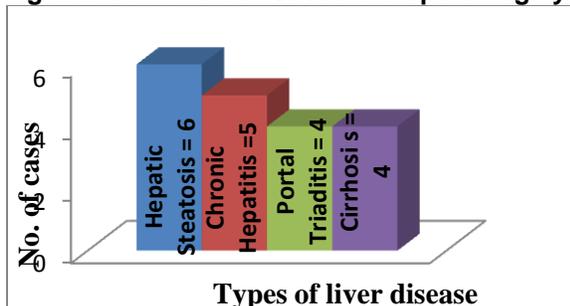


Fig 5 : Age And Sex Wise Distribution of Chronic Hepatitis

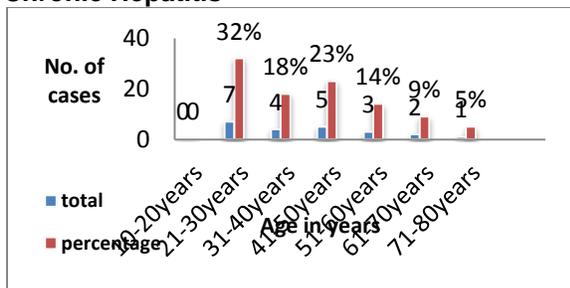


Fig 6: Percentage of Portal Triaditis by Age

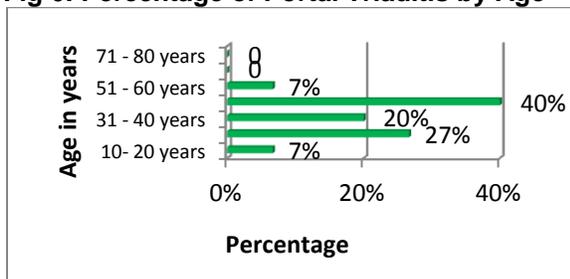


Fig 7 : Distribution of Miscellaneous Cases

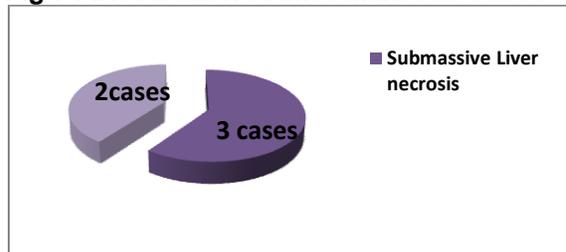


Table 1: Histopathological Diagnosis

Histopathological Diagnosis	Cases (%)
Cirrhosis	25(25)
Chronic Hepatitis	22(22)
Hepatic Steatosis	17(17)
Portal Triaditis	15(15)
Normal Liver	11(11)
Congestive liver	5(5)
Miscellaneous	5(5)
Grand Total	100(100)

Table 2: Frequency Distribution of Cirrhosis by Age and Sex

Age (yrs)	M	F	Total	%
10 - 20	0	0	0	0%
21 - 30	3	0	3	12%
31 - 40	2	1	3	12%
41 - 50	9	1	10	40%
51 - 60	6	1	7	28%
61 - 70	2	0	2	8%
71 - 80	0	0	0	0%
Total	22	3	25	100%

Table 3: Staging and Grading of Cases of Chronic Hepatitis

Total Scores	Staging and Grading (Modified Scheuer method)	Cases (%)
1	0	0(0)
2	a.(1+1+0) b.(1+1+0) c.(1+1+0) d.(1+1+0)	4(18)
3	a.(1+1+1) b.(1+1+1) c.(1+2+0)	3(14)
4	a.(1+2+1) b.(1+2+1) c.(1+2+1) d.(1+2+1) e.(2+1+1) f.(2+1+1)	6(27)
5	a.(1+2+2) b.(2+1+2) c.(2+1+2) d.(0+4+1) e.(2+1+2)	5 (23)
6	a.(2+2+2) b.(1+3+2) c.(3+2+1)	3(14)
7	a.(3+2+2)	1(5)
		22(100)

Column 1: indicates portal/periportal inflammation; Column 2: lobule inflammation; Column 3: degree of fibrosis

Original Research Paper

Unsafe Abortion: A Study in a Tertiary Care Hospital

*Prem Chandra Srivastava, **Rajesh Kumar Rai, ***Shikha Saxena, ****S. K. Roy Chaudhary, ****H. K. Singh

Abstract

The study was conducted by the department of Forensic Medicine in collaboration with the department of Obstetrics and Gynaecology at Rohilkhand Medical College and Hospital, Bareilly, U.P. during one year period. A total of 150 married women presented for seeking abortion related services were included in the study. 34.67% women first contacted qualified doctors and equal number of cases reported directly to Rohilkhand Medical College Hospital whereas 30.66% women first contacted to unqualified persons. Among unqualified, quacks constituted major chunk (23.33%), followed by midwives (4%) and nurses (3.33%). Abortion providers unsuccessfully attempted to terminate the pregnancy in 54.67% women by using various abortifacient. In 75.33% of cases, there was no any history of ultrasonographic exposure. None of the cases reported any incidence of physical domestic violence culminating into abortion. Majority of the women (78%) wanted to disclose to her family members or relatives regarding abortion.

Key Words: Unsafe abortion, unqualified persons, Quacks, Pregnancy

Introduction:

Unsafe abortions have devastating effects on women's health. While some abortions are self-induced, most of the abortions are frequently performed by providers lacking qualifications and skills to perform induced abortion and hence termed unsafe. Although unsafe abortions are preventable, they continue to pose undue risks to a woman's health and may endanger her life. [1]WHO defines unsafe abortion as a procedure for terminating an unintended pregnancy carried out either by persons lacking the necessary skills or in an environment that does not conform to minimal medical standards, or both. [2]

Safe abortion services protect women's right to health. Article 12 of the International Covenant on Economic, Social and Cultural Rights (1966) provides for the right to "the highest attainable standard of health." The Programme of Action adopted at the United Nations International Conference on Population and Development in Cairo in 1994, states that,

"Governments should deal with the health impact of unsafe abortion as a major public health concern". [3]

Despite the liberalization of abortion services since the enactment of the Medical Termination of Pregnancy Act, 1971 (act no. 34 of 1971) by Parliament in the Twenty-second Year of the Republic of India and introduction of safer abortion techniques, access to safe abortion services remains limited and abortion continues to be unsafe for the vast majority of Indian women seeking such services, particularly in rural areas. Every year an estimated 5.7 million abortions (ten times the legal ones) are conducted illegally in India. [4]Data on abortion are scarce and unreliable because of legal, ethical, and moral constraints.

Underreporting and misreporting are common because women may be reluctant to admit an induced abortion. This study has been conducted to know the recent trend on the unsafe abortion among women seeking abortion related services in a tertiary care hospital. This study is important for health planners concerned with maternal health, and family planning programme specialists as well as for the law enforcing agencies.

Aims and Objectives:

The present study was conducted on cases who reported to the tertiary care hospital seeking abortion services or for the complications due to unsafe abortions carried out elsewhere. This study aimed to explore the

Corresponding Author:

* Associate Professor, Dept. of Forensic Medicine
Rohilkhand Medical College & Hospital, Bareilly, UP
E-mail:premskhikha1115@rediffmail.com

** Assistant Professor

***Demonstrator (PG-II), Dept. of Biochemistry

****Prof & HOD, Dept. of Forensic Medicine

****Prof, Dept. of Pharmacology

DOR: 9.1.13 DOA: 11.7.13

trend adopted by women when they required abortion services. Information was collected with an objective to explore the data regarding the first contacted person by the women, abortion service providers (abortifacient advisor/provider/dispenser), the use of ultrasonography before coming to the tertiary care hospital, any history of domestic physical violence culminating into abortion, and whether the women undergoing/undergone abortion wished to keep confidential or disclose to the relatives regarding the abortion.

Material and Methods:

The study was conducted in department of Obstetrics and Gynaecology in collaboration with Department of Forensic Medicine at Rohilkhand Medical College and Hospital (RMCH), Bareilly, U.P. between October 2009 and September 2010, for a period of one year after approval from Institutional Ethical Committee. A total of 151 women

1. Who directly consulted to terminate pregnancy in RMCH with gestational age up to 20 weeks, and
2. Who have history of unsuccessful attempt to terminate the present pregnancy elsewhere and reported to RMCH for further management of complications, were recruited for the study after getting an informed consent.

However, one case that was advised curettage refused to give consent and dropped out. Thus the present study included only 150 cases. Detailed history of the current pregnancy or the recent abortion services sought outside the RMCH was collected with the help of a specifically structured questionnaire.

The questionnaire was administered to these women after admission to the hospital to gather information regarding the first contacted person by these women, person who rendered abortion services to the women (abortifacient advisor / provider / dispenser), ultrasonographic examination before consulting to the tertiary care hospital, any history of domestic physical violence culminating into abortion, and whether the women undergoing/undergone abortion wished to keep confidential or disclose to the relatives regarding the abortion.

The exclusion criterion was period of gestation more than 20 weeks confirmed by LMP, clinical examination and/or Ultrasonography; and those women who did not consent to be included in the study.

Observations and Results:

Present study showed that 52 cases (34.67%) contacted qualified doctors and equal

number of cases reported directly to Rohilkhand Medical College Hospital followed by 46 cases (30.66%) who had first contacted an unqualified person. Among the unqualified persons, major chunk was constituted by quacks (n = 35, 23.33%), followed by midwives (n = 6, 4%) and nurses (n = 5, 3.33%). (Table 1)

In our study we noted that 82 (54.67%) patients unsuccessfully attempted to terminate the present pregnancy by using various abortifacients (Mifepristone, Misoprostol, Abortion sticks) and 68 (45.33%) patients consulted to terminate pregnancy in our hospital. Abortifacients were prescribed / provided / dispensed by unqualified persons in 42 cases (28%) whereas the qualified doctors prescribed only in 40 cases (26.67%). Among unqualified persons, quacks ranked the highest (16%) followed by medical store person (6.67%) and nurses/midwives (5.33%). Self medication was not reported in any case in the study. It is worth mentioning here that abortion stick was used in only 2 cases (1.33%) in our study and that too by midwives in rural areas. (Table 2)

In our study in only 37 (24.67%) cases USG was done before reporting to the tertiary care hospital i.e. Rohilkhand Medical College Hospital (RMCH), out of which 31 (20.67%) cases were of first trimester (<12 weeks) and only 6 cases (4%) were of >12 weeks to 20 weeks of gestational age although no any case of sex selective abortion was noted. In majority (75.33%) of the women there was no history of ultrasonographic examination for present pregnancy or recent abortion. (Table 3)

In our study all 150 women were married and there was no history of any incidence of physical domestic violence culminating into abortion. (Table 4) All women were married and majority of the women (n = 117, 78%) wanted to disclose to her family members or relatives. Only 33 women (22%) wished to keep abortion confidential. (Table 5)

Discussion:

The majority of women (69.34%) seeking abortion had contacted qualified doctors including the doctors of RMCH while 30.66% women contacted unqualified persons. Among unqualified persons, major chunk was constituted by quacks (23.33%) followed by midwives and nurses (7.33%). This is in contrast to the study conducted by Barua&Apte [5] in Jharkhand where about one third clients accessed the services of certified private medical practitioners and 36.45% approached ANMs/dais (traditional birth attendants) and other unqualified public/private service providers

and 20.56% had accessed the services of uncertified private general practitioners for abortion services.

During last one decade, Bareilly has developed as a medical hub. Majority of the women seeking abortion services contacted doctors. Instead, before reporting to the RMCH, the high incidence of unqualified persons first contacted by women was noted because they are the local people rendering first hand health care services to the community in rural and also in urban areas though to lesser extent. They are readily available to the clients first hand for the medical aid. People have more trust in them.

Perhaps they are not aware of the legality and consequences of the MTP Act and there is no any strict law to forbid them doing the medical practice although the Hon'ble Allahabad High Court has passed an order for strict action against quacks. Quacks are doing their private practice and legal action against them is not effective. There is no law enacted by the state Government till date against the quackery.

Mostly registered abortion facilities are based in urban areas and government health care facilities provided in rural areas may not be sufficient to meet the demand of the local people as far as operational abortion facilities are concern. Also qualified private practitioners (doctors) are least interested in rendering their services in rural areas.

The use of medical abortion has been approved by The Drug Controller of India in April 2002. [6] Given the current situation in India, where abortion-related mortality and morbidity are high, medical abortion offers great potential for improving the access to abortion and safety, as it does not require extensive infrastructure and is non-invasive. Further, as the client does not need to be hospitalized, medical abortion offers women greater independence, control and privacy. However, the potential for misuse is a matter of concern. In fact, although abortion tablets are required to be sold by medical prescription and consumed under medical supervision, these pills are reportedly widely available over-the-counter and unsupervised consumption is rising. [7]

Out of the approximate 15 million abortion cases that take place in India, around 30 per cent women die and over 10 million risk their lives by going to quacks to terminate their pregnancy. [8]

We noted a higher incidence (28%) of abortion induction using abortifacients (Mifepristone, Misoprostol and abortion sticks) by unqualified persons whereas 26.67% abortions by qualified doctors before reporting to

RMCH. Among unqualified persons, quacks ranked the highest (16%) followed by medical store persons (6.67%) and nurses/midwives (5.33%). Self medication was not reported even in a single case in the study.

Rehan et al [9] noted a higher incidence i.e. nearly two thirds of the abortions induced by inadequately trained persons. Bhattacharya et al [10] also noted that 62% (n=83) abortionists were unqualified, out of which 26 were nurses and 57 were traditional. However, in their study only 28% (n=37) were doctors which is similar to ours. Agarwal and Salhan [11] observed even higher incidence (77.3%) of abortion induction by unqualified persons, out of which the abortion was induced either by a Dai (36%), an ANM (16%), a nurse (22.6%) or an unspecified person (2.7%); all of these were unqualified and incompetent to perform the procedure. Induction in 17 victims was reported to have been done by doctors though antecedents of all but five of them could not be ascertained.

These abortion service providers though unqualified probably were easily available and accessible to the clients and women had confidence and trust in them. This emphasizes the fact that provider and client interaction, easy availability, accessibility and economic constraints in addition to technical competence of the provider is an essential component of quality abortion care.

Although abortion services in India were liberalized more than FOUR decades ago, the vast majority of women continue to seek and receive abortion services from unqualified providers. As a result, many women die or suffer serious life-threatening complications. A host of factors notably lack of awareness of the legality of abortion services, limited access to safe services, poor quality of services and gender roles and norms lead women to seek services from untrained providers. Economic constraints may compel many poor women, and those dependent on their husband or family members to seek abortion services from unqualified providers.

Majority (three fourth) of the women seeking abortion did not have any history of ultrasonographic exposure. In only 24.67% cases, USG was done outside before reporting to our tertiary care hospital, out of which 20.67% cases were of first trimester (<12 weeks) and only a miniscule of 4% cases were of >12 weeks to 20 weeks of gestational age. No any case of sex selective abortion was noted in our study as only a miniscule of cases went to get USG done in second trimester when gender identification of the fetus may be possible.

This may be because with the recent amendment to the PNDT Act, preconception and pre-implantation procedures for sex selection have been banned in the country. The amendment stipulates compulsory maintenance of written records by diagnostics centres/doctors offering sonography service. Local authorities have also been given powers to ensure the enforcement of the Act.

Our observation was supported by Akbulut-Yuksel & Rosenblum's [12] existing research by showing, contrary to common belief, that the recent rapid spread of ultrasound in India did not cause a concomitant rise in sex-selection. In contrast to our findings, recent research by other workers attributed the rise in sex-selection in India to the introduction of ultrasound as a relatively cheap and safe way to determine the sex of a fetus. [13, 14] Research has also confirmed high levels of sex-selective abortions in India, causing an estimated half a million missing women in India per year. [14, 15]

On the one hand, ultrasound can be misused for sex-selective abortion, exacerbating the already skewed sex-ratio in India though rays of hope of recent improvement in ratio is seen in current census data may be due to public awareness and strict legal provisions. On the other hand, ultrasound technology has legitimate medical benefits that may lead to general improvements in child and maternal health. Ultrasonologists are the key persons who are able to identify the sex of the fetus and along with their statutory responsibilities; strong ethical and moral values probably have made them not to divulge the sex of the fetus at any cost.

In the present study we did not note any incidence of physical domestic violence resulting in abortion. A prospective study conducted by Nelson et al [16] among predominately low income, African-American pregnant women in the US did not find any association between intimate partner violence and pregnancy loss supporting our study. In contrast, study conducted in India by Jejeebhoy [17] has shown an association between physical and/or sexual intimate partner violence and induced abortion and pregnancy loss. Similarly in other studies, workers [18] found that women who were exposed to spousal violence were 50% more likely to experience at least one episode of pregnancy loss compared with women not exposed to abuse. Stöckl et al [19] in Tanzania also noted that intimate partner violence was likely to be an important influence on levels of induced abortion and pregnancy loss. They reported pregnancy loss by 22.79% of ever

partnered, ever pregnant women, and an induced abortion by 6.78%.

Although a number of workers in the field [17-19] have reported varying degrees of incidence of abortion due to physical violence, yet in our study in this part of the country, we have not found any direct evidence pertaining to physical violence culminating into abortion.

This fallacy can be explained because of tighter social control by head of the family, a dominant nature of the husband who is supposed to resort to more physical violence on reporting the incidence or else a timid nature of the housewife who is afraid of reporting the matter to the police because she is dependent on the husband or the family head. Though Indian law protects the women against the physical violence still it is commonly observed that the women folk of poor socio-economical conditions do not report the incidences of physical violence as they consider this as a normal routine feature.

Majority of the women (78%) wished not to keep the abortion confidential and only 22% of women wished to keep confidential.

In contrast, Barua and Apte [20] observed that only 59 women out of 107 (55.14%) preferred confidentiality/privacy. This was because in our study, all women were married. Some women who wished to terminate a pregnancy may face opposition from the family.

Conclusions:

In spite of Bareilly being a medical hub, incidence of unsafe abortion cases are still prevalent and women are perhaps least aware of their health rights and abortion related services available to them specially those dwelling in rural areas. Uncertified/unqualified abortion service providers who are rendering abortion related services fearlessly thereby increasing morbidity and financial burden over the women and so on the society rather than providing cheaper services, should not be allowed to infiltrate into the medical practice and strict action against them is desired.

Medical store persons also should not be allowed to dispense the abortifacients without certified medical practitioner's prescription. Certified and approved MTP centers should also come in rural areas for rendering abortion related services to the women to protect their health rights and also to provide antenatal and postnatal services in future. Without skilled abortion service providers, adequate facilities and easy access; the promise of safe, legal abortion will remain unfulfilled.

References:

1. World Health Organization. Unsafe abortion. Global and Regional Estimates of the Incidence of Unsafe Abortion and Associated Mortality in 2008. 6th ed. Geneva: World Health Organization; 2011. p.2.
2. http://www.who.int/reproductivehealth/publications/unsafe_abortion/9789241501118/en/index.html
3. World Health Organization. *The prevention and management of unsafe abortion*. Report of a Technical Working Group. Geneva, World Health Organization, 1992 (WHO/MSM/92.5).
4. Programme of Action of the International Conference on Population and Development, Cairo, Egypt, 1994, § 8.25, UN Doc. A/CONF.171/13/Rev.1, 1995. www.iisd.ca/Cairo/program/p00000.html
5. **Ross J., Stover J., Adelaja D.** Profiles for family planning and reproductive health programs, 2nd Edn. Washington DC. The Futures Group International, 2005.
6. **Barua A, Apte H.** Quality of Abortion Care: Perspectives of Clients and Providers in Jharkhand. *Economic & Political Weekly*. Vol. 42; No. 48 (Dec. 1 - 7, 2007): pp. 71-80.
7. **Coyaji, K.** Medical Abortion. Paper presented at the Population Council Workshop on 'Abortion in India: How Can Research Help Us Move Forward?' Goa, 2002
8. **Sutirtho Partranobis.** Abortion gets a medical edge. *Hindustan Times*, 13 March 2003.
9. "10 million women seeking abortion go to quacks. *Deccan Herald*", Bangalore. Sunday, January 18, 2004.
10. **Rehan N, Inayatullah A, Chaudhary J.** Characteristics of Pakistani women seeking abortion and a profile of abortion clinics. *J Womens Health Gend Based Med* 2001 Oct; 10(8):805-10. URL: <http://www.ncbi.nlm.nih.gov/pubmed/11703893>.
11. **Bhattacharya S, Mukherjee G, Mistri P, Pati S.** Safe abortion: Still a neglected scenario: A study of septic abortions in a tertiary hospital of Rural India. *Online J Health Allied Scs*. 2010, 9(2):7. URL: <http://www.ojhas.org/issue34/2010-2-7.htm>
12. **Agarwal S, Salhan S.** Septic abortion - current scenario in a tertiary care hospital. *J ObstetGynecol India*. Vol. 58: No. 2(March/April 2008): 147-151.
13. **Akbulut-Yuksel M, Rosenblum D.** The Indian Ultrasound Paradox. IZA Discussion Paper No. 6273 January 2012. Downloaded from <http://ftp.iza.org/dp6273.pdf> accessed on 13/04/2012).
14. **Arnold, Fred and S Parasuraman, S Kishor, TK Roy.** "Sex-Selective Abortions in India," *Population and Development Review*. 2002; 28 (4): 759-785.
15. **Bhalotra Sonia, Tom Cochrane.** "Where Have All the Young Girls Gone? Identification of Sex Selection in India," IZA Discussion Paper. 2010, 5381.
16. **Jha P, Kesler M, Kumar R, Ram U, Aleksandowicz L, Bassani, Chandra S, and Banthia J.** "Trends in selective abortions in India: Analysis of nationally representative birth histories from 1990 to 2005 and census data from 1991 to 2011". *Lancet* 2011, 377 (9781):1921-28.
17. **Nelson DB, Grisso JA, Joffe MM, Brensinger C, Ness RB, McMahon K et al.** Violence does not influence early pregnancy loss. *FertilSteril* 2003; 80(5):1205-11.

18. **Jejeebhoy SJ.** Associations between wife-beating and fetal and infant death: impressions from a survey in rural India. *Stud Fam Plan* 1998; 29(3):300-308.
19. **Alio AP, Nana PN, Saihu HM.** Spousal violence and potentially preventable single and recurrent spontaneous fetal loss in an African setting: Cross-sectional study. *Lancet* 2009; 373(9660):318-24.
20. **Stöckl H, Filippi V, Watts C and Mbwapo JKK.** Induced abortion, pregnancy loss and intimate partner violence in Tanzania: a population based study. *BMC Pregnancy and Childbirth* 2012, 12:12. <http://www.biomedcentral.com/1471-2393/12/12> accessed on 21/06/2012).

Table 1: First Contact Person

S.N.	First contact person	Number (%)
1.	Qualified Doctors	52 (34.67%)
2.	Unqualified Persons	46 (30.66%)
	Quack	35 (23.33%)
	Midwife	06 (04.00%)
	Nurse	05 (03.33%)
3.	Reported directly to RMCH	52 (34.67%)
Total		150 (100%)

Table 2: Abortion Service Providers (Before coming to RMCH)

S.N.	Abortion service provider	Number (%)
1.	Qualified doctors	40 (26.67%)
2.	Unqualified persons	42 (28.00%)
	Quack	24 (16.00%)
	Medical Store person	10 (06.67%)
	Nurse/Midwife	08 (05.33%)
	Self	00 (00.00%)
3.	Doctors in RMCH	68 (45.33%)
Total		150 (100%)

Table 3: USG done (before coming to RMCH)

USG done before coming to RMCH	Number (%)	
Yes	037 (24.67%)	
	First Trimester	031 (20.67%)
	Second Trimester (up to 20 weeks)	006 (4%)
No	113 (75.33%)	
Total	150 (100%)	

Table 4: Domestic Violence culminating into Abortion

Domestic Violence culminating into Abortion	Number (%)
No	150 (100%)
Yes	000 (000%)
Total	150 (100%)

Table 5: Whether Women Wished to Keep Confidential/Disclose to Her Relatives

	Number (%)
Disclosure to relatives	117 (78.00%)
Keep Confidential	033 (22.00%)
Total	150 (100%)

Original Research Paper

Correlation of Superior Extremity Length with Stature In Central Indian Populace

*M. R. Shende, **P Bokariya, **R Kothari, ***BH Tirpude

Abstract

Estimation of stature is a major Forensic anthropological concern used in the identification of unknown and mutilated human remains. Attempts of estimating stature from long bones have been made in western countries since last century. This study was carried out to evaluate the relationship between personal stature and superior extremity among a group of male and female Central Indian adults and to derive a regression formula between the superior extremity and height of an individual. The subjects consist of 391 medical students from various colleges in Vidarbha region of Maharashtra ranging between 18 to 22 years of age of similar socio economic status. They were examined anthropometrically in respect to their height and length of upper limb. The result obtained was analyzed and the differences of the superior extremity between the genders were found to be highly significant. A positive correlation between height and superior extremity was observed in both sexes and it was statistically significant. Regression equation for stature estimation was formulated using the superior extremity for both sexes. The results indicate that superior extremity provides an accurate and reliable means in estimating the stature of an unknown individual.

Key Words: Anthropometry, Superior Extremity, Stature, Identity of Individual

Introduction:

One of the factors in establishing the identity of a person is his stature and since last decade of nineteenth century the anthropometric work related to correlation between the height of an individual and different parts of body is going on and each worker has derived his own formula for calculating the stature from length of long bones. The need to develop method to construct height from various measurements has been stressed by many workers due to its application in Forensic Medicine, in medico-legal enquiries and also in identifying war casualties.

Many factors like racial, ethnic and nutritional factors play an important role in human development and growth and therefore different formulae become necessary for different populations.

Also there is no universally applicable formula, as the relationship between height and long bones differs according to race, age sex and size of body. In India a significant correlation between height and length of clavicle was derived in a previous study. [1]

Some have worked on correlation of height with length of humerus. [2] The reconstruction of stature among two tribal groups of West Bengal viz Lodhas and Mundas has been reported by some workers. [3, 4]

They used percutaneous lengths of radius and ulna and tibia and measured both sexes of the two groups to construct multiplication factors for the prediction of stature. Estimation of stature of an individual in Maharashtra by using the formulae given by western workers involves an error of 5-8% so a ready reckoner for determining stature from limb measurements of Maharashtrian males was prepared. [5] The height from length of forearm bones of 100 Maharashtrian male adults of age between 25-30 years was estimated but no such data for females was reported.

Aims and Objectives:

People from different regions of India bear different morphological features depending on their geographical distribution and primary racial characters so a single formula cannot suit all parts of the country. Keeping in mind this fact, the present study was undertaken with an aim:

Corresponding Author:

*Professor & Head
Department of Anatomy
Mahatma Gandhi Institute of Medical Sciences,
Sevagram
E-mail: shende_dr@yahoo.com
** Assist. Prof, Dept. of Anatomy
**Assist. Prof, Department of Physiology
***Prof & Head, Dept. of FMT
DOR: 8.1.13 DOA: 15.8.13

- To evaluate the relationship between personal stature and superior extremity among a group of male and female Central Indian adults and
- To derive a regression formula between the superior extremity and height of an individual.
- To evaluate the sexual differences in the correlation.

The equations of regression were derived using the data obtained.

Material and Methods:

The subjects consist of 391(165 males and 226 females) medical students from various Colleges of Vidarbha region of Maharashtra ranging between 18 to 22 years of age of similar socio economic status, having no disease or skeletal deformity. The length of superior extremity and the height of the subject were measured with using standard anthropometric instruments in anatomical position. Measurements were taken at fixed time (2 to 5 pm) to avoid diurnal variation and were carried out by a single person to eliminate the personal factor. A written informed consent was taken by subjects.

- **Superior Extremity:** For measuring the length of superior extremity, the distance from the 'acromion point' to the tip of the middle finger is recorded in Cms (Fig. 1). With the help of metal tape the student is asked to stand with his/her upper limbs by the side and then the measurement was taken (keeping head in Frankfort horizontal plane).
- **Height of Individual:** It is measured by the wooden height measuring instruments marked in centimeters. The subject was asked to stand barefooted in Anatomical erect position. The sliding head plate is brought into firm contact with the vertex of the subject. (Fig. 2) [6]

Results:

The measurements were taken with the help of measuring instruments. The statistical analysis was performed using Microsoft Excel software. The data for personal height and superior extremity for both the sexes are shown in Table 1. The correlation coefficient for superior extremity was evaluated as for males and for females. Using this correlation coefficient regression equation for calculating height from superior extremity has been derived. (Table 2)

On basis of regression equation the estimated height was calculated and then root mean square deviation was calculated by observed value and estimated height.

The root mean square deviation was obtained as for males, for females and also for both males and females taken together.

Discussion:

With the increasing frequency of mass disasters, identification of an isolated upper extremity and determination of the stature of the person it belonged to have created problems for investigation of the identity of some victims. Despite a need for such a study, there is a lack of systematic studies to identify fragmented and dismembered human remains. The purpose of this study was to analyze anthropometric relationships between dimensions of the upper extremity and body height.

Climate, heredity, nutritional status of population is reported to have an effect on stature and length of long bones. In India multiplication factors were derived for calculation of stature way back by Pan [7] for Hindus of Bengal, Bihar and Orissa, Nath [3] for UP populace, Siddiqui and Shah [8] and Singh and Sohal [9] for Punjabis. Kolte and Bansal [10] formulated regression formulae predicting stature from long bones of upper extremity on a sample drawn from Mysore and Maharashtra.

Later Shroff and Vare [11] derived the height from length of superior extremity and its segments. In the present study we have observed the correlation of height (in anatomical position) with superior extremity amongst medical students of central India. The correlation coefficient obtained in the present study was + 0.416 for males and + 0.367 for females.

The correlation coefficient for both male and female (combined) was + 0.540. Correlation coefficient between stature and superior extremity was found to be statistically significant and positive indicating a strong relationship between the two parameters.

Regression equation for stature estimation was formulated using superior extremity and checked for their accuracy by comparing the estimated stature and the actual stature. The results indicate that superior extremity provides an accurate and reliable means in reconstructing the stature of an unknown individual. Thus significant and positive correlation has been shown to exist between stature and measurements of superior extremity.

Taken together the evidence suggests that the relationship between superior extremity and stature is of practical use in medico-legal, anthropology and archeological studies when such evidence provides the investigator the only opportunity to gauge that aspect of an individual's physical description.

Conclusion:

The results of this study suggest that the estimation of a living height could be made possible by using various dimensions of the upper extremity. The superior extremity provides an accurate and reliable means in estimating the stature of an unknown individual.

The regression formula derived in this study will be useful for Anatomists, Archeologists, Anthropologists and Medicolegists or Forensic Scientists. One must consider differences between populations to apply such functions to other populations.

References:

1. Singh I, Singh S. Estimation of stature from clavicle. Ind J Med Res 1956; 44: 137-155.
2. Broca P, Hamy. Correlation of height with length of humerus. Bull Soc Anthro Paris 1862.
3. Nath BS. Estimation of stature from long bones in Indians of united provinces. Ind J Med Res 1931; 18: 1245-1253
4. Nath et al. Reconstruction of stature on the basis of percutaneous length of forearm bones among Mundas of Midnapore district of West Bengal. Human Science 1988; 37: 170-175
5. Athawale MC. The estimation of height from the length of forearm bones. A study on 100 Maharashtra male adults of age between 25-30 years. Am J Phys Anthropology 1963; 21:105-112
6. Singh IP, Bhasin MK. A manual of Biological Anthropology. 1st ed. Kamla Raj Enterprises.1970
7. Pan S. Length of long bones and their proportion to body height in Hindus. J Anat 1924; 58 : 374-378
8. Siddiqui MAH, Shah MA. Estimation of stature from long bones of Punjabis. Ind J Med Res 1944; 32: 105-108
9. Singh B and Sohal HS. Estimation of stature from clavicle in Punjabis; A preliminary report. Ind J Med Research 1951; 40:67-71
10. Kolte PM, Bansal PC. Determination of regression formulae for reconstruction of stature from the long bones of Upper limb in Maharashtra of Marathwada region. J Anat Soc India 1974; 23: 6-11.
11. Shroff AG, Vare AM. Estimation of height from length of superior extremity and its segments. J Anat Soc India 1979;28:53

Table 1: Range, Mean and SD of Height and Head Length for Males and Females

Parameter	Sex	Range (cm)	Mean	SD
Height of Subject (cm)	Male	153.4 – 189.2	170.12	6.99
	Female	140.8 – 174.0	156.15	11.10
Superior extremity (cm)	Male	69.0 – 89.0	79.11	3.98
	Female	64.0 – 84.0	72.92	3.96

Table 2: Regression Equation for Superior Extremity of Males, Females and Combine (Both Male & Female)

Sex	Subjects	Regression Equation
Male	165	$y = 0.478x + 12.474$
Female	226	$y = 1.027x + 81.257$
Combined	391	$y = 1.112x + 78.229$

y is height of an individual & x is superior extremity

Fig. 1: Measurement of Superior Extremity



Fig. 2: Measurement of Total Height of an Individual



Original Research Paper

A Study of Palatal Rugae Pattern among North and South Indian Population of Davanagere City

*Shubha C., **Sujatha G.P., **Ashok L., ***Santhosh C.S

Abstract

Forensic Odontology has played a key role in identification of persons in mass disasters, in crime investigations, in ethnic studies, in identification of decomposed and disfigured bodies, fire victims and victims of motor vehicle accidents. Palatoscopy is an important specialty, which has been the area of interest for many Forensic Dentists. The palatal rugae act as an ideal for identification as it present in all victims and resistant to change (aging, trauma and so forth). This study conducted on the under graduate students of two geographically different regions of India studying in Davanagere. The sample size of 150 students randomly selected from each study population in the age group of 17-23 years who were healthy. An Alginate impression prepared. The outline of the rugae traced on casts by a sharp graphite pencil. The rugae patterns were assessed. The data collected was statically analyzed. The analysis of Chi-square test and P-value with respect to shape, direction, sex wise distribution of the rugae showed significant in our study. Thus the palatal rugae pattern of an individual may be considered as a viable alternative for identification purpose.

Key Words: Forensic Odontology, Palatoscopy, Rugae, Raphae, Human identification

Introduction:

Palatoscopy refers to the study of palatal rugae in order to establish a person's individual identity. [1] Palatal rugae refer to the ridges on the anterior part of the palatal mucosa on each side of the medial palatal raphae and behind the incisive papilla. [2]

Anatomically, the rugae consist of around 37 ridge and oblique ridges that radiate out tangentially from the incisive papillae. Histologically, the rugae are stratified squamous; mainly para keratinized epithelium on a connective tissue base, similar to the adjacent tissue of the palate. [3] Embryologically, differences in the rugae cores from human embryo of over 20 weeks are observed. [4]

Rugae patterns have been studied for various purposes.

The published reports are being mainly in the field of Anthropology, Comparative Anatomy, Genetics, Forensic Odontology, Prosthodontics and Orthodontics. The human palatal rugae are protected from trauma by their internal position in the head and are insulated from heat by the tongue and buccal pad of fat. Furthermore the palatal rugae are resistant to chemical aggression, thermal effects and decomposition changes.

The palatoscopy is used as a necro identification technique as it can resist decomposition for up to 7 days. [5] With this background the study of palatal prints will be undertaken to study their pattern, uniqueness among the North and South Indian population residing in Davanagere city and will be subjected to suitable statistical analysis.

Aims and Objectives:

- To study the difference in the palatal rugae pattern among the North and the South Indian Population.
- To study the uniqueness of the palatal rugae among the individuals of the 2 study population.
- To study the palatal rugae pattern like length, shape, direction and unification among the study population.
- To compare the palatal rugae pattern among the males and females and its usefulness in sex determination.

Coressponding Author:

* Senior lecturer

Dept. of Oral Medicine and Diagnostic Radiology,
Bapuji Dental College and Hospital,
Davangere-577004, Karnataka, India
E-mail: dr_shubha_c@yahoo.com

**Prof

**Prof and Head

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

JJM Medical College and Hospital
Davangere-577004, Karnataka, India
DOR: 15.1.13 DOA: 11.8.13

Materials and Methods:

This study is a cross-sectional study conducted from 2008 to 2011 at the department of Oral Medicine and Radiology, Bapuji Dental College and Hospital, Davanagere. Ethical clearance was obtained from the institutional ethical committee. Study included a total of 300 palatal casts of undergraduate students studying at Bapuji Dental College and Hospital, Davanagere and J.J.M. Medical College, Davanagere.

The sample sizes of 150 students randomly selected from each study population in the age group of 17-23 years belonging to two geographically different regions of India were included in the study. One study population which is referred to as North Indians comprised of students from the states of Punjab, Haryana, Gujarat, Rajasthan, Delhi, Uttar Pradesh, West Bengal, Assam and Bihar. The other study population, which is referred to as South Indians comprised of the students from Karnataka, Andhra Pradesh, Tamilnadu, and Kerala.

Inclusion Criteria:

The undergraduate students who are healthy and free of congenital abnormalities, inflammation, trauma related to palate, were included in our study.

Exclusion Criteria:

All those students who are undergoing orthodontic treatment, inflammation and trauma to the palate were excluded in our study.

Examination of the patient was carried out according to the methods described in Kerr, Ash, and Millard. [6] Maxillary impression trays were selected according to the shape and size of the patient's arches. Two levels of alginate impression material were taken in the scoop and mixed with 40 ml of water (using a measuring jar provided by the manufacturer), in a water/powder (W/P) ratio of 40 ml: 15 g, in a flexible rubber bowl with a mixing spatula. [7]

A vigorous figure-eight motion was used for mixing. The mix was immediately transferred to the impression tray for insertion into the patient's mouth. The tray was held passively and motionless during the setting of impression material. After about 2 minutes (setting time of Alginate), the tray was separated quickly from the teeth to avoid rocking and possible deformation of the fine areas of the impression.

Excess material at the periphery was trimmed. [8] Dental stone was mixed and poured on alginate impression tray.

The cast was separated from the impression after 60 minutes. [9] Base for the study casts was made using the base former

and dental stone. Each cast was numbered for easy identification.

All the measurements were taken by a two observer. The rugae were highlighted by a sharp graphite pencil on the cast and a magnification lens was used for identification. Measurement was done using a plastic ruler (Kenson) in millimeters. The method of rugae identification was based on the classification of Thomas et al. This classification includes number, length, shape and unification of rugae.

The shapes are classified into curved, wavy, straight and circular. Fragmented rugae are those which have length less than 5 mm. Unification is divided into converge where two rugae originate away from the centre and unite towards it. [10] While diverge ones are those rugae which originate from the centre and diverge away from it.

The data thus obtained was recorded in a printed proforma. A written informed consent was obtained from the students participating in the study and photographs were also taken. Two-sample t-test and Chi-Square tests were used for comparison of means and relationship between the attributes. A significance level of 5% was considered as critical value.

Results:

The study of Palatal rugae pattern among the North Indian and South Indian population included 150 students in each of the study population.

There were 86 males and 64 females in the North Indian population and 58 males and 92 females in the South Indian population. The total number of rugae in North Indians was 1596 and among the South Indians was 1587 which is equal in both the population. A comparison of total number of rugae in North Vs South Indians with respect to t-value and P-level was 0.29 and 0.78 respectively which was not significant.

The number of rugae on right side was 797 (49.9%) in North Indians and 794 (50%) in South Indians. The number of rugae on left side was 799 (50%) in North Indian and 793 (49.9%) in South Indians. No difference was found in the number of rugae on either side of the palate in both the study population.

In our study there were 923(57.8%) rugae in North Indian males and 627(39.5%) rugae in South Indian males as compared to 673(42.2%) rugae in North Indian females and 960(60.5%) rugae in South Indians. The t-value and p-Value between male Vs female North Indians were 0.43 and 0.67 respectively, and 1.15 and 0.25 for male Vs female South Indians which is not significant.

Our study showed that the percentage of curve rugae was more in North Indians as compared to South Indians and wavy shape was significantly more in South Indians as compared to North Indian population. The circular shape was more common in South Indians. The t-value and P-level were 2.17 and < 0.01 in wavy shape when compared with North Indian Vs South Indian population which is a significant result.

Some of the rugae which did not fall under the shapes mentioned and which were either divergent or convergent and could not be classified were not included.

Out of 1585 rugae in North Indians there were 1536 primary rugae, 48 secondary rugae and one is fragmentary rugae. In south Indians out of 1586 rugae there were 1542 primary rugae, 44 secondary rugae and no fragmentary rugae. The t-value and P-value were 0.19 and 0.85 for primary rugae in North Indian Vs south Indians and 1.16 and 0.25 for secondary rugae in North Indians Vs South Indians.

The results for Direction of rugae in North and South Indian population showed that backwardly directed rugae were more among North Indians as compared to South Indians with a P-value of 0.01 which is significant.

The forwardly directed rugae were more, in the South Indian Population as compared to the North Indian Population with a P-value of 0.01 which is significant. The t-Value and P-value were not significant for Unification of the rugae among North and South Indian Population

Discussion:

In our study the total number of rugae in North Indians and South Indians was equal. No difference in the number of rugae was seen in both the study population. Similar results were found in the study conducted by Vishlesh Arora [11] for Karnataka and Manipur population and study conducted by Shwetha K Shetty, [12] for both the Mysorean and Tibetan population.

This study showed that North Indian Males had more number of rugae and South Indian females had more number of rugae than their counterparts. Similar results were found in the study conducted by Falsal M Fahmi. [13]

Present study showed that the percentage of curve rugae was more in North Indians as compared to South Indians and wavy shape was significantly more in South Indians as compared to North Indian population.

The circular shape was more common in South Indians. Similar results were found in the study conducted by Shwetha K Shetty, [12] where curve shape was more common in

Mysorean population and wavy shape in Tibetan population. There was no difference in the occurrence of primary and secondary rugae in both the study population in our study. [12]

The analysis of Chi-square test and P-value with respect to shape of the rugae between North and South Indians showed the values 13.37 and <0.01 respectively, which is a significant in our study. Similar results were observed in the study by Vishlesh Arora. [11] Our study was similar to the study by Preethi Nayak, [14] showed significant differences in the straight and curved forms of rugae.

Conclusion:

One of the main focuses of the Forensic Odontologist is human identification. Dental identification is based on the comparison of ante mortem and postmortem records.

Palatoscopy is a technique that is of great interest in human identification. The palatal rugae are unique to an individual as no two rugae are similar, even between twins though the patterns are similar but not identical and are equated to fingerprints. Thus the palatal rugae pattern of an individual may be considered as a viable alternative for identification purpose.

Further there is scope for a larger sample size of the various population of Eastern, Western, Northern and South Indian population may studied in detail.

References:

1. English WR, Ribison SF, Summit JB, Oesterle LJ, Brannon RB, Morlang WM. Individuality of Human Palatal Rugae. *Journal of Forensic sciences* May 1988; 33(3): 718-726.
2. Snell RS. *Clinical Anatomy by Regions*. 8th ed. Philadelphia: Lippincott Williams & Wilkins; 2008.
3. Gray H. *Grays Anatomy*. 40th ed. Spain: Churchill Livingstone ; 2008
4. Datta AK. *Essentials of Human Embryology*. 4th ed. Calcutta: Current Books International; 2007.
5. Segelinck SL, Goldstein L. *Forensic Application of Palatal Rugae in Dental identification*. The Forensic Examiner Spring 2005; 44-47.
6. Kerr DA, Ash MM, Millard HD. *Oral Diagnosis*. 6th ed. USA: C. V. Mosby Company; 1983. 82 – 150.
7. Shen C. *Impression materials* In: Anusavice KJ, editor. *Philips Science of Dental Materials*. 11th Edition. St Louis, Saunders, 2003, 241-243.
8. Tueller VM. *Impression Material and Technique*. In: Rhoades JE, Rudd KD, Morrow RM, editors. *Dental Laboratory Procedures: Fixed Partial Dentures (Volume 2)*. 2nd Edition. St Louis, Mosby, 1983. 11-12.
9. Lefler BB, Reddy TG. *Working casts and dies*. In: Rhoades JE, Rudd KD, Morrow RM, editors. *Dental Laboratory Procedures: Fixed Partial Dentures (Volume 2)*. 2nd edition. St Louis, Mosby, 1983. 33-34.
10. Thomas CJ, Kotze TJVW. The palatal rugae pattern: a new classification. *Journal of Dental association South Africa* 1983; 38: 153-157.
11. Arora V, Bagawadi A, Keluskar V, Shetti A. Comparison of Palatal rugae pattern in two populations of India. *International Journal of Medical Toxicology & Legal Medicine* Jan-June 2008; 10(2): 59-62.

12. **Shetty SK, Kalia S, Patil K, Mahima VG.** Palatal rugae pattern in Mysorean and Tibetan Populations. Indian Journal of Dental Research 2005; 16(2): 51-55.
13. **Fahmi FM, Al-shamrani SM, Talic YF.** Rugae pattern in a Saudi Population sample of males and females. Saudi Dental Journal May-Aug 2001; 13(2): 92-95.
14. **Nayak P, Acharya AB, Padmini AT, Kaveri H.** Difference in the Palatal rugae shape in two populations of India. Archives of Oral Biology 2007; 52: 977-982.

Fig. 1: Palatal Rugae Pattern before Marking on Cast



Fig. 2: Palatal Rugae Pattern after Marking on Cast



Table 1
Chi-square and P-value analysis of Shape, Length, Direction, Unification, and Sex wise Distribution of Rugae Pattern in North and South Indian Population

Parameters		North Indian		South Indian		North Indian v/s South Indian	
		Number	%	Number	%	Chi-Square value	P-value
	Total	1596	-	1587	-		
Shape	Straight	478	29.9	455	28.7	13.37	<0.01 S
	Wavy	331	20.7	389	24.5		
	Curved	634	39.7	565	35.6		
	Circular	19	1.2	32	2.0		
Length	Primary	1536	96.2	1542	97.2	0.18	0.66 NS
	Secondary	48	3.0	44	2.8		
	Fragmentary	1	0.1	-	-		
Direction	Forwardly directed	547	34.3	640	40.3	19.10	<0.001HS
	Backwardly directed	813	50.9	689	43.4		
	Perpendicular	166	10.4	137	8.6		
Unification	Diverging	105	6.6	124	7.8	1.39	0.24 NS
	Converging	27	1.7	22	1.4		
Gender	Male	923	57.8	627	39.5	106.92	<0.001HS
	Female	673	42.2	960	60.5		

(S-Significant, NS-Nothing significant, HS-Highly significant)

Original Research Paper

Regression Equation for Estimation of Femur Length in Central Indians from Inter-trochanteric Crest

*Sandeep Singh, **Shema K Nair, **Vaibhav Anjankar, ***Vishal Bankwar, ****D.K. Satpathy, *****Yogender Malik

Abstract

It is well documented that the intact femur has the highest correlation with stature and as such has been widely used in the derivation of regression equations for stature estimation. As intact femur is not always present for analysis in Forensic cases, it has become necessary to derive regression equations for the estimation of stature from fragments of this bone. The aim of this study is to derive regression equation for estimation of stature in Central Indian population by measuring inter-trochanteric crest length. A sample of 200 femurs taken from bone bank of anatomy and forensic departments were measured for femur length and inter-trochanteric crest length and regression equation was derived. The mean value of femoral length and the inter-trochanteric crest length were 43.75 cm and 6.31 cm respectively. The Pearson's correlation coefficient was found to be 0.58 which was statistically significant ($p < 0.05$). It is therefore suggested that in the absence of intact femur, regression equation derived from its present study can provide a reliable estimation of adult stature.

Key Words: Forensic Anthropology, Stature, Femur Length, Regression Equation

Introduction:

The identity of the dead is an essential part of postmortem examination, for various reasons. These include the ethical and humanitarian need to know which individual has died, especially for the information to surviving relatives. Identification is essential to establish the fact of death in respect of that individual for official, legal, statistical purposes and to discharge legal claims and obligations in relation to property, estate debts pensions and financial matters. Forensic Anthropology as a discipline of Forensic Medicine deals with assessment of remains of human skeleton.

Methods of stature estimation from long bones have been given due importance by both physical anthropologists and forensic pathologists. Identification of an individual by stature estimation has profound significance in civil and criminal cases from the medico-legal view of point.

Data obtained from stature estimation from long bones provide evidences to inculcate the indicative features of a population for an archaeological research work.

Stature is usually estimated by employing either anatomical or mathematical methods. Anatomical method, more commonly referred to as the "Fully method", reconstructs stature by summing the measurements of the skeletal elements cranial height, vertebral height, femoral length, tibial length, and the articulated height of calcaneus and talus that contribute to height and adding a correction factor for soft tissue. The other known method is mathematical method which makes use of one or more bone lengths to estimate the stature. Total skeletal height is estimated by use of bone length, stature table and regression formula. [1]

Karl Pearson developed first stature regression formula [2] and there after Trotter and Gleser 1952, 58 and 70 produced a series of regression equations based on measured cadaveric height and long bone length from Terry collection. [3-5] Anthropologists have investigated multiple bones of the body for potential use in stature estimation: long bones [6], cranial height [7], scapula, clavicle and ox coxa [8], vertebra. [9] Regression formulae derived from major long bones are generally considered to be more accurate than those utilizing other bones of hand and foot.

Corresponding Author:

* Assistant Professor, Dept. of Forensic Medicine, L.N. Medical College, Kolar Road, Bhopal-462042
E-mail: drsandeesingh07@gmail.com

**Assist. Prof, Dept .of Anatomy,

*** Assist. Prof, Dept. of Community Medicine,

**** Prof, Dept. of Forensic Medicine,

****Assist. Prof, Dept. of Forensic Medicine, BPS Govt. Medical College, Sonapat, Haryana

DOR: 8.2.13 DOA: 1.7.13

Gleser demonstrated that the weight-bearing bones of the lower limbs have the highest correlation with stature and advised against the use of upper limb bones unless lower limb bones are not available. [4]

Fragments of long bones (because of injuries, mutilation, destruction, post mortem gnawing by wild animals) are often presented as only available identity and subsequently stature estimation from the fragments available by the use of regression equation becomes necessary.

Steele and McKern [10] have examined the possibility of estimating stature from just section of long bones. Similar studies were done in different races by Steele in American population, Bidmos in South African population. [10, 11] Researchers have clearly indicated that population specific formula produced more accurate results. The present study is aimed at assessing the femur length and hence the statures by measuring inter-trochanteric crest to create regression equation for Central Indian population.

Material and Method:

Completely ossified and dried adult human femurs of both sexes were taken for morphometric measurements from the collection of the bone bank of Anatomy department and Forensic department of L.N Medical College, Bhopal, Madhya Pradesh, India. However, after a visual examination bones in poor conditions, due to injury, deformity or partly damaged were not considered. After exclusion 200 bones were selected for measurement.

Measurements were taken using anthropometric set consisting of Osteometric board and digital Vernier caliper. The maximum length of femur was measured by using Osteometric board with a precision of 0.1 cm Salles et al [12], where the femur was kept on a clean graph sheet with well marked calibration with one end fixed. Inter-trochanteric crest at upper level of femur was measured by using sliding digital caliper with precision of 0.01cm.

A single author performed all measurements for consistency. Each measurement was repeated three times and the mean value was recorded. Measurement error was assessed for every anatomical parameter according to the method described by White and Folkens for osteometric studies. [13] All measurements were rounded to two decimal places and were obtained in centimeters (cm).

- **Maximum length of femur:** Distance from the most superior point on the head of femur to the most inferior point on the distal condyles.

- **Inter-trochanteric Crest:** It marks the junction of posterior surface of neck with shaft of femur. It is a smooth roughened ridge which begins above at the postero-superior angle of greater trochanter and ends at lesser trochanter.

The measurements obtained were analyzed using SPSS Statistical software for windows version 13. Metric data were reported as mean standard deviation, median and 95% confidence interval. P value of <0.05 was taken as significant. Pearson's correlation coefficient was used to examine the association between maximum femoral length to inter trochanteric crest.

Observation and Results:

The mean value of femoral length and the inter-trochanteric crest were 43.75 cm and 6.31 cm respectively. (Table 1) The correlation was made between the inter-trochanteric crest and the maximum femoral length. (Table 2) Regression equation with the inter-trochanteric crest as the independent variable and the maximum length of femur as dependant variable was obtained using the total sample (N=200). The Pearson's correlation coefficient was 0.58.

The following Regression equation was obtained:

$y = 27.85 + 2.51x$, where — x is the inter-trochanteric crest (in cm.) and — y is the maximum femoral length (in cm).

The standard error of estimate was 2.283. The value of R squared was 0.336. (Fig. 1) From the equation the values were obtained for 50 randomly selected bones. These were compared with the observed length of those (n=50) and test of significance was done. It was seen that the results were consistent and accurate. The difference between mean of estimated and observed values of the total length was by chance (p value >0.05) indicating the validity of the regression equation.

Discussion:

Living stature estimation from the lengths of the limb bones is one of the oldest problems in history. The measurement of length of long bones from the available fragments plays a vital role in estimation of stature of an individual. Height of individuals is vital to medico legal investigations, as projection of the stature from bones, plays an important role in the identification of missing persons.

Pearson has pioneered stature estimation early in 19th and 20th century. In the last quarter of the last century researchers had done such studies on large populations.

Deviation and eventual use of generalized equation is a task accomplished by Steele. [10]

Individually and collectively, the femur and the tibia are the most important components of height. Therefore, the best assessment of height is obtained from regression formulae derived from femoral and tibial lengths.

As compared to Fully's method regression analysis is a more appropriate method to define relationship between length of long bones and living height of individuals and between length of measurements of long bone fragments and their maximum length.

However the statistical formula used in this method is appropriate when used only in specific population whence it was derived. Individual height is influenced by ethnicity, so it is recommended that regression formulae obtained in certain population should not be applied in another. Regression formula obtained in a specific population can underestimate or over estimate stature if applied in another population. It is recommended that regression formulae obtained from other population specific studies should be used for such purpose.

Such studies on different population have been done by Turkish Celbis & Agrimis [14], German Mall, Hubig, Buttner et al. [15] Kate and Mazumdar also successfully estimated stature from length of femur and humerus by regression method in Indian sample. [16] The present study is also a population specific study and the regression equation derived is specific for Central Indian population.

In most studies a small number of skeletons are available, thus it is necessary to accomplish new studies on larger sample for a better characterization of these relationships. The present study was done on 200 dry adult femurs. Similar studies to estimate stature from long bones were performed by Mukhopadhyay P. on 65 dry adult male femurs [17], Chandran M. on 60 adult South Indian female femurs. [18]

Peterson has considered that in most studies only a small number of skeletons are available for analysis. [19] The sample size used in present study was better for establishing a relationship between long bone length and stature. Scholars had admitted that greatest accuracy in estimating living stature from long bones length will be obtained when sex and ethnic identity are available. [20]

Bidmos found significant sex related differences in measurements of fragments of femur in indigenous South Africans. [11] Analyzing 431 skeletons from Danish Mediaeval Cemetery, Peterson assumed that differences of femur length were independent of sex and thus

his analysis was taken on considering both sexes combined. [19] In our study the data were sex aggregated. In the present study we cannot obtain any information about sex of individuals, considering origin of the skeletal material from anatomical collection.

To estimate maximum length of long bones from fragmentary remains, it is important that accurately recognizable land marks be used. As a result measurements used to develop regression formulae for estimation long bone length are restricted. Measures of transverse dimensions along diaphyses are inappropriate because of lack of precision. The suitable locations include proximal and distal epiphysis and for this reason in our study proximal end of femur with precise landmarks was used to measure femur length.

Numerous univariate and multivariate studies have been done to estimate stature from fragments of femur. Our study is a univariate study using inter-trochanteric crest length.

Similar univariate study was done by Mukhopadhyay P [17] using epicondylar breadth for which Pearson coefficient obtained by him was (0.85) as compared to (0.59) in the present study, both these correlation are statistically significant. Because of unavailability of information about individuals in the present study, it was not possible to establish correlation between measurements of fragments of the femur and height of each person.

Segregation of bones for age, sex and side was not done while selecting femur for the study as no significant difference was observed. Except for these few demerits, the present study shows that inter trochanteric crest length may be as good or other variable for estimating femur length and hence stature.

Conclusion:

Basic osteometric data have been established. This can be used in the future for further comparison studies in Indian population. This study results in the development of specific osteometric standards designed for stature determination from the femur of recent central Indian population with high prediction accuracy.

References:

1. **Fully G.** Une nouvelle me'thode de de'termination de l'ataille. Ann Med Legale 1956; 35:266-273.
2. **Pearson K.** Mathematical contribution to the theory of evolution: on the reconstruction of the stature of prehistoric races. Philos Trans R Soc Lond [Biol.] 1899; 192:169-244.
3. **Trotter M, Gleser G.** Estimation of stature from long bones of American whites and Negroes. Am J Phys Anthropol. 1952; 10:469-514.
4. **Trotter M, Gleser G.** A re-evaluation of estimation of stature based on measurements taken during life and the long bones after death. Am J Phys Anthropol. 1958; 16:79-123.

5. Trotter M. Estimation of stature from intact long limb bones. In: Stewart TD, editor. Personal identification in mass disasters. Washington, D.C.: Smithsonian Institution. 1970; p 71-83.
6. Rollet E. De la mensuration des os longs des membres dans ses rapports avec l'anthropologie, la Clinique et al médecine judiciaire. 1889. Lyon: A. Storck.
7. Ryan I, Bidmos MA. Skeletal height from measurements of the skull in indigenous South Africans. Forensic Sci Int. 2007; 167:16-21.
8. Shulin, P., Fangwu, Z. Estimation of stature from Skull, Clavicle, Scapula and Os Coxa of male adult of Southern China. Acta Anthropologica Sinica 1983; 2:253-259.
9. Nagesk, K., Kumar, G. Estimation of stature from vertebral column length in South Indians. Legal Medicine. 2006; 8(5):269-272.
10. Steele, D. G., Mckern, T. W. A method for assessment of maximum long bone length and living stature from fragmentary long bones. Am. J. Phys. Anthropol. 1969; 31(2):215-27.
11. Bidmos, M. A. Estimation of stature using fragmentary femora id indigenous South Africans. Int J of Legal Med. 2007; Jul; 122(4):293-99.
12. Salles A. D. Carvalho C. R. F. Silva D. M., Santana L. A. Reconstruction of humeral length from measurements of its proximal and distal fragments. Braz. J. Morphol. Sci., 2009; 26(2):55-61,.
13. White T.D., Folkens P. A. The Human Bone Manual. Elsevier Academic Press, London; 2005; p 398-99.
14. Celbis O., Agrimis H. Estimation of stature and determination of sex from radial and ulnar bone lengths in a Turkish corpse sample. Forensic Science International. 2006; Vol. 158, no. 2-3:135-139
15. Mall G. Hubig M. Buttner A. et al. Sex determination and estimation of stature from the long bones of the arm. Forensic Science International, 2001; Vol. 117, no. 1-2:23-30.
16. Kate B. R., Mazumdar R. D. Stature estimation from femur and humerus by regression and autometry. Acta Anat., 1976; 94:311-20
17. Mukhopadhyay P., Ghosh T. P., Dan, U. et al. Correlation between maximum femoral length and epicondylar breadth and its application in stature estimation: A population specific study in Indian Bengali males. J of Acad Forensic Med. 2010; 32(3):204-207.
18. Chandran M. Reconstruction of Femur Length from Its Fragments in South Indian Females. Int. J of Forensic Med and Toxicology. 2011; Vol. 1(2): 45-53
19. Petersen, H. C. On the accuracy of estimating living stature from skeletal length in the grave and by linear regression. Int. J. Osteo-archaeology, 2005; 15:106-14.
20. Iscan M. Y. Forensic anthropology of sex and body size. Forensic Sci. Int., 2005; 147(2-3):107-12.

Table 1: Summary Statistics

	Maximum Femoral Length (cm)	Inter-trochanteric Crest Length (cm)
Mean	43.26	5.81
Variance	7.14	0.22
Median	43.75	5.80
Standard Deviation	2.67	0.47
95% C.I.	37.92 – 48.60	4.86 – 6.75
Minimum	36.3	4.7
Maximum	49.1	7.1

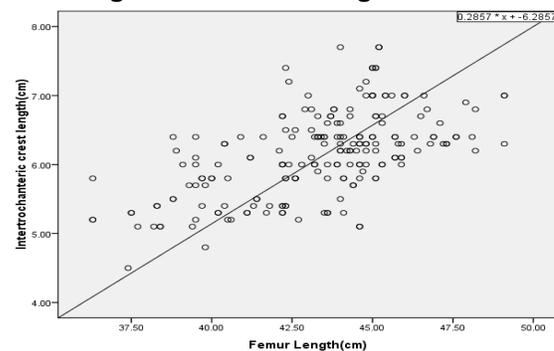
Fig. 1: Measurement of Femoral Length over the graph sheet On Osteometric Board



Fig. 2: Measurement of Inter-trochanteric Crest Length using Vernier Calipers



Fig. 3: The Regression Line of Maximum Femoral Length against Inter-Trochanteric Crest Length with Scatter Diagram



**Table 2
Correlations between Maximum Femoral Length and Inter-trochanteric Crest Length**

		Maximum Femoral Length	Inter trochanteric Length
Maximum Femoral Length	Pearson Correlation	1	.596**
	Sig. (2-tailed)		.000
	N	200	200
Inter-trochanteric Crest Length	Pearson Correlation	.596**	1
	Sig. (2-tailed)	.000	
	N	200	200

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

Original Research Paper

A Study of Stressors in Medical College Students (Hostelities) In Northern Maharashtra

*Ajay T Shendarkar, **Vijay Patil

Abstract

Entering Medical College and staying in hostel for the first time is a very stressful for medical students. This study is an attempt to determine stress in the medical students of a Medical College in Northern Maharashtra. A survey of randomly selected medical students of a Medical College in Northern Maharashtra was conducted based on a questionnaire in which demographic data and items examining possible sources of stressors based on our experience with medical students and a scale to measure the anxiety experienced by the students studying medicine were given to all subjects. On the questionnaire space was provided for respondent to express their comments on each factor they identify as source of stress. To measure the anxiety the students were asked to mark the level of anxiety they experienced on a five point scale. An analysis of data was conducted with SPSS version 16.

Key Words: Stress factors, Medical students, Demographic Data, Anxiety

Introduction:

As a larva transforms into a beautiful butterfly, likewise a secondary high school student gets transformed into a doctor in a medical college. However, it is observed that the medical students undergo tremendous stress during their course [1], may it be entrance examinations, staying in hostel, economic reasons, heavy course, vast amount of knowledge and skills with efforts required which gets reflected in increasing number of suicides among medical students.

The expectations of family members, competition, the uncertainty involved about the future add to the background stressors. Few local factors are like new environment, hard challenging studies, new friends, teachers, the teen tender age. Studies which have tried to identify the sources of stress among medical students generally pointed to three main areas: academic pressures, social issues and financial problems. [2] The majority of stressful incidents in traditional curricula are related to medical training rather than to personal problems. [4, 5]

Anxiety is also associated with feeling of loneliness, peer competition, long hours and loss of social time. [3, 6] However, it was also related to the development and child rearing which gives tremendous strength to the student to cope with the new world and effectively deal with the stressors. The family background, the economic condition was thought to be affecting the stress management. Hence this study was proposed to find out stressors and to suggest possible solutions for the same.

Material and Methods:

A carefully drafted questionnaire was given to randomly selected students staying in hostel in a Medical College in Northern Maharashtra and they were asked to return it after completion. The questions were formed so as to gather information regarding their background, development, personal stressors, day to day stress causing factors and stressful situations like examinations, the expectation from parents etc. It was also tried to find out the relationship between the socio- economic factors affecting the stress- if any.

The new environment the student faces during and after entering medical course, the adjustment with peer groups, new friends. A sincere attempt was made for seeking the remedies that the students feel that could work for relieving stress, and hence was also included in the questionnaire. More than 200 medical students participated in the study, completed the questionnaire and returned.

The Department of Forensic Medicine and Toxicology conducting a survey search

Corresponding Author:

*Associate Professor,
Department of Forensic Medicine & Toxicology,
Dr. Vasant Rao Pawar Medical College,
Hospital & Research Centre, Nashik-03
E-mail: ajayshendarkar@yahoo.com

** Professor & Head

DOR: 16.3.13 DOA: 17.6.13

project on the common stressor amongst the students in the age group of 17 to 22 years. The information gathered during this survey research project will be kept strictly confidential. (See Proforma)

Observations:

There was no significant difference between the stress experienced by exam going and non exam going students. The socioeconomic issues were found to be of less statistical significance as a cause of stress among the medical students in northern Maharashtra. The expectations by parents and others found to be non significant as a cause of stress. The teachers and apprehension about them, as a cause of stress among the students, were found to be of no significance, as evident from the results found in the present study.

It was found out that stress was more in medical students from a family where single parent was working ($p < 0.05$). (Table 1, 2)

Discussion:

In prior studies, the significant stress causing factors were academic stress, financial stress gender issues, [7,8] Helmers et al found out that medical students were not untowardly stressed but the transition of basic to clinical training was associated with stress. [9]

There are controversies among scholars regarding academic years and their relationships with stress. Few scholars like Miller [10], Supe [1], Mosley [11], and Forster-Williams et al [12] found out that it was more in first years as compared with later years where the student gets adjusted to the environment, others like Lloyd & Gartrell [13] claim that no such difference exists.

It was really a strange observation in this study of having a factor like child rearing and parenting having significant influence ($P < 0.05$) on the stress found amongst the medical students. The reason being, one parent is always available at home for taking care of the offspring when the need arises, thereby providing a sound mental foundation for battling the outer world and newer situations.

The independent living for the first time was found out to be an important factor for stress origin. [1, 2] The families where both parents were working, the students were used to stay on their own and were able to cope with the hostel environment more effectively than those who had a parent always to take care.

Many students felt the need for councilor at various stages during the course. Hence it is suggested that for a better

management of stress, a councilor is to be made available for the students.

Conclusion:

Our findings suggest that, although many stressors are present in the journey of a student to transforming into a doctor, the child rearing was found to be playing an important role in the constitution of a doctor as an individual. Hence, so as to make a person an effective stress manager, the growth of the person and factors affecting it must be taken into consideration. A good parenting will undoubtedly try sorting out such problems.

Family support can be an effective tool for helping medical students coping up with the stressors in their life. Hence, the families of students should be taken into confidence. A comprehensive program needs to be initiated for the strong mental and emotional built up of medical students with significant involvement of their families. We feel, it is the need of current time. A more detailed investigation of these factors using larger sample size and in various medical colleges throughout universities will undoubtedly help tackling of these problems.

A physician is like a flower in the society. For spreading its fragrance into the society, it needs to be nurtured healthily providing a sound mental built up from the curricular activities supported adequately by their families.

References:

1. Supe AN. A study of stress in Medical Students at Seth G.S. Medical College. J Postgraduate Med 1998; 44:1-6
2. Wolf T. M. Stress, coping and health: enhancing well-being during medical school. Medical Education, 1994; 28: 8-17. DOI: 10.1111/j.1365-2923.1994.tb02679.x
3. Vitaliano PP, Russo J, Carr JE, Heerwagen JH. Medical school pressures and their relationship to anxiety, J nervous mental Disorder 1984; 172:730-6
4. Coles C. Medicine and stress, Med Educ 1994; 28:3-4
5. Guthrie E.A., Black D, Show C.M. et al. Embarking upon a medical career: Psychological morbidity in first year medical students. MedEduc1995; 29:337-41
6. Stewart SM, Bet son C, Lam TN et al. Predicting stress in first year medical students: a longitudinal study. Med Educ. 1997;31:163-8
7. Jagmohni Kaur Sidhu. Effect of Stress on Medical Students, JSME 2007; 1 (1): 52-53
8. Aarti Sood Mahajan. Stress in Medical Education: a global issue or much ado, About Nothing specific? South-East Asian Journal of Medical Education Vol. 4 (2), 2010
9. Helmers K.F., Danoff D., Steinert Y., Leyton M., Young S.N. Stress and depressed mood in medical students, law students and graduate students at Mc Gill University, Academic Medicine, 1997; 72, 8, pp.708-714
10. Miller P., Mc C. The first year at Medical School, some findings and students perceptions, Medical Education, 1994; 28, pp. 5-7
11. Mosley T.H., Perrin S.G., Neral S.M., Dubbert P.M., Grothues C.A. & Pinto B.M. Stress, coping and well being among third year medical students, Academic Medicine, 1994; 69, pp.765-767.
12. Foster-Williams K., Thomas P., Gordon A. & William-Brown S. An assessment of stress among clinical medical students of the

University of the West Indies, Mona Campus, West Indian Medical Journal, 1996; 45, pp. 51-54.

13. **Lloyd C., Gartrell N.K.** Psychiatric symptoms in medical students, Comprehensive Psychiatry, 1984; 225, pp. 552-565.

Table 2: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.772 ^a	9	.019
Likelihood Ratio	10.562	9	.307
N of Valid Cases	201		

a. 11 cells (68.8%) have expected count less than 5. The minimum expected count is .04.

Table 1

			Stress Cat				Total
			Never	Rare	sometimes	Frequently	
Parent work Stat		Count	0	3	7	0	10
		% within parent work stat	.0%	30.0%	70.0%	.0%	100.0%
		% within stress cat	0%	3.3%	7.9%	.0%	5.0%
	Both	Count	6	38	33	4	81
		% within parent work stat	7.4%	46.9%	40.7%	4.9%	100.0%
		% within stress cat	50.0%	41.8%	37.1%	44.4%	40.3%
	No	Count	1	0	0	0	1
		% within parent work stat	100.0%	.0%	.0%	.0%	100.0%
		% within stress cat	8.3%	.0%	.0%	.0%	.5%
	single	Count	5	50	49	5	109
		% within parent work stat	4.6%	45.9%	45.0%	4.6%	100.0%
		% within stress cat	41.7%	54.9%	55.1%	55.6%	54.2%
Total	Count	12	91	89	9	201	
	% within parent work stat	6.0%	45.3%	44.3%	4.5%	100.0%	
	% within stress cat	100.0%	100.0%	100.0%	100.0%	100.0%	

Proforma

Name of student: _____ Age: _____ Sex: _____

(Optional)

Course (year): _____

Exam Going –Yes/ No

Whether stayed in hostel previously- Yes/ No

If yes- duration of the stay -

Socioeconomic status- Upper class/ upper middle/ middle/ lower

Parents working- Both/ Single

Family type- Nuclear/ joint/ divided (divorced).

S. N.	Question	Never	Rare	Sometimes	Frequently	Always
1	Do you feel homesick?					
2	Do you feel lonely?					
3	Do you feel stressed during the examination?					
4	Do you feel tensed regarding competition in studies?					
5	Do you feel apprehended about the teachers?					
6	Do you feel stressed while co-habiting (staying) with the room-partner / partners					
7	Do you feel stressed regarding future career prospects?					
8	Do you feel tensed regarding the high expectations of parents/ relatives from you?					
9	How often do you feel the need for a counselor?					
10	Does your stress give rise to any health related issues?					
11	Your stress is related to what basis?	College	Personal	Family	Friends	studies
12	What do you do when you feel stressed?	Music/movies	Sports	Spiritualactivity	addiction	yoga
13	Your opinion regarding getting rid of stress?					

Original Research Paper

Missed Injuries in Fatal Blunt Thoraco-Abdominal Region

*R.K. Punia, **Dhruv Singh Meena

Abstract

The study was conducted with the aim to highlight the pattern of thoraco-abdominal injuries sustained by the victims of fatal blunt thoraco-abdominal trauma in Jaipur, Rajasthan, which were remained undiagnosed during the hospital stay of victim. This was due to various reasons such as overlooked during initial assessment and management of trauma, during diagnostic procedure etc. These undiagnosed fatal injuries become a source of professional negligence and other legal consequences. A meticulous autopsy helps to determine the actual or probable anatomical site of primary impact, so the fatal consequences of these undiagnosed injuries can be prevented. This was an autopsy based observation of blunt thoraco-abdominal injuries during October 2011 to September 2012. A male predominance (81%) was observed. Road traffic accidents were the major cause of fatality due to blunt thoraco-abdominal trauma (74.50%). External thoracic injuries were more common than internal thoracic injuries whereas, in abdominal region, internal injuries were more common than external injuries. Fracture of thoracic cage was the most common thoracic injury (65%).

Key Words: Blunt trauma, Thoraco-abdominal injuries, External injuries, Internal injuries

Introduction:

Thoraco-abdominal injuries provide a major contribution to death due to anatomical position and dimension. The thoraco-abdominal region, which contains vital organs of body, is a major site of impact in any type of trauma.

It is frequently seen that the thoracic wall may or may not show any injuries subsequent to blunt force trauma but abdominal walls usually escape gross injury by transmitting the force of violence to the more resistant organs inside the abdominal cavity which get injured without any visible external injury in the region. Hence, there is always a possibility of fatal thoraco-abdominal injuries to go unnoticed, and leading to their late detection and fatal outcome.

Injuries are overlooked during three phases in patient management: (a) initial assessment, (b) diagnostic work-up (imaging, laboratory studies etc.), (c) surgical exploration.

These undiagnosed fatal injuries become a source of professional embarrassment and possible litigation.

This study of pattern of blunt thoraco-abdominal injuries, nature of external and internal injuries may all together helps in the determination of actual or probable site of primary impact. This may be useful in reconstruction of the events and to broaden the horizon of the knowledge of clinicians for treatment of trauma victims and also help us to devise strategies and policies to reduce mortality and morbidity from blunt thoraco-abdominal injuries.

Material and Method:

This study was Hospital based Descriptive Observational Study conducted during October 2011 to September 2012 in the Department of Forensic Medicine, S. M. S. Medical College, Jaipur (Rajasthan) and includes 200 cases of blunt thoraco-abdominal traumatic deaths. A detailed Victimologic profile was made which contain data related to bed head treatment during hospital and police inquest documents to analyze the fatal blunt thoraco-abdominal injuries.

Results:

A total of 157 cases of thoracic trauma were observed in this study. Out of these, 149 cases had external injuries and in 8 cases there was internal injury without any external injury to the thoracic wall.

In our study, out of these 149 cases of thoracic trauma having external signs of injuries, there was associated internal injury in 110 cases. (Table 2) Isolated injury to lungs was

Corresponding Author:

* Professor & Head

Department of Forensic Medicine

SMS Medical College, Jaipur

E-mail: rkpunia86@gmail.com

** Junior Resident IIIrd Year

DOR: 7.4.13 DOA: 12.7.13

seen in 91 cases. The heart was traumatized in 15 cases and in rest of the 12 cases both lungs and heart were injured. (Table 3)

Though visible external trauma was seen in 149 cases; but investigations for evaluation of that trauma were performed in only 32 cases. (Table 4) A highly significant number of cases with external thoracic injury remained unevaluated as regards to the type and severity of the injury and in 91 cases, out of the total 117 cases in which external injuries were present but investigation were not performed; the external injuries were associated with visceral thoracic injuries. (Table 5)

In all, there were 160 cases of external and/or internal abdominal trauma. Out of these external abdominal injuries were present in 100 cases. In 60 cases there was internal abdominal injury without any associated trauma to the external abdominal wall. (Table 6)

Amongst the 100 cases of external injuries to abdominal region, 85 cases had associated visceral trauma. (Table 7)

In this Study out of 100 cases of abdominal injuries, 75 cases remained undiagnosed despite, having external sign of injury over abdominal wall and 68 cases had fatal visceral injuries. Present study showed that 60 cases of abdominal injuries had no external visible injuries over abdominal wall, 47 cases had fatal abdominal visceral injuries and only 13 cases were investigated. (Table 7)

A total of 98 cases of abdominal trauma showed hepatic trauma contributing to fatality, though it remained uninvestigated in a highly significant proportion of 87 cases. This study also showed that a highly significant proportion of 60 out of 65 cases of splenic trauma were not investigated. (Table 8, 9)

Discussion:

Males (81%) outnumbered the females (19%) in the ratio of 4:1, which is explained by the fact that males are usually the earning members of the families making them vulnerable to accidents and industrial mishaps as compared to females who are mostly indulged in house hold works. These findings are similar to other authors. [1, 2, 4, 6] In the thoracic region, injuries were seen in 157 (78.5%) cases out of 200 cases either individually or in association with abdominal injuries.

External thoracic injuries were seen in 74.5% cases. Out of these, 75.16% cases had associated visceral injuries and rest 24.84% had no visceral injuries. Thus, sub grouping thoracic injuries to external and internal thoracic injuries

revealed that external thoracic injuries were more common than the internal injuries.

This study correlates with the observations made by Hirshberg A et al, Biswas G et al and Shetty BSK et al. [3, 5, 7]

External injury to the abdomen was seen in 100 cases (50%) of all studied cases. However, the total number of cases suffering abdominal injuries, external as well as internal were 160 (80%) of all cases.

This is quite explainable by the anatomical morphology of abdomen which is a pliable structure, thus vulnerable to sustaining injuries to internal organs even with no external sign of injury evident. The abdominal wall usually escapes gross injury to the wall by transmitting the force of violence to more resistant organs inside the abdominal cavity. Similar results have been reported by others. [3, 6-7] Initial investigation reports of each trauma patient should be reviewed meticulously.

Diagnostic study that is not clear must be repeated. Serial examinations of each patient must be pursued for the entire clinical course. Clinicians should give the attention over remote body areas also. Surgeon/ clinician should keep in mind that any deviation from expected course of recovery in a trauma patient should promptly need a diligent search for a missed injury.

Conclusion:

Prompt transportation with facilities for adequate pre-hospital care should be routinely provided at various places for immediate care, stabilization and timely shifting of trauma victims to a well equipped trauma care centre. These are some of the factors apart from injury severity scoring which affect the period of survival.

References:

1. Chandra J, Dogra TD. Pattern of injuries in various road users involved with different vehicles in fatal accidents; J Police Research and Development. 1978; (3):26-8.
2. Ghosh PK. Epidemiological study of the victims of vehicular accidents in Delhi; J Indian Med Assoc. 1992; 90(12):309-12.
3. Hirshberg A et al. Causes and pattern of missed injuries in trauma; American Journal of Surgery. 1994; 168:299-303.
4. Sager P et al. Thoracic trauma: An analysis of 187 patients. Acta Chir Belg. 2001; 101(6):277-82.
5. Biswas G et al. Pattern of road traffic accidents in North-East Delhi. J Forensic Med Toxicol. 2003; 20:27-32.
6. Meera T, Nabachandra H. A study of pattern and Injury severity score in Blunt Thoraco Abdominal Trauma cases in Manipal. Medico-legal update. 2005; 5(2):47-52.
7. Shetty SKB, Kanchan T, Menezes RG, Bakkannavar SM, Nayak VC, Yoganarasimha K. Victim Profile and Pattern of Thoraco-Abdominal injuries Sustained in Fatal Road Traffic Accidents. JAIFM 2012; 34(1):17-20

Table 1: Distribution of Cases according to Age & Sex of Total Fatalities (n=200)

Age grps(Yrs)	Sex		Total (%)
	Male	Female	
0-9	2 (1.0)	4 (2.0)	6 (3.0)
10-19	17 (8.5)	4 (2.0)	21 (10.5)
20-29	58 (29.0)	2 (1.0)	60 (30.0)
30-39	32 (16.0)	9 (4.5)	41(20.5)
40-49	21(10.5)	8(4.0)	29(14.5)
50-59	19(9.5)	3(1.5)	22(11.0)
>60	13(6.5)	8(4.0)	21(10.5)
Total	162(81.0)	38(19.0)	200(100.0)

Table 2: According to External and Internal Injuries in Thoracic Trauma (n=157)

Thoracic Injury	Number	Percentage
Both external and visceral injury	110	70.06 %
External Injury only	39	24.84 %
Visceral injury only	08	5.10 %
Total	157	100%

Table 3: Pattern of Visceral Injury to Thoracic Region

Thoracic Viscera Involved	Cases
Lungs only	91
Heart only	15
Both Lungs and Heart	12
Total	118

Table 4: According to External Injury of Chest & Investigation Status (n=200)

Investigation(CT/X-ray)	External Injury of Chest		Total
	Present	Absent	
Performed	32(21.5)	25 (50.9)	57 (28.5)
Not Performed	117(78.5)	26 (49.0)	143 (71.5)
Total	149(100.0)	51(100.0)	200(100.0)

Table 6: According to External and Internal Injuries in Abdominal Trauma (n=160)

Abdominal Injury	Cases	Percentage
Both external and visceral injury	85	53.12
External Injury only	15	9.38
Visceral injury only	60	37.5
Total	160	100

Table 8: According to Injury of Liver with Investigation Status in Abdominal Trauma

Investigation (USG/CT)	Injury of Liver		Total
	Present	Absent	
Performed	11(11.2)	47(46.0)	58(29.0)
Not Performed	87(88.8)	55(53.9)	142(71.0)
Total	98(100.0)	102(100.0)	200(100.0)

Table 9: Cases of Splenic Injury with Investigation Status

Investigation(USG/CT)	Injury of Spleen		Total
	Present	Absent	
Performed	5(7.7)	53(39.3)	58(29.0)
Not performed	60(92.3)	82(60.8)	142(71.0)
Total	65(100.0)	135(100.0)	200(100.0)

Table 5
According to External and Visceral Thoracic injuries and the Investigation Status (n=200)

Investigation	External Injury Present			External Injury Absent		
	Visceral injury of chest			Visceral injury of chest		
	Present	Absent	Total	Present	Absent	Total
Not Performed	91(82.7)	26(66.7)	117(78.5)	4(50.0)	22(51.2)	26(50.9)
Performed	19(17.3)	13(33.3)	32(21.5)	4(50.0)	21(48.9)	25(49.0)
Total	110(100.0)	39(100.0)	149(100.0)	8(100.0)	43(100.0)	51(100.0)

Table 7
According to External Injury & Visceral Injury to Abdomen and their Investigation Status (n=200)

Investigation	External Injury Present			External Injury Absent		
	Visceral Injury to abdomen			Visceral Injury to abdomen		
	Present	Absent	Total	Present	Absent	Total
Not Performed	68(80.0)	7(46.7)	75(75.0)	47(78.3)	20(50.0)	67(67.0)
Performed	17(20.0)	8(53.3)	25(25.0)	13(21.7)	20(50.0)	33(33.0)
Total	85(100.0)	15(100.0)	100(100.0)	60(100.0)	40(100.0)	100(100.0)

Original Research Paper

Pattern of Suicidal Deaths at District Hospital Davangere A Cross-Sectional Study

*Santhosh. C.S, ** Bande Nawaz

Abstract

The pattern of suicidal deaths in an area reflects the socio-economic status and mental health status of the population in this region. Suicide committed by an individual will be a burden for the family members as a bread winner of the family, or a care taker of the family or a loving child of the family may die, resulting in deep agonizing pain to the rest of the family members who are living. This study included 370(44.04%) suicidal deaths in a year. The most common age group involved was 21-30 years which included 40% males and 37% females. Males (56.76%) were most commonly involved; most people were from rural area (51.14%) and were married (58.11%). The most common method adapted to end life was Poisoning (49.73%) followed by hanging (32.44%), burns (17.29%) and drowning (0.54%). The majority of the population was Hindus (94.05%), followed by Muslims (5.40%) and Christians (0.54%). Suicidal deaths are preventable by the combined effort of the Government agencies, stringent laws, and more importantly change in the mindset of the people to adapt to all the difficult situations in life.

Key Words: Suicide, Autopsy, poisoning, Rural, Religion

Introduction:

According to Durham, the French biologist, suicide is death resulting directly or indirectly from a positive or negative act of the victim himself, which he knows will produce this result. [1] There has been a drastic surge in the incidence of death by suicide year by year, although there is under reporting in the cases.

An estimate by WHO states that nearly 900000 people worldwide die from suicide every year, including about 200000 in china and 170000 in India and 140000 in higher income countries. [2] The rapid change in the life style, increase in mental stress, adaptation problems at home and work place, the dowry menace have only added to the numbers.

The method adapted in Suicide may be by consumption of poison, hanging, burns, drowning and many others. Death by suicide neither is more significant with respect to medical health care, as researchers to date have neither unearthed nor revealed what possesses some individual to effectuate their own demise and why such a desperate course of action is dictated. [3]

Corresponding Author:

*Associate Professor, Dept. of Forensic Medicine
J.J.M. Medical College, Davangere-4, Karnataka
E-mail: drsan_99@rediffmail.com

**Assistant Professor

DOR: 6.2.13 DOA: 16.8.13

Materials and Method:

The present study is a cross-sectional study conducted at Chigateri General Hospital, Davangere during January 2008 to December 2008. This study included 370 cases of suicidal deaths out of 840 autopsies conducted during the year (Table -1). The data was collected regarding the age, sex, marital status, region, religion and manner of suicidal death by direct interrogation with the relatives and Police, case sheet records. The data so collected was written in a proforma and analyzed. The data was presented in the form of Charts and tables.

Results:

The present study included 370(44.04%) cases of suicidal deaths autopsied out of a total of 840 autopsies during the year January 2008 to December 2008. (Chart 1) In the age and sex wise distribution of cases, the age group of 21-30 years included the maximum number of deaths 84 males(40%) and 60 females (37%) which was followed by the age 11-20 years, which included 65 males (30.95%) and 55 females(34.37%). (Table 1)

The study included 210 males (56.76%) and 160 females (43.24%). (Table 1) In our study 204 (51.14%) cases were from rural background and 166 (44.86%) were from urban area. (Table 2) The maximum number of deaths was among the married persons (58.11%) as compared to (41%) unmarried persons. (Table 3) In considering the religion of the people, the

maximum number deaths were among the Hindus (94.05%), followed by Muslims (5.40%) and least were Christians (0.54%). (Table 4) The most common method adapted in our study was Poisoning (49.73%) followed by hanging (32.44%), burns (17.29%) and drowning (0.54%). (Table 5)

Discussion:

In among the un-natural deaths, suicidal deaths account second leading cause of death next only to road traffic accidents in a developing country like ours. The increase in the population resulting in lack of job opportunities, frustration in life, chronic diseases / illness, dowry and ill-treatment by husband and in laws, lack of adjustment problems have resulted in enormous number of deaths.

Our study which included 44.04% of suicidal deaths in a year is similar to the study conducted by S K Dhatarwal [4] in Haryana state which included 46.9% of suicidal deaths and is also similar to the study conducted by B R Sharma [5] which included 38.55%. However it is in contrast to the study conducted at RIMS, Imphal [6] where suicidal deaths included less than 10% of the autopsies. This only reflects the regional imbalance, socio-economic factors, unemployment and life style of the population with regard to more miseries and frustration in cities as compared to other areas.

The age and sex wise distribution of cases is similar to the study is similar to suicides in Imphal [6] where the age group 21-30 years included 36.48% and 31-40 years included 27.36% followed by 11-20 years (20.61%).

Similar results were obtained by Behera A and colleagues [1] where the age group 20-29 included the maximum number of cases. In our study the age group 11-20 years is second most commonly involved since the population in Davangere includes more of a student population as a result of increase in the establishment of professional educational institutions. In our study males were predominantly involved as compared to a female which is similar to the study conducted by B R Sharma [5] and Kh. Pradipkumar Singh. [6]

Males being the bread winner of the family and many being farmers and unemployed youths will take up the extreme step without second thought.

Maximum number of people who committed suicide was from rural background in our study, which is similar to the study by B R Sharma [5] where many committing suicide were from rural area. This reflects that majority of people still live in villages than the cities.

The recent rise in the suicide conducted in urban population as compared to the older studies indicate that there is large number of migrant population from villages to cities for a better living. Our study is similar to the study conducted by Behera A and colleagues¹ and Sandeep S Kadu [8] were married people were more commonly involved in Suicidal deaths.

In our study the maximum numbers of victims were Hindus, followed by Muslims and Christians. It is similar to the study conducted by Sandeep S Kadu [8] where 87% were Hindus, 7.6% were Muslims and 5% were Christians.

This is due to the fact that majority of the people in our country are Hindus. The most common method employed to die were poisoning, hanging, burns and drowning in the decreasing order in our study, which is similar to the study by Behera A and colleagues, Vikram Patel et. al. [1, 2] Though the study by S K Dhatarwal [4], B R Sharma [5], were similar with regard to poisoning as the leading cause of death, burns was the second leading cause of death in their study.

Method to end life will depend upon the circumstances and ease of availability of the material for suicide and will depend on the area of dwelling of the population as poisoning is more common in rural areas and hanging more common in urban areas.

Conclusion:

Unfortunately, an autopsy surgeon can do little to prevent the deaths in any manner. But those persons in depression of any form can be helped by a Psychiatrist, Sociologist or a Psychologist if approached in the need of the hour. Women less than 30 years, children in adolescent age, unemployed youths are the persons largely committing suicide. The Government along with Private agencies, Non-Government Organizations, and women self help group can take a leading step in counseling them at the right time, no matter whatever is their place of dwelling.

References:

1. Behera A, Balabantry JK, Nayak SR. Review of suicidal cases, A retrospective study. JIAFM 2005; 27(2); 100-102.
2. Patel V et al. Suicide mortality in India: a nationally representative survey. The Lancet June 2012; 379; 2343-2351.
3. Arun M, Yoganasimha K, Kar N, Palimar V, Mohanty MK, Siddhartha P. Suicide- The magnitude of the Problem. JIAFM 2005; 27(4); 243-246.
4. Dhatarwal SK. Pattern of suicide in Medico-legal deaths in Haryana. JFMT July-Dec 1997; 14(2); 47-48.
5. Sharma BR, Singh VP, Sharma R, Sumedha. Unnatural deaths in Northern India a Profile. JIAFM 2004; 26(4): 140-146.
6. Singh P, Marak FK, Longkumar K, Momonchand A. Suicide in Imphal. JIAFM 2005; 27(2): 85-86.

7. **Garg V, Verma SK.** Profile of Medico-legal cases at Adesh Institute of Medical Sciences and Research, Bathinda, Punjab. JIAFM April-June 2010; 32(2): 150-152.
8. **Kadu SS, Asawa R.** Medico-legal Evaluation of Suicidal Deaths in Rural Area. Journal of Forensic Medicine, Science and Law Jan-June 2011; 20(1): 8-11.

Chart 1: Total Number of Suicidal Cases in a Year

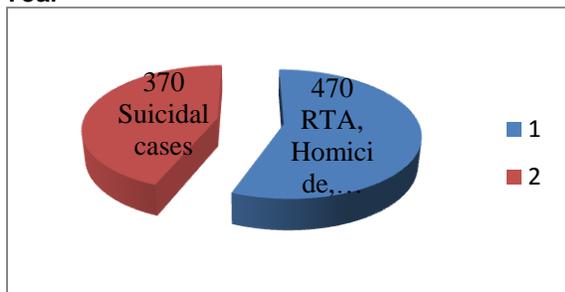


Table 1: Age and Sex Wise Distribution of Cases

Age (yrs)	Male (%)	Female (%)
1-10	-	-
11-20	65(30.95)	55(34.37)
21-30	84(40)	60(37.5)
31-40	30 (14.28)	21(13.12)
41-50	13(6.19)	12(7.5)
51-60	10(4.76)	8(5)
>60 years	8(3.80)	4(2.5)
Total	210(100)	160(100)

Table 2: Area Wise Distribution of Cases

Area	Number	Percentage
Rural	204	51.14
Urban	166	44.86
Total	370	100

Table 3: Marital Status of the Cases

Marital status	Number	Percentage
Married	215	58.11
Un married	155	41.89
Total	370	100

Table 4: Religion of the People Committing Suicide

Religion	Number	Percentage
Hindu	348	94.05
Muslim	20	5.40
Christian	2	0.54
Total	370	100

Table 5: Methods adapted to commit Suicide

Method	Number	Percentage
Poisoning	184	49.23
Hanging	120	32.44
Burns	64	17.29
Drowning	2	0.54
Total	370	100

Original Research Paper

Deaths due to Fatal Road Traffic Accidents A Retrospective Study

*Dileep Kumar R, **Raju .G.M, ***Vijayanath. V, ****Shahina

Abstract

A retrospective study of road traffic deaths during the period January 1st 2011 to 31st December 2011 was conducted in Davangere, Karnataka, India. Victims with alleged history of Road Traffic Accidents died in the SSIMS&RC, Davangere and subsequently autopsied were included in the present study. Road Traffic Accidents (RTA) are increasing is an alarming rate throughout the world. Thereby it poses itself as a major epidemiological and medico-legal problem. Victims in RTAs sustain varieties of injuries, which are fatal or dangerous to life. Pattern of the injuries helps in reconstruction of RTA. The study of injuries associated with fatal outcome helps in implementation of measures to prevent fatalities due to RTAs. Hence, the present study conducted to know, injuries in victims of fatal RTAs, in relation to victim's age and sex. In addition, an attempt also made to know the percentage of cause of death.

Key Words: RTA; Cause of death; Intra-cranial haemorrhage, Injuries

Introduction:

Road Traffic Accident is any vehicular accident occurring on the roadway i.e. originating on, terminating on, or involving a vehicle partially on the roadway. [1] Road traffic injuries are one of the leading causes of death in the world. [2] This includes collision of an automobile with a, rider / pillion rider / driver / passengers/pedestrian or another automobile or with a non-automobile on the roadway or fall from a moving vehicle causing injuries or death of the individuals is involved. Worldwide the number of people killed in road traffic crashes each year spastically estimated to be around 1.2 million, while the number of injured could be as high as 50 million. [3]

RTAs are considered as the third deadly killer, next to heart disease and cancer. [4] The first death due to a motor vehicle was registered in 1896 in the United Kingdom. [5] Accidents represent a major epidemic of non-communicable disease in the present century.

Corresponding Author:

*Postgraduate / Tutor,
Department of Forensic Medicine & Toxicology,
S.S.I.M.S. & R.C, Davanagere, 577005 Karnataka
Email: drdileep@gmail.com

**Associate Professor,

***Associate Professor Dept. of FMT
Vinayaka mission, Salem, Tamil Nadu

****Postgraduate, Dept. of FMT,
S.S.I.M.S. & R.C., Davangere
DOR: 7.5.13 DOA: 17.8.13

In developing countries, the morbidity and mortality burden is increasing due to road traffic injuries. According to the recent survey RTA amount at least 1-2% of GDP loss to the countries worldwide. [6] RTA is due to the tremendous increase in the number of vehicles, high-speed technology along with other contributing factors like, poor roads, intoxicating influence of alcohol or drugs, inexperienced drivers without having proper driving license, ignorance or intentional violation of traffic rules etc. Victims in RTAs sustain varieties of injuries; external as well as internal injuries, may be abrasions, lacerations, contusions etc.

Internal injuries may be fractures, rupture of viscera, destruction of major arteries etc. Fatality in RTAs can be due to immediate causes like haemorrhage, injury to vital organs, vagal inhibition, neurogenic shock, embolism etc. and late causes like infection, complications of injuries, etc. [7] Early detection of the injury and prompt treatment are necessary in saving the lives of many of these victims. [8]

A careful and detailed study of injuries helps in the reconstruction of RTAs, especially in hit and run cases, which in turn help the investigating officer in identification and prosecution of those responsible for the accident. In addition, the study of injuries associated with fatal outcome helps in implementation of measures to prevent fatalities due to RTAs. Therefore, here is an attempt to analyze the trends of fatal road traffic accidents by retrospective study of autopsied bodies died due to RTAs.

Objectives:

1. To know the age and sex wise distribution of fatal RTAs.
2. To find out fatal injury leading to the cause of death.
3. The pattern of intracranial haemorrhages in victims.

Methodology:

The study material comprised of victims of RTA who succumbed to death and subsequently autopsied at the S.S.I.M.S. & R.C., Davangere, Karnataka, during the one-year period from 1st January 2011 to 31st December 2011. The sample size was 84 cases. All the victims of RTA who died and subsequently autopsied at the same centre, were included in the present study. Controversial RTA cases were excluded from the study.

Observation and Results:

Out of 218 autopsies conducted during the study period, RTAs related deaths accounted for 84 cases (38.53%).

Males outnumbered the females in total number of deaths due to RTA, 73 (86.9%) male cases compared to 11 (13.09%) female cases. The male to female ratio in the study was 6.63:1. (Chart 1) Age group most commonly involved in male sex was 21–30 years (27 cases), followed by 31-40 years (16 cases), 41-50 years (12 cases), 51-60 years (9 cases), 11-20 years (4 cases), 61-70 years (3 cases) and least in the age group of less than 10 years (2 cases).

In females maximum deaths occurred in the age group of 31-40 years, accounting six cases, followed by 41-50 years (3 cases), 1 case each in the age group of 11-20 years and 51-60 years. (Chart 2) In total most commonly involved age group in both sexes is 21-30 years (32.14%), followed by 31-40 years (26.19%), 41-50 years (17.85%), 51-60 years (11.90%), 11-20 years (5.95%), 61-70 years (3 cases;3.57%) and 2 cases (2.38%) in the age less than 10 years.

In our study Intracranial haemorrhage was the leading cause of death in fatal RTA cases accounting for 56 cases (66.66%), followed by 18 cases (21.42%) due to hemorrhagic shock, 5 cases (5.952%) due to septicemia, 4 cases (4.761%) due to spinal cord injury, and one death due to pulmonary embolism (1.19%). (Chart 3)

Discussion:

There is a rapid rise in the number of the vehicular accidents in the present era in both rural and urban area. Tremendous growth in road transport sector as well as population explosion acts as catalyzing factors for increased number of accidents. Since accidents

are multi-factorial in causation, inter-sectorial approach to both prevention of accidents and taking care of the injured person is needed.

In present study maximum number of RTAs victims were 73 male cases (86.9%), compared to 11 (13.09%) female cases. The male to female ratio in the study was 6.63:1. Singh H et al [9] showed that male female ratio was 9:1; Chaudhary et al [10] showed that male female ratio was 4.9:1. Menon A et al [11] also showed marked male preponderance in road accidents. Arvind K et al [12] showed that male female ratio was 7.49:1.

The reason of male predominance could probably be due to the social structure of the Indian society as most of the outside work usually carried out by males and tendency of males not following the traffic rules and regulations. Moreover, females have minimal outdoor activities as compared to males.

Age group most commonly involved in both sexes was 21–30 years (27 cases; 32.14%) and 31-40 years (22 cases; 26.19%) means age group 21-40 years shared 49 cases (58.33%) of all RTA with a clear male dominance.

In females maximum deaths occurred in the age group of 31-40 years, accounting six cases (54.55%). The maximum numbers of victims were young adults as they are more ambulatory hence exposed to greater risk as compared to persons belonging to other age groups. Present study and its results are in agreement with the study done by Singh H et al [9] showed that the commonest age group involved was 21-30years (27.3%), followed by 31-40 years (20.6%) and 11-20 years (17.3%).

In the study done by Palimar V et al [13] the age group commonly involved was 21-30 years (22.2%), followed by 41-50 years age group (18.7%) and 31-40 years age group (15.2%). Further in the study done by Kachre RV et al [14] largely involved age group was 21-30 years (32.5%), followed by 11-20 years (21.0%). Intracranial haemorrhage was the leading cause of death in fatal RTA cases in our study accounting for 56 cases (66.66%), followed by 18 cases (21.42%) of hemorrhagic shock, 5 cases (5.952%) of septicemia, 4 cases (4.761%) of spinal cord injury, and one pulmonary embolism case (1.19%).

In present study, intracranial haemorrhages were classified further as extradural haemorrhage, subdural haemorrhage, and subarachnoid haemorrhage. Subarachnoid haemorrhage was associated with subdural haemorrhage in majority of 17cases (30.35%).

Extradural haemorrhage, subdural haemorrhage, and subarachnoid haemorrhage

combination was seen in five cases (8.92%). Extradural and subdural haemorrhage combination was seen in two cases (3.57%). Extradural haemorrhage alone was seen in three cases (5.35%), subdural haemorrhage alone was seen in two cases (3.57%), and subarachnoid haemorrhage alone was seen in 13 cases (23.31%).

In total subarachnoid haemorrhage was most commonly seen in 48 cases (85.71%), followed by subdural haemorrhage 31 (55.35%). Extradural haemorrhage was seen in only 15 (26.78%) of total cases. This is in contrast with the study done by Chandra et al [15] where subarachnoid haemorrhage (66.9%) was most common intracranial haemorrhage followed by subdural haemorrhage (58.2%).

Conclusion:

Road traffic accidents are increasing at an alarming rate, causing the loss of valuable work force and resources. Most of them caused by human errors and they can be prevented by providing road safety education to all. Improvement of roads, streetlights and displaying of traffic signs needed.

Strict enforcement of laws regarding driving of vehicles, wearing of helmets, applying seat belts is needed. As such, intracranial haemorrhage was the most common cause of death due to RTAs in our study.

It was observed that in majority of cases, intracranial haemorrhage contributed either directly or indirectly to death. There is a need to stress on the importance of usage of helmets, seat belts and adherence to traffic rules to reduce the incidence of road traffic accidents.

References:

1. WHO ICD-10 'International Statistical Classification of Diseases and Related Problem'. 10th revision; Volume 1. Geneva: World Health Organization; 891-943.
2. Peden M, McGee K, Krug E (eds). Injury: A leading cause of the global burden of disease, 2000. Geneva Switzerland: WHO; 2002.
3. World Health Organization. World Report on Road Traffic injury prevention 2009
4. District Statistician. A view on statistics of Belgaum district 2003-04. Belgaum: Zilla Panchayat; 2005.
5. Patel NS. Traffic fatalities in Lusaka, Zambia. Med Sci Law 1979;19(1):61-5.
6. Park K. Park's Textbook of Preventive and Social medicine, 20th ed. Jabalpur: Banarsidas Bhanot; 2009.
7. Nandy A. Principles of Forensic Medicine. 3rd ed. Calcutta: New Central Book Agency; 2010. p. 515.
8. Meera TH, Nabachandra H. A Study of Pattern and Injury Severity Score in Blunt Thoraco-abdominal Trauma cases in Manipal. Medico-Legal Update 2005-06; 5(2):47-52.
9. Singh H, Dhatarwal SK. Pattern and Distribution of injuries in fatal road traffic accidents in Rohtak (Haryana), JIAFM 2004;26(1):20-3.
10. Choudhary BL, Singh Deepak, Tirpude BH, Sharma RK, Meel Veena. Profile of road traffic accidents cases in Kasturba Hospital

of MGIMS, Sevagram, Wardha, Maharashtra, India; Medico Legal Update 2005; 5(4):1-12.

11. Menon A, Pai VK and Rajeew A. Pattern of fatal head injuries due to vehicular accidents in Mangalore; J Forensic Leg Med. 2008; 15(2):75-7.
12. Arvind K, Sanjeev L, Deepak A Ravi R, Dogra TD. Fatal road traffic accidents and their relationship with head injuries: An epidemiological survey of five years. Indian J Neurotrauma 2008;5(2):63-7.
13. Palimar V, Arun M, Singh B, Mohanty MK. Victimologic study of road traffic fatalities. Medico Legal Update 2004;4(1):91-3.
14. Kachre RV, Kachre VH, Asawa SS. Pattern of vehicular accidents in Pravara region: a rural region of Ahmदनगर district of Maharashtra. Journal of Forensic Medicine & Toxicology 2003; 20(2):29-32.
15. Chandra J, Dogra TD Dikshit PC. Pattern of Cranio-intra cranial injuries in fatal vehicular accidents in Delhi; Med Sci Law 1979; 19(3):186-94.

Chart 1: Sex Wise Distribution of Cases

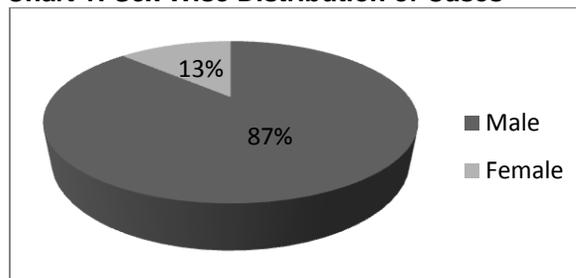


Chart 2: Age Wise Distribution of Cases

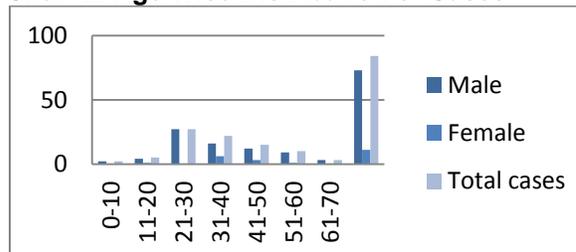


Chart 3: Pattern of Cause of Death in RTA

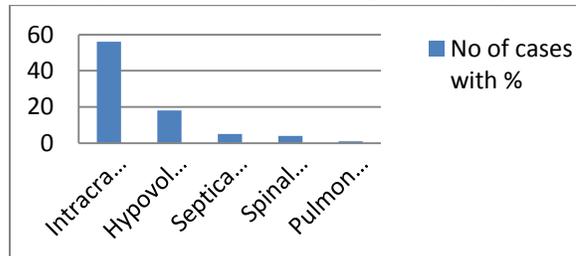


Table 1: Pattern of Intracranial Haemorrhages

Intracranial haemorrhage	Total (56) cases
Extradural Haemorrhage (in total)	15 (26.78%)
Subdural Haemorrhage (in total)	31 (55.35%)
Subarachnoid Haemorrhage (in total)	48 (85.71%)
Subdural + Subarachnoid Haemorrhage	17 (30.35%)
Extradural + Subdural Haemorrhage	2 (3.57%)
Extradural + Subarachnoid + Subdural Haemorrhage	5 (8.92%)
Extradural haemorrhage alone	3 (5.35%)
Subdural haemorrhage alone	2 (3.57%)
Subarachnoid haemorrhage alone	13 (23.21%)

Original Research Paper

Study of Fracture of Hyoid Bone in Hanging Cases

*Abhishek Yadav, **Manish Kumath, *Sumit Tellewar, ****Lohith Kumar R

Abstract

There is great importance of fracture of hyoid bone in the cases of asphyxial deaths due to compression of neck by ligature material. There had been a vast difference of opinion regarding the presence of hyoid bone fractures in cases of hanging. The various authors have reported the incidence of hyoid bone fracture from nil/rare to as high as 67% in hanging cases. Keeping the above facts into consideration, the present study was undertaken with the aim of studying the presence of hyoid bone fractures in hanging cases. The study was conducted in a retrospective manner in the Department of Forensic Medicine, VMMC & Safdarjung Hospital, New Delhi. The data regarding the incidence of hyoid bone fractures were collected by analyzing the postmortem records of hanging cases over an interval of four years from 2009-2012. The presence of hyoid fractures was found to be very rare in cases where cause of death was attributed to hanging.

Key Words: Hanging, Hyoid Bone, Fracture, Asphyxial deaths, Ligature material

Introduction:

The fracture of Hyoid Bone is being looked upon by the Forensic Pathologists as a very important finding in cases of violent asphyxia deaths by compression of neck. The fractures are indicative of compression of neck by external force. [1] Its importance significantly increases when the other findings are not very clear for a case to be labeled as strangulation or hanging. The presence of Hyoid Bone fracture has been documented more in the case of manual strangulation than in cases of hanging or ligature strangulation. [1-3]

There has been considerable difference in various studies regarding the frequency of hyoid Bone fractures in hanging cases.

It has been reported from as low as nil or rare, to as high as 67%. The studies in different countries over the time, regarding the incidence of fracture of hyoid bone in hanging cases have shown variable findings.

Corresponding Author:

*Assistant Professor,
Department of Forensic Medicine and Toxicology,
VMMC& Safdarjung Hospital, New Delhi-110029
E-mail: drayad_in@yahoo.com

** Associate Professor

*Assist. Prof, Dept. of FMT
Army College of Medical Sciences, New Delhi

****Senior Resident,
DOR: 8.5.13 DOA: 6.7.13

Keeping the above discrepancy in view, we undertook the following research, to study the pattern of hanging cases in relation to the incidence of hyoid bone fracture and the reasons for their discrepancies in the studies.

Aims and Objectives:

1. To study the pattern of hanging cases, with regard to criteria of age and sex.
2. To note the frequency of hyoid bone fracture in hanging cases.
3. To review the literature and try to evaluate the reasons of the variations in various studies.
4. To analyze the data and study its feasibility, so as to use it for the differential diagnosis of ligature asphyxial death cases.

Material and Method:

The study was conducted in the Department of Forensic Medicine, Vardhman Mahaveer Medical College (VMMC) and Safdarjung Hospital (SJH). The study was done in a retrospective manner for a period of four years, from January 2009 to December 2012.

The data was collected from postmortem reports of all the cases where cause of death has been attributed to ante-mortem hanging, irrespective of manner, patient's survival time etc.

A total of 186 cases were studied and the collected data was analyzed in relation to age, gender, and presence of hyoid bone fractures. The hyoid fractures, both, whether present alone or present in combination of other laryngeal fractures were taken into count.

Observations and Discussion:

During the four year period from January 2009 to December 2012, a total of 186 cases of hanging were studied. The largest group was found to be 21-30 years, followed by 11-20 years and 31-40 years respectively.

The least incidence was found in the groups 0-10 years and 71-80 years. (Table 1) The previous studies have also reported similar results, with 21-30 years age group being the most commonly involved by different other authors. [4-9] The above findings can easily be explained by the fact that 21-30 years of age group is most susceptible to frustration in life because of many factors like marriage, financial crunch, failure of love affairs, and pressure of making a good career after completion of studies etc.

Further, there is transformation from a student's life, where most of the expenses/responsibilities are taken care of by the parents, to an adult life where they are expected to start earning and share the responsibilities of life. This age group starts a new life with their fresh exposure to world at a different level, and sometimes they are not able to hand this transitional face.

The males to female ratio were 1.7:1. The predominance of the males was in accordance with studies of Singh (1.5:1), Sharma (2.1:1), Meera (3.4:1), Patel (1.5:1) and Reddy (1.4:1). [4, 5, 8-10] Male dominance can be explained by the fact that in Indian society the male members are more expected to bear all the above mentioned responsibilities. So, they have the dual pressure of career and family responsibilities.

In our study out of 186 cases, the fracture of hyoid bone was present in only 1.6% cases (3/186), all on the unilateral Greater Cornu. (Fig. 1) The cases were of all males with their Mean age being 39.3 years. The studies conducted in India by Naik [6] and Patel [9] reported the incidence of fracture of hyoid bone to be nil in hanging cases, Meera [8] in 3.6% and Sai Sudheer [11] in 4% cases.

Rao [12] mentioned the hyoid bone to be intact in 90-95% cases of hanging. Modi [13] mentioned that due to direct lateral compression of the neck the fractures of hyoid bone are rare. Parikh [14] reported the fractures to be rare below forty years of age. Internationally, Feigin [15] also has found only 3.2% cases to be having fractures.

In contrast, various other studies have reported the higher incidence of hyoid bone fracture. [7, 16-23] They mentioned about the

variation of incidence of fractures of hyoid bone from 0-60%, with an average being 15-20% cases. Betz [24] found the incidence of throat skeleton fractures to be as high as 67%.

So why there are so many variations in the frequency of hyoid bone fractures in hanging cases? First, we will have a look at the anatomy of Hyoid Bone of forensic significance. Hyoid bone is a U-shaped structure and lies at the root of the tongue. The bone has a central body, two greater horns which sweep backwards and upwards. The bone is having natural joints between the body and the greater horns.

In teenagers and young adults, the joints are cartilaginous and mobile and they calcify irregularly as the age increases in middle and later life. [1, 2] These natural joints may be mistaken as the fractures, if dissection is not done meticulously. There is also the possibility of fractures being post-mortem, due to incorrect autopsy techniques, inexperienced forensic pathologist, body transit trauma, improper handling in the mortuary etc. [1, 2]

The ante-mortem fractures are usually associated with extravasation of blood at the site. Sometimes it is not apparent to the naked eye, so histological confirmation must be done before labeling it as an ante-mortem fracture. [1]

Knight [1] commented the role of radiography before dissection in such cases, so as to confirm the fractures. Morlid [17] also performed the radiography technique before dissection and found it to be very useful, as very fine bony structures of the small bones were revealed.

Charoonate [16] applied three different methods to detect the fractures and found out that no fractures were revealed, when only visual and palpatory methods were used. Subsequently stereomicroscopy and stereomicroscopy with toluidine blue stain was used, and fractures were found to be present in 15% of the cases. One very important reason for these variations may be the difference of age of the cases in various studies.

In the studies where the incidence was found to be nil, the teenage and young adult were most commonly involved age groups. [6, 9] In our study, the mean age was 28.8 years and cases who were more than 40 years victims were 12.4%. In studies which reported higher incidence, the mean age was also high like, 35 years. [16- 20, 22] Morlid [17] also observed that the different age composition may be the reason behind the variations in the incidence of hyoid bone fractures. Meera [8] also only found the fractures in cases which were more than 40 years of age.

The other factors which can be considered as the reason for these variations are gender, height of suspension, the difference in the types of ligature material and type of hanging. But Feigin [15] concluded that the height of suspension, gender of the decedent and ligature width were not predictive of the Fractures. Nikolic and Charoonnate [16, 18] also concluded that the hyoid bone fracture is not correlated with the type of hanging.

Conclusion:

1. The incidence of hyoid bone was found to be rare in hanging cases. If any such fracture is found in a case with history of hanging, the case should be thoroughly studied regarding the circumstantial evidence and eyewitnesses, and any signs of manual strangulation should also be ruled out.
2. The different age composition may be the reason behind the variations in the incidence of hyoid bone fractures. The higher incidence is found with the increasing age after 35 years.
3. The fracture of hyoid bone should always be confirmed by radiography (before dissection), and histology (after dissection) before labeling it as an ante-mortem fracture.
4. The young adults are most commonly involved age group in hanging. The proper counseling centers should be established, so as to give moral, social and if possible financial support like unemployment allowance etc.

References:

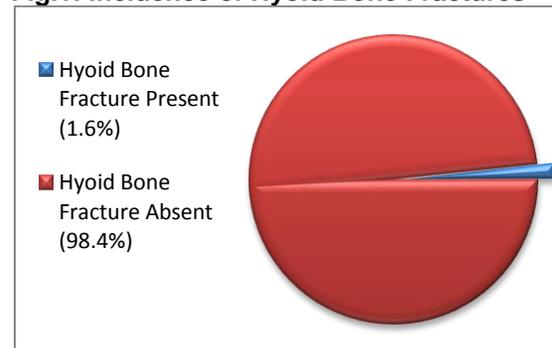
1. Knight B, Saukko P. Knight's Forensic Pathology, 3rd ed. London: Arnold; 2004: p376- 380.
2. Vij K. Textbook of Forensic Medicine and Toxicology, Principals and Practice. 5th Ed. New Delhi: Elsevier; 2011: p122-33.
3. Ubelaker DH. Hyoid Fracture and Strangulation. JrForSci, JFSCA 1992; 37(5): 1216-1222.
4. Singh A, Gorea RK, Dalal JS, Thind AS, Walia D. A study of demographic variables of violent asphyxial death. Journal of Punjab Academy of Forensic Medicine and Toxicology. 2003; 3:32-34.
5. Sharma BR, Harish D, Singh VP and Singh P. Ligature mark on neck: How informative? J Indian Acad Forensic Med. 2005; 27(1):10-15.
6. Naik SK, Patil DY. Fracture of hyoid bone in cases of asphyxia deaths resulting from constricting force round the neck. J Indian Acad Forensic Med. 2005; 27 (3):149-153.
7. Ahmad M, Hossain MZ. Hanging as a method of suicide- Retrospective analysis of postmortem cases. JAFMC Bangladesh 2010; 6(2):37-39.
8. Meera Th, Singh MBK. Pattern of Neck Findings in Suicidal Hanging- A Study in Manipur. J Indian Acad Forensic Med. 2011; 33(4):352-354.
9. Patel AP, Bansal A, Shah JV, Shah KA. Study of hanging cases at Ahmedabad Region. J Indian Acad Forensic Med. 2012; 34(4):342-345.

10. Reddy S, Kumar R, Rudramurthy. Asphyxial Deaths at District Hospital, Tumkur- A Retrospective Study. J Indian Acad Forensic Med. 2012; 34(2): 146-147.
11. Sai Sudheer T, Nagaraja TV. A study of ligature mark in cases of hanging deaths. Int J Pharm Biomed Sci 2012; 3(3):80-84.
12. Rao NG. Textbook of Forensic Medicine and Toxicology. 2nd Ed. New Delhi: Jaypee Brother's Medical Publisher's Pvt Ltd; 2010: p 122-133.
13. Modi JP. Modi's Medical Jurisprudence. 22nd Ed. by Subrahmanyam BV. New Delhi: Lexisnexis; 2002: p256.
14. Parikh CK. Textbook of Medical Jurisprudence Forensic Medicine and Toxicology. New delhi; CBS Publishers: 2001: p3.43.
15. Feigin G. Frequency of neck organ fractures in hanging. Am J. of For Med & Path. 1999; 20(2):128-130.
16. Charoonnate N, Narongchai P, Vongvaivet S. Fractures of Hyoid Bone and Thyroid Cartilage in Suicidal Hanging. J Med Assoc Thai. 2010; 93(10):1211-1216.
17. Morlid I. Fractures of Neck Structures in Suicidal hanging. Med Sci Law. 1996; 36 (1):80-84.
18. Nikolic S, Micic J, Antanasijevic T, Djokic V, Djonic D. Analysis of Neck Injuries in Hanging. Am Jr of For Med & Path. 2003; 24(2):179-182.
19. Luke JL, Reay DT, Eisele JW, BonnellHJ. Correlation of Circumstances with Pathological Findings in Asphyxial Deaths by Hanging: A Prospective Study of 61 Cases from Seattle, WA. JFSCA 1985; 30(4): 1140-1147.
20. Green H, James RA, Gilbert JD, Byard RW. Fractures of the hyoid bone and laryngeal cartilages in suicidal hanging. J Clin For Med. 2000;7(3): 123-126.
21. Uzun I, Büyük Y, Gürpınar K. Suicidal hanging: fatalities in Istanbul retrospective analysis of 761 autopsy cases. J Forensic Leg Med. 2007; 14(7):406-409.
22. Azmak D. Asphyxial Deaths- A Retrospective Study and Review of the Literature. Am Jon of For Med & Path. 2006; 27(2):179-182.
23. Reddy KSN. The essentials of Forensic Medicine and Toxicology. 28th Ed. Hyderabad: K Suguna Devi; 2009: p 301.
24. Betz P, Eisenmenger W. Frequency of throat skeleton fractures in hanging. Am Jon. of For Med & Path. 1996; 17(3):191-193.

Table 1: Age and Sex Wise Distribution

Age grps (yrs)	Male	Female	Total
0-10	00	01	01 (0.54%)
11-20	21	24	45 (24.19%)
21-30	46	30	76 (40.86%)
31-40	32	09	41 (22.04%)
41-50	09	03	12 (6.45%)
51-60	05	00	05 (2.69%)
61-70	03	01	04 (2.15%)
71-80	01	01	02 (1.08%)
TOTAL	117 (62.9%)	69 (37.1%)	186

Fig.1: Incidence of Hyoid Bone Fractures



Original Research Paper

Rape or Pseudo Rape: A Five Year Study of the Medico-legal Cases in Imphal

*Memchoubi Ph., **Kh. Pradipkumar Singh, **Supriya Keisam, ***H. Nabachandra

Abstract

The medico-legal cases brought to the RIMS Imphal are mainly elopement cases. After elopement, disagreement arises between the parties and then a charge of rape is brought against the boy (Sec 366-kidnapping and Sec 375&376-rape). This study was undertaken to find out the incidence, the actual circumstances, the physical findings, the legal consequences and the practical flaw in the rape laws. During the last 5 yrs i.e., from 2007-11, there were 224 medico-legal cases. Majority were rape victims and accused persons. When these rape cases were carefully examined by means of detailed history-taking and personal interview with the victim as well as the accused, they turned out to be elopement cases. Only a few were actual rape cases. Because of the absolute advantage given to the victim in the Rape laws, many a times, the boy suffers punishment even though the act of elopement was committed with mutual consent. This study has brought to light the pseudo rape cases for which innocent men suffer the ill consequences due to the many loopholes in the Rape laws.

Key Words: Rape, Pseudo Rape, Elopement, Rape Laws

Introduction:

Elopement is a taboo in many parts of India. In the North-east, including Manipur, there is no honour killing but in fact leans towards the cultural ideology of love marriage. The 5th episode of Satyameva Jayate spoke highly of North East India's traditions where love was accepted and no honour killings had ever happened. Elopement is not a desirable outcome, but it is not something that will mark our graves. Love finds both acceptance and social sanction in the communities of Manipur.

Elopement has been a traditional practice since time immemorial and is socially accepted and has become a part and partial of the Manipuri customs. Only when disagreement arises between the boy's and the girl's families, these cases are booked under Sec 366 (kidnapping) and Sec 375 & 376 IPC (rape) and are brought to our Department for examination.

When these rape cases were carefully examined by means of detailed history-taking and personal interview with the victim as well as the accused, they turned out to be elopement cases.

Only a few were actual rape cases. Because of the absolute advantage given to the victim in the Rape sentences [2-5] many a times, the boy suffers punishment even though the act of elopement was committed with mutual consent. This study was undertaken to find out the incidence, the actual circumstances, the physical findings & the legal consequences.

Material and Method:

The medico-legal cases brought to the Dept. of Forensic Medicine, RIMS, Imphal were studied under the following headings: Age of victim, caste, education, occupation, marital status, period of acquaintance, initiation of relationship, seasonal variation, residence of victim, place of rape, frequency of meeting, marital status of accused, compensation demand by victim, lapse between occurrence and reporting, abandonment after elopement, general physical finding and signs of violence, local examination findings. Data was collected and analysed.

Results and Observations:

From 2007-11, 224 Medico-legal cases related to kidnapping and rape (booked under Sec 366, 375 & 376 IPC) were examined. Maximum number of victims was above 18 yrs of age. Meiteis were in the majority. Most the victims were below matriculate standard, Unemployed and Unmarried and had been in a relationship with the so-called accused for almost a year with frequent meetings, at least

Corresponding Author:

*Assistant Professor, Dept. of Forensic Medicine, Regional Institute of Medical Sciences (RIMS), Imphal
E-mail: mem010177@gmail.com

**Demonstrator,

***Prof & HOD

DOR: 20.5.13 DOA: 12.8.13

more than 5 times in most of the cases. Elopement cases outnumbered the actual rape cases throughout the study period.

Incidences were highest during February-April. Relationship between the victim and accused were usually started through a friend. Mobile phone played a role to some extent. Rape usually occurred in a friend's house. Demand for compensation was there in some cases. Signs of violence were seen only in a few cases. Cases with old hymenal tears were more than the ones having fresh tears. In some cases, there was more than 1 week lapse in reporting and this was usually associated with demand for compensation.

Discussion:

Victims being above 18 yrs of age and in a relationship with the so-called accused for almost a year with frequent meetings, indicate that the victims were not minors and were in an affair with the accused. [8-11]

Meiteis were in the majority as the dominant community in Manipur is that of the Meiteis. [9-11] Most of the victims were below matriculate standard, unemployed, & unmarried. [9-10] Maximum incidence occurred during February-April (marriage season). Rape usually occurred in a friend's house. Cases with old hymenal tears without signs of violence indicate previous intimacy. [12, 13]

All these facts point towards elopement between consenting parties with the intention of getting married but if disagreement between parents, a charge of kidnapping and rape is brought up against the boy. A Berlin study on the authenticity of rape cases found out of 30 cases, 15 cases were classified as false accounts. [7] The complainants eventually confessed to having fabricated their allegation. The remaining cases were classified as true rapes on the basis of medical and other corroborating evidence.

In this study mobile phones played a role in duping innocent girls by married men leading to a charge of kidnapping and rape brought up by the girl later on. In some of the cases, there was more than 1 week lapse in reporting which was associated with a demand for compensation.

These observations were seen in those cases where the accused person turns out to be a married man and the victim came to know about the matter only after the elopement.

Times of India reported a five-year study by a group of psychologists who assist Delhi Police in investigating sexual assault allegations,

in which, in 18.3% cases, rape is used as a weapon to malign and attempt revenge.

According to 2011(1) Criminal Court Cases 770(S.C) and State of Rajasthan v/s N.K. Accused on 30 March, 2000, [2] it was stated that "It is not necessary that in all cases of rape, there should be injuries on external or internal parts of the victim". Further court stated that "Delay in seeing a doctor or lodging the FIR is not enough to discredit the statement of the victim." [4]

In another case, Madan Lal v/s State of J&K on 6 Aug 1997, [3] Allegations to Head Master by student of attempt to commit rape which was negated by medical evidence but the High court after scrutinizing the matter came to hold that the statement of the victim was so convincing that it did not require any corroboration. In this & another on 29 mar 1992 (Equivalent citations: 1992 SCR (2) 921, 1992 SCC (3) 204, [5, 6] it was stated that "**In the absence of hymenal tear and injury on private parts, accused convicted on victim's statement as Court held satisfactory.**"

Under **Section 376 in The Indian Penal Code, 1860: Punishment for rape [1]** states as "Whoever, except in the cases provided for by sub-section (2), commits rape shall be punished with imprisonment of either description for a term which shall not be less than seven years but which may be for life or for a term which may extend to ten years and shall also be liable to fine unless the woman raped is his own wife and is not under twelve years of age, in which case, he shall be punished with imprisonment of either description for a term which may extend to two years or with fine or with both."

These Court verdicts appear to be slightly one-sided in favouring the victim but in some cases an innocent man may also be punished.

Conclusion:

Sexual assault is tricky to investigate. Wrong convictions can harm the falsely accused and discredit the ordeal of real rape victims. Zero tolerance to sexual crime has a flip side to it. A person's testimony can be taken at face-value in the absence of evidence or corroboration. This study has brought to light the pseudo rape cases for which innocent men suffer the ill consequence. By giving complete favour to the victim innocent men may be punished. If this loophole is overlooked, can the legal system do absolute justice?

References:

1. Section 376 in the Indian Penal Code, 1860

2. 2011(1) Criminal Court Cases 770(S.C) and State of Rajasthan v/s N.K. Accused on 30 March, 2000.
3. Madan Lal v/s State of J&K on 6 Aug 1997.
4. State of Rajasthan vs N.K. Accused on 30 March, 2000
5. Madan Lal Kakkad vs Naval Dubey & another on 29 mar 1992 (Equivalent citations: 1992 SCR (2) 921, 1992 SCC (3) 204.
6. Vijay @ Chinee vs the State of Madhya Pradesh, the Supreme Court
7. Institut für Psychologie, Freien Universität Berlin
8. **Mahopatra J, Mahopatra SC.** The psycho-social impacts of sexual assaults on women and female children. Int J Med Toxi. Leg Med 2002;5(1):8-9
9. **Pradipkumar Kh, Momonchand A.** Alleged rape in and around Imphal. JIAFM 2003; 25(4):147-49.
10. **Bijoy Th, Momonchand A, Fimate L.** Changing pattern of rape in Manipur. JIAFM 2001; 23(3):49-51.
11. **Fimate L, Meera Th.** Rape in Manipur-an analytical study. JIAFM 1998, 1(1):49-54
12. **Bijoy Th, Lepcha OT, Pradipkumar Kh.** A study of child rape in Manipur. JIAFM 2006; 28(4):135-37.
13. **Angam G, Memchoubi Ph, Nabachandra H.** Purity defiled: how safe is your child? A study of child victims of sexual assault in Imphal during 2001-6. JFMT 2006; 23(2):7-11.

Table 1: Age of Victims

Age(Yrs.)	2007 (%)	2008(%)	2009(%)	2010(%)	2011(%)
<12	1	4	3	2	4
<16	0	0	2	6	8
16-18	9	7	3	10	23
>18	16 (61.5)	10(47.6)	23(74.1)	43(70.4)	50(58.8)
Total	26	21	31	61	85

Table 2: Caste of Victims

Caste	2007 (%)	2008(%)	2009(%)	2010(%)	2011(%)
Meitei	19(73)	16(76)	23(74)	47(77)	65(76)
Muslim	4	2	4	12	13
ST	2	0	3	1	5
Others (NM)	1	3	1	1	2
Total	26	21	31	61	85

Table 3: Incidence of Elopement and Rape Cases

	2007(%)	2008(%)	2009(%)	2010(%)	2011(%)
Elopement	73	61	61	68	81
Rape	29	39	39	32	19

Table 4: Educational Status of Victims

Education	2007 (%)	2008(%)	2009(%)	2010(%)	2011(%)
Undermatic	14(54)	10(48)	13(42)	29(48)	29(48)
Matriculate	4	4	12	13	13
Graduate	3	2	3	6	6
Illiterate	5	5	3	13	13
Total	26	21	31	61	61

Table 5: Marital Status of Victims

Marrital Status	2007(%)	2008(%)	2009(%)	2010(%)	2011(%)
Married	4	2	3	3	6
Unmarried	22(85)	19(90)	28(90)	56(92)	79(93)
Divorced	0	0	0	1	0
Widow	0	0	0	1	0
Total	26	21	31	61	85

Table 6: Seasonal Incidence

Season	2007(%)	2008(%)	2009(%)	2010(%)	2011(%)
Nov-Jan	6	5	6	18	20
Feb-Apr	8(31)	7(33)	9(29)	17(21)	21
May-Jul	7	5	7	9	22(26)
Aug-Oct	5	4	9(29)	17	22(26)
Total	26	21	31	61	85

Table 7: Residence of Victims

	2007(%)	2008(%)	2009(%)	2010(%)	2011(%)
Rural	19(73)	20(95)	22(71)	45(74)	71(84)
Urban	7	1	9	16	14
Total	26	21	31	61	85

Table 8: Place of Rape

Place	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)
Friend Place	9(35)	8(38)	8(26)	25(41)	32(38)
Restaurant	1	0	1	5	3
Hotel	0	2	2	3	10
Hostel	0	1	0	1	0
Isolated	3	1	3	2	6
Accused Place	1	2	4	8	13
Victim's Place	2	2	4	1	8
Outside	2	0	2	5	6
Unknown	8	5	7	11	7
Total	26	21	31	61	85

Table 9: Marital Status of Accused

Marrital Status	2007(%)	2008(%)	2009(%)	2010(%)	2011(%)
Married	4	3	10	17	22
Widower	0	0	0	1	0
Unmarried	8	5	2	22	45(53)
Divorced	1	0	0	0	0
Unknown	13(50)	13(62)	19(61)	21(34)	18
Total	26	21	31	61	85

Table 10: Demand for Compensation

	2007(%)	2008(%)	2009(%)	2010(%)	2011(%)
Yes	9	11(52)	6	13	15
No	12(46)	8	17(55)	39((64)	64(75)
Unknown	5	2	8	9	6
Total	26	21	31	61	85

Table 11: Signs of Violence

	2007(%)	2008(%)	2009(%)	2010(%)	2011(%)
Yes	1	1	2	4	7
No	19(73)	18(86)	21(68)	48(79)	72(85)
Unknown	6	2	8	9	6
Total	26	21	31	61	85

Table 12: Local Findings

	2007(%)	2008(%)	2009(%)	2010(%)	2011(%)
Fresh	7	8(38)	11(35)	18	24
Old	12(46)	8(38)	10	30(49)	53(62)
Nil	2	3	3	3	2
Unknown	5	2	7	10	6
Total	26	21	31	61	85

Original Research Paper

Body Height Estimation Based on Foot Length and Foot Breadth

*Arti L. Narde, **A. P. Dongre

Abstract

Estimation of stature is one of the important parameters used for establishing the individuality of a person mostly in mutilated bodies and skeletal remains. This study was undertaken with objectives of reconstruction of stature in both sexes by regression formulae and multiplication factors from percutaneous measurements of foot for this region. The present study was carried out on 640 (343 males and 297 females) young and healthy individuals of age group 18-23 years studying in Indira Gandhi Government Medical College, Nagpur. The body height, foot length and foot breadth of both sides was measured separately. Independent linear regression equations and multiplication factors were derived.

It was observed that males were having greater mean value of stature, foot length, and foot breadth as compared to females. The positive value of 'r' suggests a direct correlation between stature and foot length as well as foot breadth in both sexes. Multiplication factors were also derived for estimation of stature from percutaneous measurement of foot.

Key Words: Foot length, Foot breadth, Percutaneous measurement, Stature

Introduction:

Anthropometry is being widely used in medical sciences especially in Forensic Sciences for identification of an individual which is an important step in crime investigation. Various parameters used for identification are determination of age, sex, race, etc.

Reconstruction of stature is one of the important parameters used for establishing the individuality of a person mostly in cases of mutilated bodies and skeletal remains.

Apart from this, the estimated height narrows down the area of search for an investigator. Many sets of regression equations have been calculated for estimation of stature from cadaveric bones and skeletal remains in recent years [1-3], however, the earlier work done in India was limited to estimating stature based on multiplication factors only.

Although different researchers have ventured percutaneous bone dimensions of the living population of India to formulate either regression equations or multiplication factors for reconstruction of the stature [4-6].

Such regression formulae or multiplication factors have limited application as they are specifically computed for a particular population for estimation of the stature. Computation of stature from these formulae is not appropriate for other population as climate, heredity, and nutritional status of population has been reported to have an effect on stature and length of long bone. Thus the study of resident of one region is not necessarily applicable to the resident population of other region. Different formulae will be required for calculating the stature for different population.

Keeping this in mind, this study was undertaken with objectives of reconstruction of the stature in both sexes by regression formulae and multiplication factors from percutaneous measurements of foot for this region.

Materials and Method:

The present study was conducted in the Department of Forensic Medicine, Indira Gandhi Government Medical College, Nagpur after getting approval from Institutional Ethical Committee. The material comprised of 640 (343 males and 297 females) young and healthy individuals of age group 18-23 years studying in Indira Gandhi Government Medical College, Nagpur. Since maximum height of an individual is attained between 18 to 23 years, only these individuals were selected for the study. Subjects having any significant disease or deformities, which could have affected the general or bony

Corresponding Author:

* Assistant Professor,
Department of Forensic Medicine,
NKPSIMS&RC, Nagpur
E-mail: artinarde@rediffmail.com
**Dean, GMC, Yeotmal
DOR: 15.1.13 DOA: 14.8.13

growth, were excluded from the study. Prior to examination, the students were addressed regarding the purpose and procedure and their informed consent was obtained.

Measurements of both feet for length and breadth were taken separately in centimeters as follows:

1. Stature:

The subject was asked to stand barefoot on the base of a standard stadiometer in a standard standing position. The individual was instructed to stand barefoot, both feet in close contact with each other, trunk braced along the vertical board on the stadiometer with head oriented in ear-eye plane and the lateral palpebral commissure and the tip of the auricle of the pinna in a horizontal plane parallel to that of the feet. The measurement was taken in centimeters as the distance between the standing surface and the highest point on the head (vertex) by bringing the sliding bar to the vertex.

2. Foot Length:

With the help of sliding caliper, foot length was measured as a straight distance between the most posterior projecting points of the heel (Pternion) to the most anterior projecting point (Acropodion) of the first or second toe whichever was bigger, when the foot was fully stretched.

3. Foot Breadth:

With the help of sliding caliper, foot breadth was measured as a straight distance from metatarsale tibial (the most medially placed point on the head of the first metatarsal) and metatarsale fibulare (the most laterally placed point on the head of the fifth metatarsal), when the foot was fully stretched.

All the above measurements were tabulated and subjected to statistical calculations and final results were further analyzed.

Results:

A total of 640 (343 males and 297 females) healthy individuals of age groups 18-23 years were included in the present study and percutaneous measurements of length and breadth of foot of both sides were taken separately and analyzed.

• **Stature:**

The stature in males varied from 150.00 cm to 198.00 cm whereas in females' stature varied from 140.00 cm to 178.00 cm. It was observed that males have greater mean value of stature as compared to that of females. (Table 1)

• **Foot Length:**

In males, the right foot length (FLRT) ranged from 22.700 cm to 29.800 cm and the left foot length (FLLT) ranged from 22.800 cm to 29.900 cm. In females, the right foot length varied from 21.600 cm to 28.100 cm and the left foot length varied from 21.600 cm to 28.200 cm (Mean=24.324 cm and SD= 1.431 cm). (Table 2)

• **Foot Breadth:**

In males, the right foot breadth (FBRT) varied from 8.700 cm to 11.600 cm and left foot breadth (FBLT) varied from 8.700 cm to 11.700 cm. In females, right foot breadth varied from 8.200 cm to 11.100 cm and the left foot breadth varied from 8.300 cm to 11.200 cm. (Table 3)

a. Estimation of Stature:

Linear regression equations were derived for estimation of stature from foot length and breadth of right and left side which are given as under:

Stature=9.01+5.96 FLRT±1.738 cm (for total males), 'r'=0.9700

Stature=8.57+ 5.96 FLLT±1.813 cm (for total males), 'r'=0.9669

Stature=53.0+4.26 FLRT±0.992 cm (for total females), 'r'=0.9869

Stature=53.3+4.23 FLLT±1.057 cm (for total females), 'r'=0.9848

Stature=29.6+13.5 FBRT±1.585 cm (for total males), 'r'=0.9751

Stature=31.0+13.2 FBLT±1.768 cm (for total males), 'r'=0.9690

Stature=51.3+11.2 FBRT±1.055 cm (for total females), 'r'=0.9853

Stature=51.5+11.1 FBLT±1. 311 cm (for total females), 'r'=0.9772

The positive value of 'r' suggests a direct correlation between stature and foot length and foot breadth.

b. Multiplication Factors:

Multiplication factors were also derived for estimation of stature from percutaneous measurement of foot. If these measurements are multiplied by the respective multiplication factor, the approximate height of an individual can be obtained. (Table 4)

Females exhibits greater mean multiplication factor and SD values for foot length and foot breadth for right and left side as compared to males thereby unfolding the fact that the males and females have variable proportion of their lower limb dimensions with the stature in living population.

Discussion:

The identification of skeletal remains and mutilated bodies is essential for both legal and humanitarian reasons. Reconstruction of

stature is one of the essential parameter for the same. Various anthropologists, anatomists and Forensic experts took interest in devising ways of reconstructing the stature of living individuals from skeletal remains.

The present study was aimed at reconstruction of stature from percutaneous measurements of feet by formulating linear regression equations and multiplication factors. For this purpose, various measurements included in the study were length and breadth of feet. The measurements were taken for right and left side separately and were subjected to statistical computation so as to derive independent formulae for the all the parameters.

A total of 640 (343 males and 297 females) healthy individuals of age group 18-23 years were included in the present study. Since maximum height of an individual is attained between 18 to 23 years, only these individuals were selected for the study. Similar age group studies were carried out by Rani M et al and Nath S et al. [6, 7]

The stature estimated in the present study in males varied from 150.00 cm to 198.00 cm (Mean =170.75 cm and S.D. =7.13 cm) whereas in females stature varied from 140.00 cm to 178.00 cm (Mean =156.28 cm and S.D. =6.15 cm). It is also observed that males have greater mean value of stature as compared to that of females.

The stature obtained by different researchers such as Duyar I et al [5], Nath S et al [7], Qamara SR et al [8], and Ozaslan A et al [9] varies due to geographical variations and variations in the morphology of different population group, however they had also noticed that males have greater mean value of stature as compared to females.

In the present study, in males, the right foot length ranged from 22.700 cm to 29.800 cm and the left foot length ranged from 22.800 cm to 29.900 cm. While right foot breadth varied from 8.700 cm to 11.600 cm (and left foot breadth varied from 8.700 cm to 11.700 cm. In females, the right foot length varied from 21.600 cm to 28.100 cm and the left foot length varied from 21.600 cm to 28.200 cm. The right foot breadth varied from 8.200 cm to 11.100 cm and the left foot breadth varied from 8.300 cm to 11.200 cm.

The foot length noticed by different workers such as Nath S et al [7], Qamra SR et al [8], Ozaslan A et al [9], and Nath S et al [10] do not tally with our findings because of many factors like racial, ethnic and nutritional factors and geographical variations, which play an

important role in human development and growth.

In our study, linear regression equations for estimation of stature from foot length and foot breadth were derived. High positive value of 'r' i.e. correlation coefficient suggests that there exists a direct relationship between these parameters and stature.

Foot length and breadth for estimation of stature by use of regression formula have been explored by Qamra SR et al [8] and he reported that foot length appeared to be a suitable measurement than foot breadth for stature estimation.

Giles E et al [11] presented linear regressions for determining height from foot length for males and females and it was found that foot length displays a biological correlation with height. However in the present study both foot length and foot breath are found good predictor for estimation of the stature in both sexes. Our findings are in concordance with Gordon CC et al [12] who suggested that for estimation of stature both foot length and foot breadth are significantly better.

Singh TS and Phookan MN [13] studied the correlation between stature, foot length and foot breadth among four Thai population of Assam, but in their study only male population was studied and it was suggested that estimation of stature from foot length is preferable than from foot breadth.

In this study, both males and females have been taken into consideration and observed that the stature can be estimated from both foot length and foot breadth.

In our study, multiplication factors were also computed for foot length and foot breadth for both sexes. In males, multiplication factors for right foot length 6.29, left foot length 6.27, right foot breadth 16.29, and left foot breadth 16.18 whereas in females for right foot length 6.44, left foot length 6.43, right foot breadth 16.75, and left foot breadth 16.64.

However multiplication factors derived from studies conducted by various research workers such as Rani M et al [6], Nath S et al [7], Nath S et al [10], Jain P et al [14], Jain P et al [15] are not similar with our findings.

The similarities and variations obtained in multiplication factors values of above measurements in different Indian population is the direct outcome of the variation in the morphology of different population group of India. It may also be emphasized that all measurements exhibit high value of correlation in both sexes and thus any of these lengths would offer a reliable estimate of the stature for

both males and females of this region. Therefore depending upon the availability of the body parts, stature may be estimated using linear regression equations and multiplication factors with reasonable accuracy. The stature can be accurately and satisfactorily estimated for medico-legal and forensic purposes since bilateral and bisexual differences have been taken into account while devising the linear regression equations and multiplication factors.

Conclusion:

It is concluded that males have greater mean value of stature as compared to that of females. It was also observed that there is direct relationship between foot length and foot breadth with the stature in both sexes. These regression equations and multiplication factors are specific for this region only because of geographical variations in the morphology of different population group.

References:

1. **Pan N.** Lengths of long bones and their proportions to body height in Hindus. *J Anatomy* 1924; 58: 374-378.
2. **Nat BS.** Estimation of stature from long bones in Indians of the United Provinces: A medico-legal inquiry in anthropometry. *Indian. J Med Res* 1931; 18: 1245-1263.
3. **Trotter M, Glessner GC.** A re-evaluation of stature based on measurements taken during life and of long bones after death. *Am J Phys Anthropol* 1958; 16: 79-123.
4. **Allbrook D.** The estimation of stature in British and East African males based on tibial and ulnar bone lengths. *J For Med* 1961; 8: 15-28.
5. **Duyar I, Pelin C, Zagypayan R.** A new method of stature estimation for forensic anthropological application. *Anthrop Sci* 2006; 114:23-27.
6. **Rani M, Tyagi AK, Verma SK, Kohali A.** Estimation of stature from percutaneous measurements of legs (1999-2000). *J of For Sci Jan-June* 2004; 21(1):12-14.
7. **Nath S, Jain P.** Use of lower limb measurements in estimation of the stature. *Forensic-Anthropology Science and Medicine*. 1st Edn. Delhi: Kamla-Raj Enterprises; 2005. p. 37-43.
8. **Qamra SR, Jit I, Deodhar SD.** A model of reconstruction of height from foot measurement in an adult population of Northwest India. *Indian J Med. Res.* 1980; 71:77-83.

9. **Nath S, Kaur S, Jain P, Joshi PC.** Reconstruction of stature among Rajputs and Brahmins of Srinagar, Garhwal (U.P.). *South Asian Anthropologist* 1999; 20(2): 63-66.
10. **Ozaslan A, Iscan MY, Ozaslan I, Tugcu H, Koc S.** Estimation of stature from body parts. *For Sci Inter* 2003; 132:40-45.
11. **Giles E, Vallandigham PH.** Height estimation from foot and shoeprint length. *J Forensic Sci* July 1991; 36(4): 1134-1151.
12. **Gordon CC, Buikstra JE.** Linear models for the prediction of stature from foot and boot dimensions. *J Forensic Sci* May 1992; 37(3): 771-782.
13. **Singh TS, Phookan MN.** Stature and foot size in four Thai communities of Assam, India. *Anthropol Anz* 1993 Dec; 51 (4):349-355.
14. **Jain P, Kaur S, Nath S.** Reconstruction of stature from hand and foot dimensions among male Brahmins of Kumaon (India). *J Indian Acad For. Sci* 1996; 35(1-2): 22-29.
15. **Jain P, Roy S, Nath S.** Estimation of stature through measurements of hand and foot among female Jats of Delhi. *Anthropologists* 1999; 1(3): 171-173.

Table 1: Stature (cm) in Males and Females

Stature	Total males (n=343)	Total females (n=297)
Minimum	150.00	140.00
Maximum	198.00	178.00
Mean	170.75	156.28
S.D.	7.13	6.15

Table 2: Foot Length (cm) in Males and Females

Measurements	Foot Length			
	Males		Females	
	Rt. Side	Lt. side	Rt. side	Lt. side
Minimum	22.700	22.800	21.600	21.600
Maximum	29.800	29.900	28.100	28.200
Mean	27.141	27.199	24.258	24.324
S.D.	1.161	1.157	1.425	1.431

Table 3: Foot Breadth (cm) in Males and Females

Measurements	Foot Breadth			
	Males		Females	
	Rt. Side	Lt. side	Rt. side	Lt. side
Minimum	8.700	8.700	8.200	8.300
Maximum	11.600	11.700	11.100	11.200
Mean	10.485	10.553	9.337	9.398
S.D.	0.517	0.522	0.539	0.539

**Table 4
Multiplication Factors for Foot Length & Foot Breadth in Males and Females**

Population	Multiplication factors for foot length and foot breadth			
	Right side	Left side	Right side	Left side
Male: Mean (SD)	6.2921±0.06	6.2786±0.07	16.2917±0.21	16.1877±0.23
Female: Mean (SD)	6.4497±0.13	6.4324±0.13	16.7556±0.34	16.6462±0.35

Original Research Paper

Head in Homicides: A Post-mortem Study From North East India

*Yogender Malik, **Ritu Raj Chaliha, ***Pushpendra Malik, ****Kalpana Sangwan, *****Chhavi Rathi

Abstract

The violence is endemic in nature with periods of exacerbation and remissions. It is a dynamic process. Weapons are easily available especially in NE Region of country legal as well as illegal. All these have increased rate of trauma, of which, head trauma is amongst commonest, vital and inescapable consequence. Out of Total 70 homicide cases during study period of 1st August, 2009 to 31st July 2010, 82.2% had head injury component. Most common weapon used was blunt weapons (44.83%). Defence wounds were absent in 95% cases. Contusions (44.83%) were commonest scalp injury. Fissure fracture is most common skull fracture followed by depressed fracture and most common intracranial haemorrhage was subdural. Head injury was cause of death in 65.52% cases of homicides with head injury component. Correct interpretation of head injuries is vital for reconstruction of events for Forensic Medicine as well as for providing correct data to policy makers.

Key Words: Violence, Homicide, Weapons, Trauma, Injuries

Introduction:

Head is prime target in assaults. Simpson pointed out that if the marks of violence are over the top of the head, it is highly probable that they have been caused by a weapon. [1] Dikshit et al found in his study that defence wound was found in 40 (28.58%) cases out of 140 cases. [2] In India, most scalp injuries were homicidal, and are generally produced by blunt weapons, for example, a lathi, a stone or a wooden pestle (musal) and occasionally by a cutting instrument, such as gandasa, khurpi, an axe or a sword. The injuries are commonly contusions and lacerated wounds, as well as incised and punctured wounds. [3]

Synder observed that injuries found on the back of the head are likely to be more fatal than other part of the head. [4] Padhi B and Mishra KK found tangia, a typical sharp weapon, most commonly used and in 31.5% cases head was the target of assault. [5]

In a study of firearms 54.6% of the cases died due to bullet injury in their chest, followed by the head and neck with 33.3% of the total cases. [6]

Materials and Methods:

This study was conducted on medico legal cases coming for autopsy in Department of Forensic Medicine, Gauhati Medical College and Hospital (GMCH), Guwahati during the period of 1st August, 2009 to 31st July 2010. Data relating to trauma incident and victim were collected from the records of investigating police officers and hospital record. Facts regarding the event were obtained from accompanying relatives, friends of the deceased, eye witness etc. if found reliable.

Observations and Results:

In present study conducted at Gauhati Medical College and Hospital (GMCH), Guwahati during the period of 1st August, 2009 to 31st July 2010, out of total 70 homicide cases 82.2% had head injury component. (Table 1) In the study, we found that most common weapon used in 26 cases of homicide were blunt weapons (44.83%). In 19 cases heavy sharp cutting weapons were used (32.76%). (Table 2)

In our study we observed defence wounds were present in only 3 cases (5%) of homicides and in 55 they were absent (95%). (Table 3) Among all injuries contusions were commonest in scalp injury. (Table 4) In this study we observed that 79.3% of the homicide cases with head injury had fracture skull. Fissure

Corresponding Author:

*Assistant Professor, Dep. of Forensic Medicine
BPSGMC for Women, Khanpur Kalan, Sonapat,
Haryana

E-mail: dryogendermalik@gmail.com

**Prof and Head, Dept. of FMT
Gauhati Medical College and Hospital, Guwahati

*** SR, Dept. of Onco-Surgery,
Pt BD Sharma PGIMS Rohtak

****Dental Surgeon

*****Medical officer (Haryana Civil Medical Services)

DOR: 16.03.10 DOA: 04.10.13

fracture was most common skull fracture. (Table 5) In present study most common intracranial haemorrhage was subdural occurs in 75.86% cases followed by subarachnoid and extra-dural haemorrhages. (Table 6) Head injury was cause of death in 65.52% cases of homicides with head injury component in this study. (Table 7)

Discussion:

Out of total 70 homicide cases (2.83% of the total cases) during study period, 82.2% had head injury component. Other studies also showed preponderance of head in homicides. [7] Most common weapon used was a blunt weapon (44.83%) which is consistent with findings of some [3, 7] and in variance to findings of others who found tangia, a typical sharp weapon, most commonly used. [5] This could be due to availability of particular types of weapon in household of a particular region of the country.

Defence wounds were absent in 95% cases which is in variance with the earlier study where defence wound were seen in 28.58% cases. [2] This could be due to difference in length of study period and different settings of homicides in different parts of country.

Contusions (44.83%) were commonest scalp injury which is consistent with findings of earlier work. [3] Fissure fracture is most common skull fracture followed by depressed fracture. Most common intracranial haemorrhage was subdural. Head injury was cause of death in 65.52% cases of homicides with head injury component. This shows the intention with which injuries are inflicted because brain is vital organ and injury to it will cause death. [7]

Conclusion:

The most basic instinct of the person when he is assaulted is to save his head. Head injuries are serious and require immediate attention to save life of the patient. So, it is imperative that the doctors are sensitized and casualty department is equipped with all the facilities required to save life of the patient.

References:

1. **Simpson K.** Taylor's Principles and Practice of Medical Jurisprudence. 12th edition. Publisher J&A Churchill Ltd. 1965. Vol.1
2. **Dikshit PC et al.** Comprehensive study of homicides in South Delhi, 1969-79. Med. Sci. Law; 26(3): 230-234.
3. **Mathiaran K and Patnaik AK.** Modi's Textbook of Medical Jurisprudence and Toxicology. 23rd edition. LexisNexis Butterworth's, 2006. P. 796.
4. **Synder LM.** Homicide investigation. 3rd ed. Charles C Thomas. 1977. P. 307.

5. **Padhi B, Mishra KK.** 1980. Pattern of trauma in female homicidal victims in Southern Orissa. JIAFM, 1980(1): 3-6.
6. **Potwary A.J.** Study of pattern of injuries in homicidal Firearm injury cases. JIAFM, 2005: 27 (2). 92-95.
7. **Mishra PK, Yadav J, Singh S, Dubey BP.** Pattern of injuries in homicidal deaths in Bhopal region. JIAFM, 2012: 34(3). 195-8.

Table 1: Cases during Study Period in Dept. of Forensic Medicine, GMCH, Guwahati

Cases	Numbers
Total Cases	2474
Head injury	815
Homicides	70
Homicides with head injury	58

Table 2: Type of Weapon Used in Homicide Cases

Weapon (Homicide Cases)	Cases (%)
Blunt	26 (44.83)
Sharp	19 (32.76)
Firearm	7(12.1)
Bomb Blast	3(5.1)
Ligature/Manual Strangulation	3(5.1)
Total	58(100)

Table 3: Defence Wound in Homicide Cases

Defence Wound	Cases (%)
Present	3(5)
Absent	55(95)

Table 4: Scalp Injuries in Head Injuries Cases

Scalp Injuries	Cases (%)
Contusion	26 (44.83)
Laceration	11(18.96)
Stitch wound	12 (20.69)
Hematoma	2(3.45)
Puncture wound	6(10.34)
Incised wound	7(12.07)
Chop wound	1(1.72)

Table 5: Types of Skull Fractures in Head Injury Cases

Types of Skull Fracture	Cases
Fissure	14(24.14)
Depressed	10(17.24)
Depressed comminuted	9(15.52)
Suture	4(6.89)
Base	4(6.89)
Perforation	4(6.89)
Non specific	19(1.72)

Table 6: Types of Intracranial Haemorrhages and Brain Injuries

Intracranial Haemorrhages/Brain Injuries	Cases (%)
Extra dural	7(12.07)
Subdural	44(75.86)
Subarachnoid	9(15.52)
Cerebral contusion	2(3.45)
Cerebral laceration	18(31.03)
Intra cerebral haemorrhages	5(8.62)
Cerebellum injuries	3(5.17)
Intraventricular haemorrhage	5(8.62)

Table 7: Cause of Death

Cause of Death	Cases (%)
Head injury	38(65.52)
Haemorrhage & Shock	7(12.07)
Head injury + Haemorrhage & Shock	10(17.24)
Asphyxia	3(5.17)

Original Research Paper

A Medico-Legal Study of Hair dye Poisoning

*Yadaiah Alugonda, **Bala Maddileti, **J. Naga Lingam, ***Y.K.C. Rangaiah

Abstract

Hair dye is one of the beauty preparations from ancient times. Hair dyes contain many chemical compounds like Anilene derivatives including Para-Phenylene Diamine (PPD) and Resorcinol. Among these compounds, PPD is most dangerous as it causes immediate anaphylaxis. As hair dyes are cheaply and easily available in market, people are more accessible to those products. A total number of 25 hair dye poisoning deaths were analysed during the study period. This study was shown that there is a steady rise in incidence of fatalities from hair dye poisoning. Liquid hair dyes like Supervasol are the most commonly used for poisoning. Majority of the postmortem findings are non specific and histopathological changes are responsible for various morphological features. Chemical analysis revealed the presence of PPD Compound invariably in stomach contents. Use of Anilene derivatives in hair dye preparations should be restricted and readymade hair dye preparations should not be encouraged to produce and purchase. Emotional support decrease suicidal tendency in sensitive peoples. Hair dyes should be kept in non accessible areas to prevent accidental poisoning in children.

Key Words: Hair dyes, Para-Phenylene Diamine (PPD), Anaphylaxis, Laryngeal edema, Respiratory failure, Acute Tubular Necrosis and Renal failure, Suicides

Introduction:

Hair dye is one of the oldest known beauty preparations. [1] Most of the commercial hair dyes contains many chemical compounds like Ammonia and Anilene derivatives. [1] Para-Phenylene Diamine is responsible for ill effects of its poisoning. Hair dye poisoning is most common with suicidal manner especially in women. [5][10] Systemic features of hair dye poisoning occur in two phases.

Acute presentation of cervical edema, airway obstruction, gastritis and vomiting are seen in Phase-1. [3] Sub acute presentation of haemolysis, rhabdomyolysis [12] and renal failure are seen in Phase - 2. [3] Anaphylaxis reactions like cervical swelling, facial edema and laryngeal edema are the common postmortem findings. Acute tubular necrosis is the common histological finding in hair dye poisoning. Mortality rate is 24% in hair dye poisoning. [11]

Corresponding Author:

*Assistant Professor,
Department of Forensic Medicine,
MNR Medical College, Andhra Pradesh, India
Email ID: yadi2k1@gmail.com

**Assist. Prof, Meenakshi Medical College,
Emathur, Kanchipuram, TamilNadu

**Assist. Prof, MNR Medical College,
Andhra Pradesh, India

***Post Graduate, Gandhi Medical College,
Secunderabad, Andhra Pradesh
DOR: 17.6.13 DOA: 31.08.13

PPD is detected invariably detected in stomach contents on chemical analysis.

In recent years, incidence of hair dye poisoning is increased in Andhra Pradesh especially in Hyderabad, Secunderabad, Kadapa and Chittoor districts. Increasing suicidal tendencies, easy availability of readymade hair dyes at cheaper price over the general stores and lack of emergency equipment at primary and secondary health centers are the few important causes for hair dye poisoning fatalities. [15] So the present study is small attempt to estimate the magnitude of problem.

Materials and Methods:

The present study was conducted in Department of Forensic Medicine, Gandhi Medical College, Secunderabad. In this study 25 cases of fatalities from hair dye poisoning in and around Secunderabad and Hyderabad regions were investigated. It includes retrospective study and postmortem examination of 25 cases brought to the Mortuary, Gandhi Hospital, Secunderabad by the police official during two years period from July 2009 to June 2011.

Inquest report, evidence of empty hair dye bottles or sachets at the crime scene and hospital data help in suspecting hair dye poisoning. Demographic data of hair dye poisoning fatalities like incidence, age, sex, marital status, manner of poisoning, fatal dose & fatal period of hair dye poison, histopathological

findings, postmortem findings and chemical analysis reports were studied.

Observations and Results:

Postmortem examinations performed on poisoning cases constitute nearly 9.77% in all medico-legal autopsies done at Gandhi Mortuary during the 1st year of study and 10.04% during the 2nd year of study. Hair dye poisoning postmortems constitutes 0.23% during the 1st year of study and 0.287% during the 2nd year of study showing that slight increase in incidence. (Table 1)

In our study highest incidence was recorded in the 21-30 years age group i.e. 11 cases (44%), followed by 11-20 years age group which recorded 6 cases (24%). Below 10 years aged children and above 50 years aged adults incidence is very less. (Fig. 1)

In the present study Females (64%) outnumber the males (36%). [5] Hair dye poisoning was seen more among the married males 15 cases (60%) and females 10 cases (40%) when compared with unmarried males 10 cases (40%) and females 6 cases (24%).

The overall poisoning rate is low in unmarried males. (Fig. 2) Maximum number of poisoning cases were suicidal in manner 21 cases (84%) followed by accidental in nature 4 cases (16%) and least cases one was homicidal in nature (4%). [7][16] (Fig.3)

Present study showed that Liquid hair dyes are occupying the major position 24 cases out of 25 in hair dye poisoning. But non-liquid varieties are playing a minor role only 1 case out of 25. (Table 2) The majority of cases 19 cases (76%) died due to 100 ml of liquid hair dye and died during the first 48 hours 18 cases (72%) after the ingestion of hair dye. (Table 3)

The postmortem findings were observed during the autopsies conducted on the hair dye poisoning death cases. Among these findings congestion of gastric mucosa was most common (92%), followed by facial swelling (84%), edema lungs (84%), brown colour hypostasis (80%), cervical swelling (80%), protruded tongue (76%) and laryngeal edema (72%). Congestion of brain & meninges (64) is the least common. (Fig. 4)

In our study histopathological examination was conducted in hair dye poisoning fatalities. On examination gastric mucosal infiltration with lymphocytic cells was the most common finding and the laryngeal tissue cells edema is least common among the all. (Table 4) The viscera collected during the autopsies of hair dye poisoning fatalities are subjected to chemical analysis at State Forensic Science Laboratory. This study showed that

Para Phenylene Diamine is found in all cases in their stomach. [8] (Table 5)

Discussion:

The results and observations of the present study were compared with the preceding studies and research works. Hair dye poisoning fatalities had contributed up to 0.230% in the first year of study, 0.287% in the second year of study thereby showing an increase of 21.4% even though the total number of autopsies had showed a marginal increase of just 92 autopsies. Above observations indicates that the raising tendency of hair dye poisoning fatalities in accordance to easy availability, cheap price, increase urbanization and referral to tertiary hospital due to lack of sophisticated emergency management equipment in peripheral hospitals.

In the present study, the 3rd decade age group (21-30 years) were occupied the major part (44%). The age period from 21 to 30 years is most active time in life of any person. The majority of decisions regarding life taken and majority of the problems faced during this period. **National Crime Records Bureau** [2] study on Accidental and Suicidal Deaths in 2009 showed that suicides were more in 15-30 years age group people is comparative with the present study.

Here the females were outnumbered (64%) when compared with the male (36%). Among the females, incidence in married women is more. Majority of study population have motive for committing suicide. For several reasons females are occupying major area in the total number of study age group. This is not going in parallel with the western studies.

Lack of exposure to the outer world, inability to adjust with in-laws and house environment etc were played prominent role in taking the lives of females. Hair dye poisoning is most common with suicidal intension (80%), followed by accidental intension (16%) and least by homicidal intension (4%). For the high rate of suicides various reasons are present.

Among that easy availability at any time at home, cheap price and available in readymade form are common reasons for suicidal poisoning. Accidental poisoning is common in children, but it is less frequent than suicidal poisoning. There is few accidental poisoning occurred under influence alcohol in adult. Homicidal poisoning is very rare, but it occurred in non-resistant people and children.

National Crime Records Bureau [2] study on Accidental and Suicidal Deaths in 2009 showed that suicides increased by 1.7% compare to previous year and Andhra Pradesh

placed in 2nd position among the all states of India. These suicidal deaths accounting with poisoning are around 33.6% and Andhra Pradesh is in number one position in the aspect of suicidal deaths with poisoning. The present study is also comparative with above study i.e. hair dye poisoning cases were almost suicidal and accidental in nature (96%).

Among the all hair dyes liquid varieties like Supervasmol are responsible for most of the cases (96%). Non-liquid hair dyes like Loreal, Godrej Black are responsible for very few cases. As liquid varieties available at cheap price in readymade form in any of the general stores it usually using as a poison.

Majority of deaths (72%) were occurred in early period i.e. death in first 48 hours. It occurs due to respiratory failure and late deaths (>48 hours) are due to renal failure mainly and few cases are due to hypoxic shock. [13] [6] Majority of deaths 19 cases (76%) occurred from ingestion of 100 ml liquid hair dye. Ingestion of more than 100 ml causes severe and immediate vomiting, that results in elimination of poison. So fatalities from more than 100 ml of liquid hair dye are less. Fatal dose without medical intervention is usually 100ml of quantity and fatal period without medical intervention is 48 hours.

Among postmortem findings congestion of gastric mucosa is most common finding as hair dye enters into stomach and irritates gastric mucosa. PPD is absorbed by stomach and also impregnated in gastric mucosa, which is responsible for leucocytic infiltration. Facial swelling, neck swelling and protrusion of tongue are the common findings and appear due to angio-neurotic edema. Laryngeal edema (Photo 1) is also a feature of angio-neurotic edema.

Brown colour hypostasis is common due to presence of Aniline derivatives in hair dye. Respiratory failure is responsible for bluish discoloration of nails. Stomach contents have the peculiar smell due to the pungent nature of hair dye. Generalized congestion of viscera is common in any type of poisoning due to toxicity of substance on each organ and due to respiratory interruption. Congestion of brain & meninges is least common finding.

On histopathological examination, gastric mucosal infiltration with leucocytic cells is the most common and the laryngeal tissue edema is least common among the all findings. PPD is absorbed by gastric mucosa and pertinent for long time. So the lymphocytic infiltration taken place and is remain for a longer period. Laryngeal tissue showed swelling of cells in 68% cases. Nephrotoxicity is the one of the

main effect of PPD and it is responsible for acute tubular necrosis. [4] [9] [10] [14]

On histological examination of kidney cut section showed increased cellularity of glomeruli in 84%, swollen tubular lining cells with pale cytoplasm in 76% and focal areas of total loss of tubular lining cells in 72%.

On histological examination of liver cross section showed that focal areas of fatty change and central vein dilatation in 48% due to systemic toxicity. [9] Para Phenylene Diamine is found in all hair dye poisoning fatalities in their stomach. The poison may be wholly or partially eliminated in the excreta or during the gastric lavage. Hence in all the cases of suspected poisoning it is essential that the vomitus and other excreta passed by the deceased and the stomach wash preserved by the medical officer during the treatment, must be subjected for chemical analysis.

Conclusions:

The current study was conducted and the data generated were compared with the work done by previous researchers. The incidence of hair dye poisoning fatalities is on rise in recent years in Hyderabad and Secunderabad areas. It is more common in females rather than in males, more common married personnel rather than in singles. Fatal dose and fatal period are varies depending on the weight and age of the person & ingested dose. Majority of the postmortem findings are non specific and are seems to be of asphyxia.[8]

Chemical analysis revealed the presence of PPD Compound invariably in stomach. But PPD does not found in other organs even in blood, because of its rapid metabolism in liver. Use of Aniline, Ammonia derivatives like PPD in hair dye preparation should be restricted to prevent hair dye poisoning fatalities. Readymade hair dye preparations like liquid and semi-solid should not be encouraged to produce and purchase.

Emotional support should be given to the suicidal tendency peoples. Hair dyes should be kept in non accessible areas to prevent accidental poisoning in children.

References:

1. Catherine Cartwright Jones. in Book of "Henna for 'How to' Henna, 2006.
2. National Crime Records Bureau, Study on Accidental and Suicidal Deaths in 2009.
3. Sumeet Singla, Sanjeev Miglani, A. K. Lal, Pulin Gupta and A. K. Agarwal. Para Phenylene Diamine (PPD) Poisoning, a case report, Journal of Indian Academy of Clinical Medicine, Vol. 6, No. 3, July-September, 2005.
4. Chugh KS, Malik GH, Singhal PC. Acute renal failure following Para Phenylene Diamine (hair dye) poisoning report of two cases. J. Med. 1982 13: 131-137. PMID: 6956650.

5. P. K. Jain, Navneet Agarwal et al. Prospective Study of Ingestional Hair dye Poisoning in Northern India, Journal of Clinical Medicine and Research, January 2011.
6. Reddy IS, Somani VK, Swrnalatha G, Maitra S. Nephrogenic Systemic Fibrosis following hair dye ingestion, Indian Journal Dermatology & Venereology, July-Aug 2010.
7. Susheel Kumar. A Case Report of Suicide by Para-Phenylene Diamine, Journal of Indian Academy Forensic Medicine, Apr-June 2010.
8. Yagi H, E Hind AM, Khali S I. Acute poisoning from hair dye. East Africa Medical Journal 1991; 68: 404-11.
9. El Ansay EH, Ahmed MEK, Clague HW. Systemic toxicity of Para Phenylene diamine. Lancet 1983; 1: 1341.
10. Suliman SM, Homeida M, Aboval OI. Para Phenylene diamine induced acute tubular necrosis following hair dye ingestion. Human Toxic 1983; 2: 633-5.
11. Ayoub F, Liham S. A retrospective study of acute systemic poisoning of Para Phenylene Diamine in Morocco. Afr. J. Trad. CAM 2006, 3(1): 142-149.
12. Kallel H, Chelly H, Dammak H, Bahloul M, Ksibi H. Clinical manifestations of systemic Para Phenylene Diamine intoxication. J. Nephrology (2005), 18(3): 308-311.
13. Bhargava P. Para Phenylene diamine induced acute renal failure, J. Post Graduate Med, 2008 Jan – March, 54(1): 60 – 1.
14. Sahay M, Vani R, Vali S. Hair dye ingestion: an uncommon cause of acute kidney injury. J Assoc Physicians India. 2009; 57:743-4.
15. Chrispal A, Begum A, Ramya I, Zachariah A. Hair dye poisoning - an emerging problem in the tropics: an experience from a tertiary care hospital in South India. Trop. Doct. 2010 Apr; 40(2): 100-3.
16. Abderlaheem MB, E-Tigani MA, Hassan EG, Ali MA, Mohamed IA, Nazik AE. Acute renal failure owing to paraphenylene diamine hair dye poisoning in Sudanese children. Ann Trop Paediatrics. 2009 Sep; 29(3):191-6.

Fig. 1: Incidence and Age

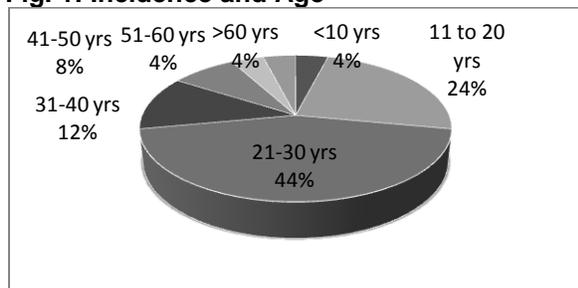


Fig.2: Incidence and Sex & Marital Status

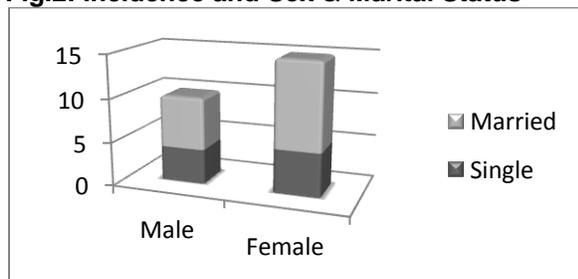


Fig. 3: Manner of Poisoning

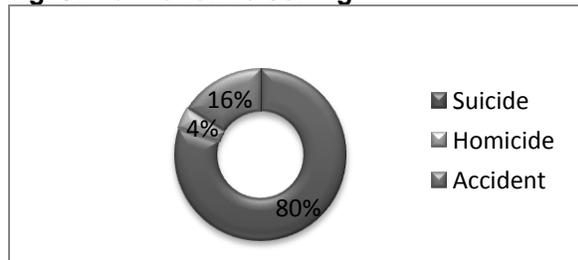


Fig. 4: Postmortem Findings

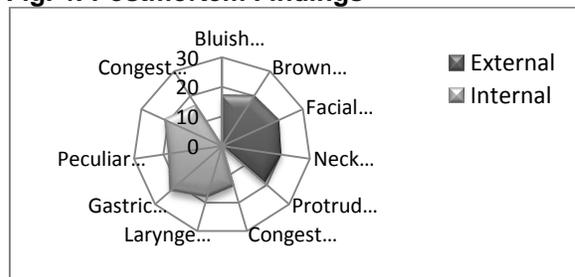


Photo 1: Laryngeal Edema



Table 1: Incidence of Hair Dye Poisoning In Medico-Legal Autopsies

Postmortems done in the Mortuary	1 st Year	2 nd Year
	Cases (%)	Cases (%)
Poisoning postmortems	467(9.77)	489(10.04)
Hair dye poisoning postmortems	11(2.30)	14(.287)
All postmortems	4778(100)	4870(100)

Table 2: Type of Hair dye

Time of hair dye	Cases	%
Liquid hair dye	24	96
Non-liquid hair dye	1	4
Total	25	100

Table 3: Fatal Dose & Fatal Period

Fatal dose	Cases	%
<100 ml	19	76
>100 ml	6	24
Fatal period		
Up to 48 hours	18	72
After 48 hours	7	28

Table 4: Histopathological Findings

Histopathological feature	Cases (%)
Increased Lymphocytic Infiltration of gastric mucosa	22(88)
Increased cellularity of glomeruli	21(84)
Focal areas of swollen tubular lining cells with pale cytoplasm	19(76)
Focal areas total loss of tubular lining cells	18(72)
Pulmonary edema with alveolar rupture	18(72)
Laryngeal tissue edema	17(68)
Focal areas of fatty change in liver	12(48)

Table 5: Chemical Analysis Report

PPD Dye	Cases	%
Detected	25	100%
Undetected	0	0%

Original Research Paper

Study of Drunkenness at Civil Hospital, Sola, Ahmedabad

*Shah Jigesh, **Patel Gaurang, ***Patel Dharmesh, ****Gupta Divyesh, ****Jakhar Rajesh, ****Jadav Sanjay

Abstract

Gujarat has sumptuary law (Bombay Prohibition Act, 1949) in force that proscribes the sale, purchase and consumption of alcoholic drinks. The legislation has been in force since 1 May 1960 when Bombay State dissolved into Maharashtra and Gujarat. Predictably, smuggling and illicit sale of alcohol are very common. Illegal drinking is continued in almost all classes of society. In July, 2009 hooch tragedy claimed 136 lives at Ahmedabad. In present study, the cases received for examination related to drunkenness were studied. The place of the study was Civil Hospital, Sola, Ahmedabad over a total period of four years from 2009 to 2012. In the year of hooch tragedy (2009), the proportion of cases related to drunkenness was relatively low (222 out of 2237 medico-legal cases forming 9.92 %). However, the mortality resulting from hooch tragedy had no effect on people's mindsets and drinking is continued in as before in usual manner. The proportion of cases of drunkenness have increased in the forthcoming year 2010 (19.73 %), year 2011 (15.25 %) and year 2012 (22.71 %).

Key Words: Drunkenness, Hooch tragedy, Medico-legal cases, Alcohol

Introduction:

Since introduction of distilled spirit into western world by the Arabians during the middle ages, alcohol has been accepted as social drink in almost all classes of the society. In India, during ancient times, "somras" was the popular alcoholic drink. [1]

Looking at the revenue generation, the British Government had imposed excise duty on alcohol in the year 1978. In 1915, when Mahatma Gandhi returned to India from South Africa, he noticed that alcoholism was one of the major reasons for the poverty of the people. Gandhiji advocated prohibition as a public policy first time in a long missive to viceroy before setting out on the Dandi march on March 12, 1930. His idea was that apart from social and moral benefits to the society, this would deny the government huge revenue. Inspired by the thoughts of Gandhiji, the Congress Government of the Greater Mumbai state decided to put step wise prohibition on alcohol in 1937.

Corresponding Author:

*Associate Professor,
Department of Forensic Medicine
GMERS Medical College & Associated Civil Hospital,
S. G. Road, Sola, Ahmedabad- 380060
E-mail: jigesh.shah2003@gmail.com

**Assistant Professor,

*** Professor & Head

****Tutor

DOR: 00.00.2013 DOA: 00.00.2013

After independence, the Bombay Prohibition Act came into force on 16th July, 1949 in the State of Greater Mumbai. Later on 1st May, 1960, Greater Mumbai was divided into the Gujarat and Maharashtra. The ban on alcohol was lifted in Maharashtra state but Gujarat continued to implement the same Bombay Prohibition Act in its original form. [1, 2]

Gujarat had banned alcohol consumption as homage to Mohandas Karamchand Gandhi. However, bootlegged alcohol, known as Hooch, is widely available. To counter the liquor mafia, the state government in 1996 formed the Prohibition & Excise Department, which was dismantled in 2006 because of a shortage of police staff personnel.

During the tenure of the department there were no incidents of alcohol poisoning in Gujarat. [2] In July 2009, 136 persons lost their lives at Ahmedabad; Gujarat after consuming illicitly produced cheap alcohol. This incident had overtaken the previous worst Gujarat incident of this type, in which 132 died in Vadodara in 1989. Smaller tragedies, with death tolls just reaching double figures, are common in various states of India. Cheap arrack, banned in most states, is illegally made and sold across the country perhaps under the patronage of corrupt police and politicians.

Gujarat is the only state in India that has the death penalty for those found guilty of making and selling spurious liquor which causes death. Governor gave her stamp of approval to

the Bombay Prohibition (Gujarat Amendment) Bill, 2009 on December 5 two years after it was cleared by the Legislative Assembly. However, the law allows a permit to foreigners and outsiders. As on 15 February 2010, tourists arriving via Ahmedabad airport can buy on the spot liquor license from the Gujarat Tourism Department counter located inside the domestic terminal. [3] The state also gives group liquor permits for conferences and meetings. The only place where the State Government of Gujarat allows free flow of liquor for all is in special economic zones (SEZs). [3]

In Gujarat, manufacture, sale and/or consumption of alcohol is prohibited under the BPA. Provisions of MVA are applicable to the nationwide people on uniform basis, as also to the vehicle drivers in Gujarat. Illegal drinking burdens medico-legal examiner with the responsibilities of examination and opinion about drunkenness. Present study on cases of drunkenness was conducted at the Civil Hospital, Sola, Ahmedabad with purpose to check the effect of hooch tragedy on mindsets of people resulting in any reduction in cases of drunkenness.

Materials & Methods:

The present prospective study with retrospective effect was carried out at the Civil Hospital, Sola, Ahmedabad; Gujarat from 2009 to 2012. Out of 34 police stations of Ahmedabad City 5 is attached to Civil Hospital of Sola.

A total of 9,928 cases were received for medico-legal examination and/or treatment that included cases of Road-traffic accidents, Poisoning, Assault, Sexual Offences, Attempted suicide, Accidents as well as drunkenness. Out of these, in 1,692 cases (17.04%), police requisition was received for opinion about state of drunkenness. These 1,692 clinical cases of drunkenness were the part of the study.

The ante-cubital fossa was cleaned with soap and water, and 10 ml of blood was collected with sterile needle under aseptic precautions. The blood was preserved in fluoride bulb (3 % Sodium Fluoride). [4] The samples so collected were forwarded to the FSL (through police) for determination of the BAC by gas chromatography method. The details were recorded on specially designed proforma, tabulated on a master chart and analyzed.

It is noteworthy that out of 858 autopsies performed at Civil Hospital, Sola during these four years period under study (2009 to 2012), none of the corpse was found under suspicion of consumed alcohol. Amongst suspected poisoning cases, alcohol was not

detected at all from the chemical analysis of viscera at FSL. So they could not become the part of the study.

Observations and Discussion:

When we look at the profile of patients received for medico-legal examinations and treatment (Table 1), the cases of drunkenness formed a large bulk. 9,928 medico-legal cases were received at the casualty of Civil Hospital, Sola during the four years (2009 to 2012) under the study. Out of them in 1,692 cases the requisition was for examination related to state of drunkenness. In the year (2009) of hooch tragedy, the proportion of cases related to drunkenness was relatively low (9.92 %) when compared to that in the year 2010 (19.73 %), year 2011 (15.25 %) and year 2012 (22.71 %).

In addition to adverse effect of prolonged and regular consumption of alcohol, the accused person can also be charged under Section 84 and 85 of the Bombay Prohibition Act, 1949 (penalty for being found drunk in any drinking house and penalty for being drunk and for disorderly behaviour) [5], Section 185 of The Motor Vehicle Act, 1988 (driving by a drunken person or by a person under the influence of drugs) [6] and Section 85 and 86 of Indian penal code (Act of a person incapable of judgment by a reason of intoxication caused against his will, offence requiring a particular intent or knowledge committed by one who is intoxicated). [7]

The provisions of M V Act in context of drunken driver are applicable across the country and in the states like Gujarat where the B P Act is being enforced in addition to the earlier.

It can be seen that majority (98.88%) of the accused under examination were male and only 19 were females (1.12 %). A large number of them were from the ages between 21 to 35 years (60.58%). (Table 2) Age groups of 35-40 years (196 cases) and 41-45 years (164 cases) were also record significant numbers. At the extremes of age the numbers are decreasing.

It is remarked that 1,221 persons accused of drunkenness were from the age group of 21-40 years. The findings are highly consistent with that of Janiet al [8] who also recorded 21-40 years being most commonly involved age group. Alcohol gives a feeling of warmth by increasing heat loss. So, it was expected that the a high number of accused should be in the winter months from November to February especially on 31st December when the youngsters are hauled up on new year eve. But the findings show a somewhat different picture. The cases show no specific pattern in

connection with the weather. Contrarily highest number of cases (203 cases) was recorded in monsoon month of August followed by 190 cases (11.23 %) in the March. (Table 3) While comparing the month-wise pattern of the year 2009 with the rest three years, it appears that there was no drastic reduction in or after July, 2009 (the month of hooch tragedy).

Whenever a living subject under suspicion of alcohol consumption was received for medical examination under MV Act and/or BP Act, a clinical examination of the accused was performed. While looking at the time of examination of the accused (Table 4), we found that majority of the accused (68.91%) were received during the night hours from 9 p.m. to 6 a.m. followed by 13.59 % in the morning hours between 6 to 9 a.m. The number of cases recorded during afternoon hours of 12 noon to 5 p.m. (8.69%) and evening hours of 6 to 9 p.m. (8.81 %) was relatively low.

It is a known fact that the silent hours of night are most convenient for rest and to drink for the people, who have returned home from their work-place, so recorded a huge number of cases. Janiet al [8] has also documented the night hours being the most common hours of drinking. The accused is charged under section 84 and 85 of the Bombay Prohibition Act, 1949 only if the blood alcohol concentration is more than 0.05mg %. Whereas the required BAC under Section 185 of The Motor Vehicle Act, 1988 and section 85 and 86 of Indian penal code is only 0.03 %.

In context with these Acts in force and also based on the clinical effects of alcohol on the body, the cases under study were distributed into seven groups depending on the BAC. (Table 5) It can be seen that 1% were having the BAC less than 0.03 gm% so they were innocent and could not be charged under any of the Act. 15 were having BAC between 0.03 to 0.05 gm % so they could not be charged under BPA but could be charged under MVA as the circumstances of the case are.

Rests of the accused were worthy to be charged under both the acts as their BAC was >0.05 gm%. 756 accused under the study were recorded to have a BAC between 0.05-0.08 gm%, classified under "drinking" category. 450 accused recorded a BAC between 0.08 to 0.1 gmpercent, classified as "under the influence".

Remaining 454 accused were having a BAC between 0.1 to 0.3 gm % and they were classified as "drunk". None of the subject was recorded with BAC of more than 0.3 gm % that is considered dangerous, can lead to coma and death. As per Section 4 of The Bombay

Prohibition (Medical Examination and blood test) Rules, 1959, the blood sample shall be submitted to analyzer within seven days of sample collection. But the lag period between the days left from the day of sample collection to the day of analysis varies from one day to more than 13 days. (Table 6) It is noteworthy that 31 out of 32 samples showing BAC within the limits of 0.05 gm% were analyzed within 9 days of sample collection and 11 samples analysed on or after 13 days of sample collection have recorded a BAC of more than 0.05 gm%.

Singh and Chandra [9] have reported that on 14th day of analysis there is postmortem loss of ethanol that further decreased on 28th day to become alcohol free. However they also reported that maximum production of ethanol occur as 70mg% mostly within 7th day.

Thus, the practical applicability of zero order kinetic metabolism of alcohol [10] is not as simple as it looks, and its interpretation is influenced by so many factors like amount of alcohol consumed, type of beverage, weight of subject, methods of drinking [11], and procedure of collection, preservation and analysis.

Conclusion:

The debate on whether the ban on liquor in Gujarat is in tune with the rapid strides the state has been making as an investment and tourist destination is raging again & again.

The revenue loss to Gujarat government because of the ban is estimated to be around Rs 30 Billion. From the present study, it is concluded that the mortality resulted from the hooch tragedy of July, 2009 had no effect on the mindsets of people. In-fact, the cases on drunkenness are on rise with increase of population in the developing areas of city.

References:

1. **Pillay VV.** Comprehensive Medical Toxicology, 1st Edition, Paras Publishing, Hyderabad, 2003. Chapter 8, Alcohols; pp: 141-159.
2. **Official website of Government of Gujarat** http://www.prohibition-excise.gujarat.gov.in/pne/CMS.aspx?content_id=152.
3. An Act further to amend the "Bombay Prohibition Act 1949" (Gujarat Act No. 29 of 2011) Published in the "Gujarat Government Gazette", on the 2nd December, 2011.
4. **Reddy K S N.** The Essentials of Forensic Medicine and Toxicology, 23rd Edition, K Suguna Devi, Hyderabad, 2004; pp:481-9.
5. **Choudhary A N.** The Bombay Prohibition Act, 1949, 3rd Edition, Shanti Law House, Nagpur, 2007.
6. The Bare Act with Short Comments, The Motor Vehicle Act, 1988, Commercial Law Publisher Pvt. Ltd., Delhi, 2008.
7. **Chandrachud Y V and Manohar V R.** Ratanlal & Dhirajlal- The Indian Penal Code, 24th Edition, Wadhwa & Co., Nagpur, 2002, p. 346-353.
8. **Jani C B et al.** Retrospective study of case of drunkenness with analysis and interpretation of results. J Indian Acad Forensic Med, 30(3), July-September, 2008; 128-135.
9. **Singh R K and Chandra H.** Estimation of Postmortem Production and Loss of ethanol in blood with respect of its duration of storage at room temperature. Int J Med Toxicol Leg Med. 2(1), 1999.1-4.

10. Subrahmanyam B V. Modi's Medical Jurisprudence and Toxicology, 22nd Edition, Butterworth's & Co., New Delhi, 1999. Chapter IX, Inebriant Cerebral Poisons; p. 307-319.
11. Roberts C and Robinson S P. Alcohol Concentration and Combination of Drinks: The effect on blood alcohol levels, J Forensic Leg Med. 2007; 14:398-405.

Table 4: According to Time of Examination & Sample Collection

Time	Cases (Year)				Total (%)
	2009	2010	2011	2012	
Morning (6 a. m- 12)	21	72	52	85	230 (13.6)
Afternoon (12- 5 p.m)	20	40	42	45	147 (8.7)
Evening (5-9 p.m.)	26	46	35	42	149 (8.8)
Night (9 p.m. -6 a.m.)	155	311	292	408	1166 (68.9)
Total	222	469	421	580	1692 (100)

Table 1: Cases of Drunkenness

Year	PM Exam.	Total MLC	Drunkenness (%)
2009	174	2237	222(9.92)
2010	183	2,377	469(19.73)
2011	245	2,760	421(15.25)
2012	256	2554	580(22.71)
Total	858	9928	1692(17.04)

Table 5: Distribution of Cases as Per BAC

BAC (gm %)	2009	2010	2011	2012	Total (%)
< 0.03 (30)	2	0	3	12	17 (1.00)
0.03-0.05(30-50)	5	4	0	6	15 (0.89)
0.05-0.08 (50-80)	104	209	186	257	756 (44.68)
0.08-0.1 (80-100)	54	123	123	150	450 (26.60)
0.1-0.15 (100-150)	42	112	85	117	356 (21.04)
0.15-0.3 (150-300)	15	21	24	38	98 (5.79)
> 0.3 (> 300)	0	0	0	0	0 (0.0)
Total	222	469	421	580	1692 (100)

**Table 2
Age & Sex Wise Distribution of Cases**

Age Grps (Yrs)	Male				Female				Total
	2009	2010	2011	2012	2009	2010	2011	2012	
11-20	18	28	22	48	1	0	0	7	124 (7.33 %)
21-30	96	187	164	291	2	0	3	6	749(44.26 %)
31-40	59	142	114	157	0	0	0	0	472 (27.9 %)
41-50	34	85	94	54	0	0	0	0	267 (15.78 %)
51-60	11	23	22	13	0	0	0	0	69 (4.08 %)
61-70	1	4	1	4	0	0	0	0	10 (0.59 %)
71-80	0	0	1	0	0	0	0	0	1 (0.06 %)
Total	219	469	418	567	3	0	3	13	1692 (100 %)
Grand Total	1673 (98.88 %)				19 (1.12 %)				1692 (100 %)

**Table 3
Month Wise Classification of Cases**

Month	Male				Female				Total
	2009	2010	2011	2012	2009	2010	2011	2012	
January	18	44	31	72	0	0	0	0	165 (9.75 %)
February	14	69	26	31	0	0	0	0	140 (8.27 %)
March	14	93	42	40	0	0	0	1	190 (11.23 %)
April	13	15	13	38	0	0	0	0	79 (4.67 %)
May	10	9	24	34	0	0	0	1	78 (4.61 %)
June	14	20	36	34	0	0	0	0	104 (6.15 %)
July	17	30	58	94	0	0	0	4	203 (12.00 %)
August	31	26	42	38	0	0	0	7	144 (8.51 %)
September	25	47	31	25	0	0	0	0	128 (7.56 %)
October	12	49	32	52	0	0	3	0	148 (8.75 %)
November	31	20	30	62	0	0	0	0	143 (8.45 %)
December	20	47	53	47	3	0	0	0	170 (10.05 %)
Total	219	469	418	567	3	0	3	13	1692 (100 %)

**Table 6
Relationship between Duration of Analysis & BAC**

Duration of analysis/ BAC(gm %)	<0.03	0.03-0.05	0.05-0.08	0.08-0.1	0.1-0.15	0.15-0.3	Total
1 day	3	1	47	19	10	4	84
2 days	5	2	113	84	49	19	272
3 days	2	4	114	96	80	16	312
4 days	2	3	145	73	55	17	295
5 days	2	2	95	56	58	18	231
6 days	0	1	74	45	41	9	170
7 days	1	0	60	43	34	8	146
8 days	1	1	38	16	11	0	67
9 days	1	0	25	6	5	3	40
10 days	0	0	12	5	0	0	17
11 days	0	0	10	3	2	0	15
12 days	0	1	16	3	10	2	32
> 13 days	0	0	7	1	1	2	11
Total	17	15	756	450	356	98	1692

Review Research Paper

Death Certificate: Ignorance and Facts

*B. D. Gupta, **M. M. Trangadia, **Rahul A. Mehta, ***D. K. Vadgama

Abstract

Going through the various textbooks on Forensic Medicine and Toxicology written by Indian authors, we observed that a good deal of ignorance and confusion is prevailing over the use of word "Death Certificate". We referred to the literature as referenced by Indian authors and relevant laws like the Registration of Births and Deaths Act, (RBDA) 1969 and Rules there off. The paper discusses 'death certificate', 'Medical Certification of Cause of Death' (MCCD), and 'death slip' in their correct perspective with relevant legal provisions and medical and social uses. Paper also deals with basic duties of medical practitioner when he deals with a dead body. We conclude that the 'death certificate' and MCCD are different entities. Legal provisions for them are different in the concerned law that is RBDA. As textbooks are read by medical students and medical officers who are concerned with such issues, authors are requested to edit their literature accordingly in view of this paper.

Key Words: MCCD, Death Certificate, Registration of Births and Deaths Act

Introduction:

As a student and Practitioners of Forensic Medicine and Toxicology in Indian context we have to read and refer literature contributed by various Indian authors. In our practice of teaching various types of Medico-Legal Certificates and duties of physician as regards to suspected death, we have referred work of about twenty Indian authors. [1-20]

We learn that the term 'Death Certificate' is loosely used by above referred authors in their works. Death certificate is a distinct legal entity in itself and very much different than another legal entity of certifying cause of death and issuing 'death slip'. [21]

Explanations:

Now we try to explain the certificate as regards to medical cause of death, death slip and death certificate one by one.

a) Duties of Physician:

In the event of the death of a person what is required is

- i. Diagnosis of fact of death,

- ii. Pronouncement of death to relatives and filling up forms 4 or 4A [21], which is a proforma of 'Medical Certificate of Cause of Death' (MCCD) and filling up of Form-2.

It is the duty of attending physician to do the needful in this regard. It is possible that there may not be any 'attending physician'. The physician might be seeing only dead body.

Also there may be attending physician but he may not be in position scientifically to certify cause of death. It means he is not in a position to fill up Form 4/4A of MCCD. Still he is very much in a position to diagnose and pronounce death and fill up 'Form -2'. Further, he has a duty to refer the dead body to concerned legal agency, most commonly police, to take further action which includes post-mortem examination also.

The MCCD can be given after PME by the autopsy surgeon. Therefore, when the authors mention in their literature [1-20] that, when physician is not sure of cause of death, he should not issue "death certificate", (they have said the same thing in different words) they are scientifically and legally away from facts.

b) What Authors Say?

Many authors have described "death certificate" along with the other certificates which are issued by physician in his duties as physician. [1-3, 6, 8, 9, 11, 18, 19] Few authors have described MCCD and other relevant things also but their description is confusing and overlapping with the concept of MCCD and death certificate. [8, 11, 15, 16, 20]

Corresponding Author:

*Prof. & HOD

Department of Forensic Medicine

M. P. Shah Medical College, Jamnagar

E-mail: bdgujn@yahoo.com

**Assist. Prof, Dept. of Forensic Medicine

M. P. Shah Medical College, Jamnagar

*** Assist. Prof, Dept. of Forensic Medicine

P. D. U. Medical College, Rajkot

DOR: 15.2.13 DOA: 17.8.13

Some of the authors have mentioned that while examining a person in his terminal illness or a dead body, if they are not sure of cause of death they should not issue the 'death certificate'. [4, 5, 7, 10, 13, 14, 17]

As per Mehta obligation to issue a death certificate is stated in Sec 450 of the Bombay Municipal Corporation Act.

His writing is of the year 1963 when the RBDA 1969 did not come into force. Still he clearly mentions the use of MCCD form as recommended by W.H.O. in 1960. Mehta also mentions the confidentiality of cause of death. [12] It seems that the term "death certificate" was in use before the enactment of RBDA, 1969 for the purpose of cause of death certificate.

c) Medical Certification of Cause of Death:

The MCCD though prescribed by W.H.O. is incorporated in RBDA, 1969 [22] in subsection 3 of Sec 10 of the Act in the form of Form 4 or 4A. The part of Act is reproduced below:

"Where the State Government has required under sub-section(2) that a certificate as to the cause of death shall be obtained, in the event of the death of any person who, during the last illness, was attended by a medical practitioner, the medical practitioner shall, after the death of that person, forthwith, issue without charging any fee, to the person required under this Act to give information concerning the death, a certificate in the prescribed form stating to the best of his knowledge and belief the cause of death; and the certificate shall be received and delivered by such person to the Registrar at the time of giving information concerning the death as required by this Act."

Accordingly, rule 7 is formed under the Gujarat Registration of Births and Deaths Rules, 2004. [23] It is same in Maharashtra State [24] also; the difference is that in Maharashtra said rules were formed in the year 2000. This is reproduced as:

"The certificate as to the cause of death required under subsection (3) of section 10 of the Act, shall be issued in Form No.4 or 4A and the registrar shall, after making necessary entries in the register of deaths, forward all such certificates to the Chief Registrar or the officer specified by him in this behalf by the 10th of the month immediately following the month to which the certificates relate."

This 'Form 4' has two parts

1. First part related to medical certification of cause of death. It is to be signed by the

attending physician who is certifying the cause of death.

2. Death Slip- the form has detachable portion separated by perforation mark, containing information on the fact of death, which after filling 4/4A will be handed over to relatives of the deceased for further procedure.

The first part of this form is to be forwarded to office of the Registrar along with 'Form-2', while second part is to be detached and handed over to the relative of the deceased. While first part of form contains cause of death second part does not.

d) Death Certificate:

'Death Certificate is a different and distinct legal entity. It is issued under Sec 12 and Sec 17(1) b [22] of RBDA 1969 in the 'Form -6' under rule 13(2). [23] It is to be certified in the manner provided for Sec 76 of Indian Evidence Act, 1872. Relevant sections of RBDA are reproduced below as:

Sec 12 of RBDA:

"The Registrar shall, as soon as the registration of a birth or death has been completed, give, free of charge, to the person who gives information under section 8 or section 9 an extract of the prescribed particulars under his hand from the register relating to such birth or death." [22]

Sec 17 (1) b of RBDA:

"Obtain an extract from such register relating to any birth or death; Provided that no extract relating to any death, issued to any person, shall disclose the particulars regarding the cause of death as entered in the register." [22]

Rule 13 (2) of Gujarat Registration of Births and Deaths Rules, 2004:

"Any such extract in regard to a birth or death shall be issued by the Registrar or the officer authorized by the State Government in this behalf in FormNo.5 or in Form No.6 as the case may be and shall be certified in the manner provided for in section 76 of the Indian Evidence Act, 1872 (Act 1 of 1872)." [23]

Accordingly 'Death Certificate' is a public document. 'Form-6', the proforma of death certificate mentions general details such as name, age, sex, address, date of death etc of the deceased. But does not mention the cause of death, on the contrary it is clearly mentioned in the note below the cause of death will not be disclosed as per Sec 17(1) b.

The signing authority, as per Sec 17, subsection 2 of RBDA 1969, is the Registrar or any other officer authorized by the state Govt. the Sec 17 subsection 2 is reproduced below:

"All extracts given under this section shall be certified by the Registrar or any other officer authorized by the State Government to give such extracts as provided in section 76 of the Indian Evidence Act, 1872, and shall be admissible in evidence for the purpose of proving the birth or death to which the entry relates."[22]

e) Difference between the MCCD and Death certificate:

To understand MCCD and death certificate we can now see the differences between the two:

MCCD:

- To be filled up by physician or the doctor who has conducted postmortem examination.
- It is submitted to registrar under the RBDA, 1969.
- It is as per the provision of Sec 10(2) of the Act.
- It is to be issued free of charge
- It is to be issued in prescribed form: Form 4 or 4A under Rule 7.
- It mentions cause of death. Therefore by inference it is a confidential document.

Death Certificate:

Death certificate is issued on the basis of information of death provided to registrar in the Form-2.

- Signing authority is either registrar or any other person authorized by State Govt.
- It is issued to nearest relative of the deceased. It is issued following Sec 12 and Sec 17 of the RBDA, 1969 and Sec 76 of IEA, 1872
- The prescribed form is Form no -6 under rule 13(2)
- It mentions fact of death and general details of the deceased but not the cause of death.
- It is in line with Sec 76 of I.E.A therefore it is a public document.
- As per Rule 13 prescribed fee is charged.

Conclusion:

While dealing with death Physician has following three duties whenever he comes across a dead body:

- Diagnose the death
- Pronounce the death and
- Fill up the MCCD for and death slip.

If he were an attending physician then he has a mandatory duty to fill up MCCD including Death slip. The MCCD is forwarded to Registrar and death slip is given to relative. If he is not able to arrive at the cause of death due to

any reason, he has a duty to inform concerned authorities for further investigations.

In such a case also he has a duty to diagnose the death and pronounced the death. Under law physician, attending or otherwise, is not authorized to issue a 'death certificate.' Now it is amply clear that MCCD, Death slip and death certificate are different entities. They are under different provisions of Law. The literature should be therefore updated accordingly.

References:

1. **Bardale R.** Principles of Forensic Medicine and Toxicology. 1st ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.; 2011. 7,432
2. **Basu R.** Fundamentals of Forensic Medicine and Toxicology. 2nd ed. Kolkata: Books and Allied (P) Ltd.; 2009. 13
3. **Basu SC.** Hand book of Medical Jurisprudence and Toxicology. 2nd ed. Calcutta: Current Distributors; 1984. 10
4. **Bhaisora CP, Chaudhary SKR.** Practical Manual of Forensic Medicine and Toxicology. 1st ed. Kolkata: New Central Book Agency (P) Ltd; 2009. 10, 169, 215
5. **Biswas G.** Review of Forensic Medicine and Toxicology. 1st ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.; 2010. 31
6. **Gorea RK, Dogra TD, Aggarwal.** Practical Aspect of Forensic Medicine A Manual for Undergraduates and General Practitioners. 1st ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.; 2010. 270.
7. **Krishnan MKR.** Handbook of Forensic Medicine. 7th ed. Hyderabad: Paras Medical Books; 1981. 7
8. **Kumar A.** Textbook of Forensic Medicine (Medical Jurisprudence and Toxicology). 1st ed. Kala Amb: Avichal Publishing Company; 2011. 14,104, 364
9. **Mahapatra SC, Kulkarni DV.** Dr. A. C. Mohanty's Legal Medicine. 1st ed. Navi Mumbai: Smt. Priya Mohanty; 2004. 4
10. **Malik CC.** A short Textbook of Medical Jurisprudence. 1st ed. Calcutta: The New Book Stall; 1978. 26
11. **Mathiharan K, Patnaik AK, editor.** Modi's Medical Jurisprudence and Toxicology. 23rd ed. Nagpur: LexisNexis Butterworths, Wadhwa; 2009. 242-43
12. **Mehta HS, Taraporevala VJ.** Medical Law and Ethics in India. 1st ed. Bombay: The Bombay Samachar Private LTD.; 1963. 339
13. **Nandy A.** Principles of Forensic Medicine including Toxicology. 3rd ed. Kolkata: New Central Book Agency (P) Ltd; 2010. 14
14. **Pillay VV.** Comprehensive Medical Toxicology. 2nd ed. Hyderabad: Paras Medical publisher; 2008. 41
15. **Pillay VV.** Textbook of Forensic Medicine & Toxicology. 14th ed. Hyderabad: Paras Medical publisher; 2004. 7-8,366.
16. **Rao NG.** Textbook of Forensic Medicine and Toxicology. 2nd ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.; 2010. 18
17. **Reddy KSN.** The Essentials of Forensic Medicine and Toxicology. 30th ed. Hyderabad: K. Sugana Devi; 2011. 8, 470
18. **Sengupta BK.** Medical Jurisprudence and Toxicology. 1st ed. Calcutta: Academic publishers; 1978. 15
19. **Sharma RK.** Concise text book of Forensic Medicine and Toxicology. 2nd ed. New Delhi: Reed Elsevier India private Limited; 2008. 8
20. **Subrahmanyam BV.** Subrahmanyam's Medical Jurisprudence & Toxicology. Allahabad: Law Publication (India) Pvt. Ltd.; 2011. 15
21. **Physician's Handbook on Medical Certification of Cause of Death (MCCD) 2009.** Chief Registrar (Birth and Death) and Commissioner Health, Medical Services and Medical Education, Gujarat State, Gandhinagar. January 2009; 3,29,31
22. The Registration of Births and Deaths Act, 1969.
23. The Gujarat Registration of Births and Deaths Rules, 2004. Health and Family Welfare Department Sachivalaya, Gandhinagar Dated 9th January 2004
24. The Maharashtra Registration of Births and Deaths Rules, 2000. Public Health Department. Mantralaya, Mumbai Dated 20th April 2000

Review Research Paper

Age of Criminal Responsibility of Juvenile in India vis-a-vis Global Scenario: A Critical Review

*Mukesh Yadav, **Pooja Rastogi

Abstract

Recent brutal assault and rape incidence of 16th December 2012 in Delhi in which one of the accused was alleged to be juvenile raised a fresh debate on reducing the age of juvenile in India. Although 2000 Amendments in the Juvenile Justice (care and Protection of Children) Act after debate in Parliament and in compliance to International obligations raised age of juvenile from 16 for male to 18 years. Issue reached the Apex Court of India in the form of bunch of writ petitions asking for complete struck off the Act of 2000 to changes in various provisions to enhanced punishment to juvenile in conflict with law.

This paper deals with historical background of law on juvenile justice, scenario across the globe vis-a-vis in India and various amendments done from time to time, human rights aspects of children recommendations for decreasing the crime and its impact on the society.

Key Words: Juvenile in conflict with law, Beijing Rule, Juvenile Justice Delivery System, Rights of Child, Protection, Treatment, Development, Rehabilitation, *doli Incapax*, *Mens Rea*

Introduction:

Brutal assault and rape incidence of 16th December 2012 in Delhi in which one of the accused was alleged to be juvenile raised a fresh debate on reducing the age of juvenile in India. Although 2000 Amendments in the Juvenile Justice care and Protection of Children (JJCPA) Act [9] after debate in Parliament and in compliance to International obligations raised age of juvenile from 16 for male to 18 years. There is yet another consideration which appears to have weighed with the worldwide community, including India, to retain eighteen as the upper limit to which persons could be treated as children.

In the Bill brought in Parliament for enactment of the JJCPA 2000, it has been indicated that the same was being introduced to provide for the care, protection, treatment, development and rehabilitation of neglected or delinquent juveniles and for the adjudication of certain matters relating to and disposition of delinquent juveniles.

The essence of the JJCPA 2000, and the Rules framed there under in 2007, is restorative and not retributive, providing for rehabilitation and re-integration of children in conflict with law into mainstream society.

The age of eighteen has been fixed on account of the understanding of experts in child psychology and behavioural patterns that till such an age the children in conflict with law could still be redeemed and restored to mainstream society, instead of becoming hardened criminals in future.

There are, of course, exceptions where a child in the age group of sixteen to eighteen may have developed criminal propensities, which would make it virtually impossible for him/her to be re-integrated into mainstream society, but such examples are not of such proportions as to warrant any change in thinking, since it is probably better to try and re-integrate children with criminal propensities into mainstream society, rather than to allow them to develop into hardened criminals, which does not augur well for the future. [5]

Age of Responsibility in Criminal Law in India:

It was submitted that the age of responsibility, as accepted in India, is different from what has been accepted by other countries of the world. But, it was also pointed out that even in the criminal jurisprudence prevalent in India; the age of responsibility of understanding

Corresponding Author:

*Professor & HOD

Forensic Medicine & Toxicology
School of Medical Sciences & Research
Sharda University, Greater Noida, G.B. Nagar, U.P.
Email: drmukesh65@yahoo.co.in

**Associate Professor

DOR: 14.5.13 DOA: 22.9.13

the consequences of one's actions had been recognized as 12 years in the IPC. Referring to Section 82 IPC, it was pointed out that the same provides that nothing is an offence which is done by a child under seven years of age. Section 83 IPC was also referred, which provides that nothing is an offence which is done by a child above seven years of age and under twelve, who has not attained sufficient maturity of understanding to judge the nature and consequences of his conduct on a particular occasion.

It was, therefore, urged that even under the Indian Criminal Jurisprudence the age of understanding has been fixed at twelve years, which according to him, was commensurate with the thinking of other countries, such as the United States of America, Great Britain and Canada. [5]

Global Scenario on the issue of Age:

- **Scenario in Canada:**

In regard to Canada, it was referred to **The Youth Criminal Justice Act (YCJA), 2003**, [14] as amended from time to time, where the age of criminal responsibility has been fixed at twelve years. Referring to Section 13 of the Criminal Code of Canada, it was submitted that the same is in **pari materia** with the provisions of Section 83 IPC. In fact, according to the Criminal Justice Delivery System in Canada, a youth between the ages of 14 to 17 years may be tried and sentenced as an adult in certain situations.

It was also pointed out that even in Canada the YCJA governs the application of criminal and correctional law to those who are twelve years old or older, but younger than 18 at the time of committing the offence, and that, although, trials were to take place in a Youth Court, for certain offences and in certain circumstances, a youth may be awarded an adult sentence. [5]

- **Scenario in USA:**

In USA, in several States, no set standards have been provided, reliance is placed on the common law age of seven in fixing the age of criminal responsibility, the lowest being six years in North Carolina as per juvenile justice and delinquency prevention Act 1974. [15] The general practice in the United States of America, however, is that even for such children, the courts are entitled to impose life sentences in respect of certain types of offences, but such life sentences without parole were not permitted for those under the age of eighteen years convicted of murder or offences involving violent crimes and weapons violations. [5]

- **Scenario in England and Wales:**

In England and Wales, children accused of crimes are generally tried under the Children and Young Persons Act, 1933, as amended by Section 16(1) of the Children and Young Persons Act, 1963. Under the said laws, the minimum age of criminal responsibility in England and Wales is ten years and those below the said age are considered to be **doli incapax** and, thus, incapable of having any **mens rea**, which is similar to the provisions of Sections 82 and 83 IPC. [5] [It was also referred to the legal circumstances prevailing in other parts of the world wherein the age of criminal responsibility has been fixed between ten to sixteen years.

It was contended that there was a general worldwide concern over the rising graph of criminal activity of juveniles below the age of eighteen years, which has been accepted worldwide to be the age limit under which all persons were to be treated as children. It was sought to make a distinction in regard to the definition of children as such in Sections 2(k) and 2(l) of the JJCPA, 2000, [9] and the level of maturity of the child who is capable of understanding the consequences of his actions.

It was submitted That the provisions of Sections 15 and 16 of this Act needed to be reconsidered and appropriate orders were required to be passed in regard to the level of punishment in respect of heinous offences committed by children below the age of eighteen years, such as murder, rape, dacoity, etc and allowing perpetrators of such crimes to get off with a sentence of three years at the maximum, was not justified and a correctional course was required to be undertaken in that regard. [5]

Human Rights Issue:

After the aftermath of the First World War, the League of Nations issued the Geneva Declaration of the Rights of the Child in 1924.

Following the gross abuse and violence of human rights during the Second World War, which caused the death of millions of people, including children, the United Nations had been formed in 1945 and on 10th December, 1948 adopted and proclaimed the Universal Declaration of Human Rights. While Articles 1 and 7 of the Declaration proclaimed that all human beings are born free and equal in dignity and rights and are equal before the law, Article 25 of the Declaration specifically provides that motherhood and childhood would be entitled to special care and assistance.

UN Declaration of the Rights of the Child:

The growing consciousness of the world community was further evidenced by the Declaration of the Rights of the Child, which came to be proclaimed by the United Nations on 20th November, 1959, in the best interests of the child. This was followed by the Beijing Rules of 1985, the Riyadh Guidelines of 1990, which specially provided guidelines for the prevention of juvenile delinquency, and the Havana Rules of 14th December, 1990.

The said three sets of Rules intended that social policies should be evolved and applied to prevent juvenile delinquency, to establish a Juvenile Justice System for juveniles in conflict with law, to safeguard fundamental rights and to establish methods for social re-integration of young people who had suffered incarceration in prison or other corrective institutions.

One of the other principles which was sought to be reiterated and adopted was that a juvenile should be dealt with for an offence in a manner which is different from an adult.

The Beijing Rules indicated that efforts should be made by member countries to establish within their own national jurisdiction, a set of laws and rules especially applicable to juvenile offenders. [7]

It was stated that the age of criminal responsibility in legal systems that recognize the concept of the age of criminal responsibility for juveniles should not be fixed at too low an age-level, keeping in mind the emotional, mental and intellectual maturity of children. [5]

International Obligation:

Four years after the adoption of the Beijing Rules, the United Nations adopted the Convention on the Rights of the Child vide the Resolution of the General Assembly on 20th November, 1989, which came into force on 2nd September, 1990. India is not only a signatory to the said Convention, but has also ratified the same on 11th December, 1992. [11]

The said Convention sowed the seeds of the enactment of the JJCPA, 2000, by the Indian Parliament. [5]

Developments in India:

India developed its own jurisprudence relating to children and the recognition of their rights. With the adoption of the Constitution on 26th November 1949, constitutional safeguards, as far as weaker sections of the society, including children, were provided for.

The Constitution has guaranteed several rights to children, such as equality

before the law, free and compulsory primary education to children between the age group of six to fourteen years, prohibition of trafficking and forced labour of children and prohibition of employment of children below the age of 14 years in factories, mines or hazardous occupations.

The Constitution enables the State Governments to make special provisions for children. To prevent female foeticide, the Pre-conception and Pre-natal Diagnostic Techniques (Prohibition of Sex Selection) Act was enacted in 1994. One of the latest enactments by Parliament is the Protection of Children from Sexual Offences Act, 2012. [5]

Law on Juvenile in India: Legal basis for fixing the Age

The JJCPA, 2000, [9] is in tune with the provisions of the Constitution and the various Declarations and Conventions adopted by the world community represented by the United Nations. The basis of fixing of the age till when a person could be treated as a child at eighteen years in the JJCPA, 2000, was Article 1 of the Convention of the Rights of the Child and that the description in Article 1 of the Convention was a contradiction in terms.

While generally treating eighteen to be the age till which a person could be treated to be a child, it also indicates that the same was variable where national laws recognize the age of majority earlier.

Scientific Basis for Fixing the Age:

In this regard, one of the other considerations which weighed with the legislation in fixing the age of understanding at eighteen years is on account of the scientific data that indicates that the brain continues to develop and the growth of a child continues till he reaches at least the age of eighteen years and that it is at that point of time that he can be held fully responsible for his actions. Along with physical growth, mental growth is equally important, in assessing the maturity of a person below the age of eighteen years. [5] [

Age of Juvenile enhanced by the Parliament:

SC observed that in any event, in the absence of any proper data, it would not be wise on the part of court to deviate from the provisions of the JJCPA, 2000, which represent the collective wisdom of Parliament.

It may not be out of place to mention that in the Juvenile Justice Act, 1986, male children above the age of sixteen years were considered to be adults, whereas girl children were treated as adults on attaining the age of

eighteen years. In the JJCPA, 2000, a conscious decision was taken by Parliament to raise the age of male juveniles/children to eighteen years. [5]

Considerations before the SC:

Prayers:

A bunch of petitions, [1-5] have been taken up together by the Supreme Court for consideration in view of the commonality of the grounds and reliefs prayed for therein.

Grounds for prayers:

Following prayers have been made on various grounds:

- Declaration of the Juvenile Justice Care and Protection of Children Act, 2000, as ultra vires the Constitution [1]
- To strike down the provisions of Section 2(k) and (l) of the JJCPA Act, and [1] to bring the Act in conformity with the provisions of the Constitution [1] To take steps to make changes in the JJCPA, 2000, to bring it in line with the United Nations Standard Minimum Rules for administration of juvenile justice. [1]
- In offences like rape and murder, juveniles should be tried under the normal law and not under the JJCP Act and protection granted to persons up to the age of 18 years may be removed and
- To declare that prohibition in Section 21 of the JJCPA, 2000, be declared unconstitutional. [2]
- The investigating agency should be permitted to keep the record of the juvenile offenders to take preventive measures to enable them to detect repeat offenders and to bring them to justice.
- Not to release the juvenile accused in the Delhi gang rape case of 16.12.2012 and to keep him in custody or any place of strict detention, after he was found to be a mentally abnormal psychic person [3]
- That proper and detailed investigation be conducted by the CBI to ascertain his correct age by examining his school documents and other records and [3]
- To declare that prohibition in Section 21 of the JJCPA, 2000, be declared unconstitutional. [3]
- To appoint a panel of criminal psychologists to determine through clinical methods whether the juvenile is involved in the Delhi gang rape on 16.12.2012. [3]

Arguments in Favour of Reducing the Age of Juvenile in India:

Argument/Contention in the first matter [1] in the bunch:

That it was necessary for the provisions of Section 2(k), 2(l) and 15 of the JJCPA, 2000, to be reconsidered in the light of the spurt in criminal offences being committed by persons within the range of 16 to 18 years, such as the gang rape of a young woman inside a moving vehicle on 16th December, 2012, wherein along with others, a juvenile, who had attained the age of 17½ years, was being tried separately under the provisions of the JJCPA, 2000. [5]

That in view of the provisions of Sections 15 and 16 of the JJCPA, 2000, children, as defined in the above Act, were not only taking advantage of the same, but were also being used by criminals for their own ends. That after being awarded a maximum sentence of three years, a juvenile convicted of heinous offences, was almost likely to become a monster in society and pose a great danger to others, in view of his criminal propensities.

That, under Article 21 of the Constitution, every citizen has a fundamental right to live in dignity and peace, without being subjected to violence by other members of society and that by shielding juveniles, who were fully capable of understanding the consequences of their actions, from the sentences, as could be awarded under the Indian Penal Code, as far as adults are concerned, the State was creating a class of citizens who were not only prone to criminal activity, but in whose cases restoration or rehabilitation was not possible.

That the provisions of Sections 15 and 16 of the JJCPA, 2000, violated the rights guaranteed to a citizen under Article 21 of the Constitution and were, therefore, liable to be struck down. [5]

That the provisions of Section 19 of the Act, which provided for removal of disqualification attaching to conviction, were also illogical and were liable to be struck down.

That in order to prevent repeated offences by an individual, it was necessary to maintain the records of the inquiry conducted by the Juvenile Justice Board, in relation to juveniles so that such records would enable the authorities concerned to assess the criminal propensity of an individual, which would call for a different approach to be taken at the time of inquiry.

That the Supreme Court to give a direction to the effect that the Juvenile Justice

Board or courts or other high public authorities would have the discretion to direct that in a particular case, the provisions of the general law would apply to a juvenile and not those of the Act. [5]

That the Juvenile Justice Board should be vested with the discretion to impose punishment beyond three years, as limited by Section 15 of the JJCPA, 2000, in cases where a child, having full knowledge of the consequences of his/her actions, commits a heinous offence punishable either with life imprisonment or death.

That such a child did not deserve to be treated as a child and be allowed to re-mingle in society, particularly when the identity of the child is to be kept a secret under Sections 19 and 21 of the JJCPA, 2000. [9]

That without disturbing the other beneficent provisions of the JJCPA, 2000, some of the gray areas pointed out could be addressed in such a manner as would make the JJCPA, 2000, more effective and prevent the misuse thereof. [5]

The Doctrine of doli incapax, Rebuttable Presumption and Adult Responsibility:

Another Writ Petition [2] gave a detailed account of the manner in which the Juvenile Justice Delivery System had evolved. Referring to the doctrine of doli incapax, rebuttable presumption and adult responsibility, it was contended that even Article 1 of the UN Convention on the Rights of the Child defines [7] a child in the following terms:

“For the purposes of the present Convention, a child means every human being below the age of eighteen years unless under the law applicable to the child, majority is attained earlier.” [5]

The expression “child” has been defined in various ways in different countries all over the world. Accordingly, the definition of a child in Section 2(k) of the JJCPA, 2000, [9] would depend on the existing laws in India defining a child.

It was referred to the provisions of the Child Labour Prohibition and Regulation Act, 1986 [12], as an example, to indicate that children up to the age of fourteen years were treated differently from children between the ages of fourteen to eighteen, for the purposes of employment in hazardous industries.

It was re-asserted, in regard to heinous crimes committed by children below the age of eighteen years, who were capable of understanding the consequences of their acts.

[5] That having regard to the provisions of Sections 82 and 83 IPC, where the age of responsibility and comprehension has been fixed at twelve years and below, it would have to be seriously considered as to whether the definition of a child in the JJCPA, 2000, required reconsideration.

That because a person under the age of 18 years was considered to be a child, despite his or her propensity to commit criminal offences, which are of a heinous and even gruesome nature, such as offences punishable under Sections 376, 307, 302, 392, 396, 397 and 398 IPC.

It was urged that the definition of a “juvenile” or a “child” or a “juvenile in conflict with law”, in Sections 2(k) and 2(l) of the JJCPA, 2000, [9] was liable to be struck down and replaced with a more meaningful definition, which would exclude such juveniles. [5]

Violation of Constitution:

It was urged that the JJCPA, 2000, operates in violation of Articles 14 and 21 of the Constitution and that Article 13(2), which relates to post Constitution laws, prohibits the State from making a law which either takes away totally or abrogates in part a fundamental right. Referring to the United Nations Declaration on the Elimination of Violence against Women, adopted by the General Assembly on 20th December, 1993, it was pointed out that Article 1 of the Convention describes “violence against women” to mean any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women.

That even going by statistics, 1% of the total number of crimes committed in the country would amount to a large number and the remedy to such a problem would lie in the Probation of Offenders Act, 1958 [13], which made the provisions of the JJCPA, 2000, redundant and ultra vires Article 21 of the Constitution. [5]

That Sections 16(1), 19(1), 49(2) and 52(2)(a) of the JJCPA, 2000 were liable to be declared as ultra vires the Constitution and that even in the proviso to Sub-section (1) of Section 16, Parliament had recognized the distinction between a juvenile, who had attained the age of sixteen years, but had committed an offence which was so serious in nature that it would not be in his interest or in the interest of other juveniles in a special home, to send him to such special home. [4]

Considering that none of the other measures provided under the Act was suitable or sufficient, the Government had empowered

the Board to pass an order for the juvenile to be kept in such place of safety and in such manner as it thought fit.

That no objection could be taken to the section 16 (1), except in the proviso to Section 16(2), it has been added that the period of detention order would not exceed, in any case, the maximum limit of punishment, as provided under Section 15, which is three years. [5]

That while the provisions of the JJCPA, 2000, are generally meant for the benefit of the juvenile offenders, a serious attempt would have to be made to grade the nature of offences to suit the reformation contemplated by the Act. [5]

Case Law refereed: Right to life and the Right to live in a safe environment

As part of her submissions, Ms. Kapoor referred to the decision of the SC wherein the pasting of black films on glass panes were banned on account of the fact that partially opaque glass panes on vehicles acted as facilitators of crime. [19]

It was urged that in the opening paragraph of the judgment, it has been observed that "Alarming rise in heinous crimes like kidnapping, sexual assault on women and dacoity have impinged upon the right to life and the right to live in a safe environment which are within the contours of Article 21 of the Constitution of India".

Another decision of the SC was also referred, which dealt with a different question regarding the provisions of Section 7A of the JJCPA, 2000, and the right of an accused to raise the claim of juvenility at any stage of the proceedings and even after the final disposal of the case. [6]

Children to be tried as Adult:

It was reiterated that in certain cases the definition of a juvenile in Sections 2(k) and 2(l) of the JJCPA, 2000, would have to be considered differently. [5]

In writ petition [1] an additional prayer that children should also be tried along with adults under the penal laws applicable to adults was raised. [5]

WP [2] filled for an appropriate writ or direction declaring the provisions of Sections 2(1), 10 and 17 of the JJCPA, 2000, to be irrational, arbitrary, without reasonable nexus and thereby ultra vires and unconstitutional, and for a Writ of Mandamus commanding the Ministry of Home Affairs and the Ministry of Law and Justice, Government of India, to take steps

that the JJCPA operates in conformity with the Constitution. [5]

A fresh WP [20] has been filed in SC to argue that a juvenile's culpability should be determined on his mental maturity rather than physical age.

Main thrust of the Argument for reducing the age of Juvenility: Unconstitutionality

The main thrust of the argument advanced was the inter-play between International Conventions and Rules, such as the Beijing Rules, 1985, the U.N. Convention on the Rights of the Child, 1989, and the JJCPA, 2000. That the salubrious and benevolent and progressive character of the legislation in dealing with children in need of care and protection and with children in conflict with law was admitted, but it was contended that a distinction was required to be made in respect of children with a propensity to commit heinous crimes which were a threat to a peaceful social order.

It was reiterated that it was unconstitutional to place all juveniles, irrespective of the gravity of the offences, in one bracket. It was urged that Section 2(l) of the JJCPA, 2000, ought not to have placed all children in conflict with law within the same bracket, it was submitted that the same is ultra vires Article 21 of the Constitution of India.

Referring to the report of the National Crime Records Bureau (NCRB) for the years 2001 to 2012, it was submitted that between 2001 and 2012, the involvement of juveniles in cognizable crimes was on the rise. (Table 1)

It was a well-established medical-psychological fact that the level of understanding of a 16 year-old was at par with that of adults. [5]

Need for Keeping Records of Juvenile Offender:

Section 19 of the JJCPA, 2000, provides for the removal of any disqualification attached to an offence of any nature.

It was submitted that the said provisions do not take into account the fact relating to repeated offences being perpetrated by a juvenile whose records of previous offences are removed. [2] It was contended that Section 19 of the Act was required to be amended to enable the concerned authorities to retain records of previous offences committed by a juvenile for the purposes of identification of a juvenile with a propensity to repeatedly commit offences of a grievous or heinous nature. [5]

That Parliament had exceeded its mandate by blindly adopting eighteen as the upper limit in categorising a juvenile or a child, in accordance with the Beijing Rules, 1985, and the U.N. Convention, 1989, without taking into account the socio-cultural economic conditions and the legal system for administration of criminal justice in India.

It was urged that the JJCPA, 2000, was required to operate in conformity with the provisions of the Constitution of India. [5]

Another Writ Petition [2] restated the same views and noted the difference in the nature of offences committed by juveniles in conflict with law.

Referring to the decision of the SC in the “**Bombay Blasts Case**”, it was submitted that a juvenile who was tried and convicted along with adults under the Terrorist and Disruptive Activities Act (TADA), was denied the protection of the JJCPA, 2000, on account of the serious nature of the offence and ended on the note that paragraph 4 of the 1989 Convention did not make any reference to age. [5]

Arguments against reducing the Age of Juvenile in India:

Arguments were made on behalf of Union of India, Ministry of Women and Child Development and various NGOs working for Child Rights against the reduction of age of juveniles on various facts and legal provisions including international obligations and constitutional provisions.

- **Arguments on behalf of the Union of India:**

Appearing for the Union of India, the Additional Solicitor General (ASG) strongly opposed the submissions made on behalf of the Petitioners to either declare the entire JJCPA, 2000, as ultra vires the Constitution or parts thereof, such as Sections 2(k), 2(l), 15, 16, 17, 19 and 21.

That Parliament consciously fixed eighteen years as the upper age limit for treating persons as juveniles and children, taking into consideration the general trend of legislation, not only internationally, but within the country as well. [5]

That the JJCPA, 2000, was enacted after years of deliberation and in conformity with international standards as laid down in the U.N. Convention on the Rights of the Child, 1989, the Beijing Rules, 1985, the Havana Rules and other international instruments for securing the best interests of the child with the primary object of social reintegration of child victims and

children in conflict with law, without resorting to conventional judicial proceedings which existed for adult criminals.

He submitted a chart of the various Indian statutes and the manner in which children have been excluded from liability under the said Acts up to the age of 18 years. In most of the said enactments, a juvenile/child has been referred to a person who is below 18 years of age.

It was urged that the fixing of the age when a child ceases to be a child at 18 years is a matter of policy which could not be questioned in a court of law, unless the same could be shown to have violated any of the fundamental rights, and in particular Articles 14 and 21 of the Constitution.

Case Law Referred:

In a SC [21] judgment it had been observed that it is neither within the domain of the Courts nor the scope of judicial review to embark upon an enquiry as to whether a particular public policy was wise or whether something better could be evolved.

It was observed that the Courts were reluctant to strike down a policy at the behest of a Petitioner merely because it has been urged that a different policy would have been fairer or wiser or more scientific or more logical. It was further urged that Article 15(3) of the Constitution empowers the State to enact special provisions for women and children, which reveals that the JJCPA, 2000, was in conformity with the provisions of the Constitution. [5]

It was submitted that in various judgments, this Court and the High Courts had recognised the fact that juveniles were required to be treated differently from adults so as to give such children, who for some reason had gone astray, an opportunity to realize their mistakes and to rehabilitate themselves and rebuild their lives. Special mention was made with regard to the decision of the SC in Abuzar Hossain [6] in this regard.

Another decision of the SC [22] wherein it had been observed that merely because the law causes hardships or sometimes results in adverse consequences, it cannot be held to be ultra vires the Constitution, nor can it be struck down.

The Supreme Court has always held that the presumption is always in favour of the constitutionality of an enactment, since it has to be assumed that the legislature understands and correctly appreciates the needs of its own

people and its discriminations are based on adequate grounds. [5]

Referring to the Reports of the NCRB [8], it was pointed out that the percentage of increase in the number of offences committed by juveniles was almost negligible and the general public perception in such matters was entirely erroneous.

Even the Committee appointed to review the amendments to the criminal law, headed by former CJI, J.S. Verma, in its report submitted on 23rd January, 2013 did not recommend the reduction in the age of juveniles in conflict with law and has maintained it at 18 years.

It was pointed out that the issue of reduction in the age of juveniles from 18 to 16 years, as it was in the Juveniles Justice Act of 1986 was also raised in the Lok Sabha on 19th March, 2013, during the discussion on the Criminal Law (Amendment) Bill, 2013, but was rejected by the House. [5]

That the occurrence of 16th December, 2012, the alleged gang rape, should not be allowed to colour the decision taken to treat all persons below the age of 18 years, as children. [5]

Need for Rehabilitation Measures:

On behalf of the Ministry of Women and Child Development, Government of India, it was submitted that the JJCPA, 2000, provides for a wide range of reformatory measures for children in conflict with law— from simple warning to 3 years of institutionalisation in a Special Home.

In exceptional cases, the juvenile to be sent to a place of safety where intensive rehabilitation measures, such as counselling, psychiatric evaluation and treatment would be undertaken. [5]

• Argument on behalf of NGO HAQ:

That the JJCPA, 2000, as amended in 2006 and 2011, is a fairly progressive legislation, largely compliant with the Constitution of India and the minimum standards contained in the Beijing Rules.

The reason for incidents was not on account of the provisions of the JJCPA, but on account of failure of the administration in implementing its provisions.

That all the Writ Petitions appeared to be based on two assumptions, namely,

- (i) That the age of 18 years for juveniles is set arbitrarily; and
- (ii) That by reducing the age for the purpose of defining a child in the aforesaid Act, criminality amongst children would reduce.

That such an approach was flawed as it had been incorrectly submitted that the age of 18 years to treat persons as children was set arbitrarily and that it is so difficult to comprehend the causes and the environment which brings children into delinquency.

That the answer lies in effective and sincere implementation of the different laws aimed at improving the conditions of children in need of care and protection and providing such protection to children at risk.

That the objective with which the JJCPA, 2000, was enacted was not aimed at delivering retributive justice, but to allow a rehabilitative, reformation-oriented approach in addressing juvenile crimes.

That the apathy of the administration towards juveniles and the manner in which they are treated would be evident from the fact that by falsifying the age of juveniles, they were treated as adults and sent to jails, instead of being produced before the Juvenile Justice Board or even before the Child Welfare Committees to be dealt with in a manner provided by the JJCPA, 2000, for the treatment of juveniles. [5]

That even as recently as 26th April, 2013, the Government of India has adopted a new National Policy for Children, which not only recognises that a child is any person below the age of eighteen years, but also states that the policy was to guide and inform people of laws, policies, plans and programmes affecting children.

It was urged that all actions and initiatives of the national, State and local Governments in all sectors must respect and uphold the principles and provisions of this policy and it would neither be appropriate nor possible for the Union of India to adopt a different approach in the matter.

Mr. Asthana, who appears to have made an in-depth study of the matter, submitted that on the question of making the provisions in the JJCPA, 2000, conform to the provisions of the Constitution and to allow the children of a specific age group to be treated as adults, it would be appropriate to take note of General Comment No.10 made by the U.N. Committee on the rights of the child on 25th April, 2007, which specifically dealt with the upper age limit for juveniles.

It was reiterated that where it was a case of a child being in need of care and protection or in conflict with law, every person under the age of 18 years at the time of commission of the alleged offence must be treated in accordance with the Juvenile Justice

Rules. It was observed that any attempt to alter the upper limit of the age of a child from 18 to 16 years would have disastrous consequences and would set back the attempts made over the years to formulate a restorative and rehabilitative approach mainly for juveniles in conflict with law. [5]

• **Submissions by NGO, Prayas Juvenile Aid Centre (JAC):**

The Prayas Juvenile Aid Centre (JAC) came into existence in 1998 as a special unit associated with the Missing Persons Squad of the Crime and Railway Branch of the Delhi Police of which Shri Amod Kanth, Deputy Commissioner of Police, was the in-charge. He was the founder General Secretary, and Chairperson of the Delhi Commission for the Protection of Child Rights.

That Prayas was created in order to identify and support the missing and found persons, including girls, street migrants, homeless, working and delinquent children who did not have any support from any organisation in the Government or in the non-governmental organisation sector. [5]

He repeated and reiterated the submissions made and also highlighted the problems faced by children both in conflict with law and in need of care and protection.

That whatever was required to be done for the rehabilitation and restoration of juveniles to a normal existence has, to a large extent, been defeated since the various provisions of the JJCPA, 2000 and the Rules of 2007, were not being seriously implemented.

The SC observed that even after thirteen years of its existence, the provisions of the JJCPA, 2000, still remained unimplemented in major areas, which made it impossible for the provisions of the Act to be properly coordinated. It was submitted that one of the more important features of juvenile law was to provide a child-friendly approach in the adjudication and disposition of matters in the best interest of children and for their ultimate rehabilitation through various institutions established under the Act.

That the JJCPA, 2000, was in perfect harmony with the provisions of the Constitution, UN provisions on child [7] but did not receive the attention it ought to have received while dealing with a section of the citizens of India comprising 42% of the country's population. [5]

Recommendation and Suggestions:

Various measures to deal with juveniles in conflict with law have been suggested, which requires serious thought and avoidance of knee-

jerk reactions to situations which could set a dangerous trend and affect millions of children in need of care and protection. It was submitted that any change in the law, as it now stands, resulting in the reduction of age to define a juvenile, will not only prove to be regressive, but would also adversely affect India's image as a champion of human rights. [5]

Having regard to the serious nature of the issues raised before the SC, Court had given serious thought to the submissions advanced and had also considered the relevant extracts from the Report of Late Justice J.S. Verma Committee on "Amendments to the Criminal Law, 2013" and are convinced that the JJCPA, 2000, as amended in 2006, and the JJCP Rules, 2007, are based on sound principles recognized internationally and contained in the provisions of the Indian Constitution and there is a definite thought process, which went into its enactment. [5]

SC further added that it cannot be questioned that children are amongst the most vulnerable sections in any society. They represent almost one-third of the world's population, and unless they are provided with proper opportunities, the opportunity of making them grow into responsible citizens of tomorrow will slip out of the hands of the present generation. International community has been alive to the problem for a long time. [5]

Added to this are the factors of poor education and poor economic set up that are jointly the main attributes of a juvenile in conflict with law, making it difficult for him to negotiate the legal procedures. [6]

Studies conducted by NCRB, Ministry of Home Affairs, reveal that poor education and poor economic set up are generally the main attributes of juvenile delinquents. Further, 56.7% of the total juveniles arrested fell into the lowest income category.

SC observed that such being the position, it is difficult to expect a juvenile in conflict with law to know his rights upon apprehension by a police officer and if the precautions that have been suggested are taken, the best interests of the child and thereby of society will be duly served.

Therefore, it may be presumed, by way of a benefit of doubt that because of his status, a juvenile may not be able to raise a claim for juvenility in the first instance and that is why it becomes the duty and responsibility of the Magistrate to look into this aspect at the earliest point of time in the proceedings before him. SC observed that we are of the view that this may

be a satisfactory way of avoiding the recurrence of a situation such as the one dealt with. [17]

We may add that our international obligations as laid down in the Convention on the Rights of the Child and the Beijing Rules require the involvement of the parents or legal guardians in the legal process concerning a juvenile in conflict with law.

For example, a reference may be made to Article 40 of the Convention and Principles 7, 10 and 15 of the Beijing Rules. [7]

This is clear from the fact that in civil disputes, our domestic law requires a minor to be represented by a guardian. [17]

References:

1. Saurabh Prakash vs. Union of India, Writ Petition (C) No.14 of 2013; Vinay K. Sharma vs. Union of India, Writ Petition (C) No.90 of 2013, Date of judgement July 17, 2013.
2. Krishna Deo Prasad Vs. Union of India, Writ Petition (C) No.85 of 2013; Kamal Kumar Pandey & Sukumar Vs. Union of India, Writ Petition (C) No. 42 of 2013; Hema Sahu Vs. Union of India, Writ Petition (C) 182 of 2013, Date of judgement July 17, 2013.
3. Shilpa Arora Sharma vs. Union of India, (Crl.) No. 6 of 2013, Date of judgement July 17, 2013.
4. Ms Shweta Kapoor vs. Union of India, Writ Petition TC (C) No. 82 of 2013, Date of judgement July 17, 2013.

5. Saili Bali vs. Union of India & Anr., Writ Petition (C) No.10 of 2013, Date of judgement July 17, 2013.
6. T.S. Thakur, J. Abuzar Hossain vs. State of West Bengal, (2012) 10 SCC 489.
7. The Convention on the Rights of the Child and the Beijing Rules, 1985.
8. Report of the National Crime Records Bureau (NCRB), Ministry of Home Affairs, 2011, 2012
9. The Juvenile Justice Care and Protection of Children Act, 2000.
10. The Juvenile Justice Care and Protection of Children Rules, 2007.
11. UN Convention on the Rights of the Child ratified by the Government of India on 11th December 1992.
12. The Child Labour Prohibition and Regulation Act, 1986
13. The Probation of Offenders Act, 1958
14. The Youth Criminal Justice Act, 2003, Canada
15. The Juvenile Justice and Delinquency Prevention Act, 1974, USA
16. Madan B. Lokur, J., T.S. Thakur, J. Jitendra Singh @ Babboo Singh & Anr. vs. State of U.P., Criminal Appeal No.763 of 2003, date of judgment: July 10, 2013
17. T.S. Thakur, J. Jitendra Singh @ Babboo Singh & Anr. vs. State of U.P., Criminal Appeal No.763 of 2003, date of judgment: July 10, 2013, <http://judis.nic.in/supremecourt/imgs1.aspx?filename=40541>
18. B.N. Mishra. 'Juvenile Delinquency and Justice System' 1991, Ashish publication house, New Delhi
19. Avishek Goenka vs. Union of India (2012) 5 SCC 321
20. Dr. Subramanian Swamy & ORS. vs. Raju.THR, member juvenile justice BRD & ANR SR1953/2013 BALCO Employees Union Vs. Union of India [(2002) 2 SCC 333
21. State of Tamil Nadu vs. K. Shyam Sunder [(2011) 8 SCC 737

Table 1
Incidence and Rate of Juveniles in conflict with Law under IPC (2002-1212)

S. N.	Year	Juvenile Crime	Total Cognizable Crimes (TCC)	%	Estimated Mid-year Population* (in Lakh)	Rate of Crime
1	2002	18560	1780330	1.0	10506	1.8
2	2003	17819	1716120	1.0	10682	1.7
3	2004	19229	1832015	1.0	10856	1.8
4	2005	18939	1822602	1.0	11028	1.7
5	2006	21088	1878293	1.1	11198	1.9
6	2007	22865	1989673	1.1	11366	2.0
7	2008	24535	2093379	1.2	11531	2.1
8	2009	23926	2121345	1.1	11694	2.0
9	2010	22740	2224831	1.0	11858	1.9
10	2011**	25125	2325575	1.1	12102	2.1
11	2012	27936	2387188	1.2	12134	2.3

*Source: The RGI [10.1 of NCRB-2012]

** Actual Census 2011 Population (Provisional), mid-year projected population for remaining year

Review Research Paper

Forensic Medicine in the Northeastern State of Meghalaya

*A. Donna Ropmay

Abstract

The northeastern state of Meghalaya is divided into eleven districts. It was carved out of Assam in 1972, with its capital at Shillong. The practice of Forensic Medicine in the state is still in its infancy. In most districts, medico-legal autopsy is performed by medical officers in Government service, who usually have no forensic qualifications, apart from a long history of exposure to the field. In recent years, there has been a spurt in crimes as well as increase in vehicular movement which resulted in more casualties due to road traffic accidents. Thus, a Government doctor not only has to manage sick patients but also face medico-legal challenges and conduct forensic examination in routine practice.

At present, there are three qualified Forensic Specialists in Meghalaya. Health authorities have engaged their services to train medical officers in Government hospitals. However, this measure is inadequate to meet the state's forensic needs. Post-graduate medical courses in the subject would ensure a steady turnover of specialist doctors in this discipline. Meanwhile, forensic orientation programmes may be conducted more regularly to equip doctors in all districts with updated knowledge and skills to handle medico-legal cases.

Key Words: Forensic Medicine, Meghalaya, Crimes, Forensic examination, Medico-legal cases

Introduction:

The hill state of Meghalaya came into existence in 1972 when it was carved out of the bigger state of Assam in northeast India. It has an area of 22,429 sq km, population of 2,964,007, and is divided into eleven districts. The capital, Shillong, was once a pristine and quiet town, but of late is fast becoming a hectic and bustling city.

The practice of Forensic Medicine in the state is still in its infancy. In most districts, medico-legal autopsy is performed in government-run health centres and civil hospitals, by medical officers, who usually have no forensic qualifications, apart from a long history of exposure to the field. [1]

In this paper, the status of Forensic Medicine in Meghalaya is highlighted against a background of soaring crime rates (Fig.1) and rapid urbanization. The average Government doctor not only has to treat sick patients, but also deal with cases of medico-legal nature such as road traffic accidents and assaults.

Corresponding Author:

*Associate Professor,
Department of Forensic Medicine,
NEIGRIHMS,
Shillong 793018, Meghalaya, Northeast India
E-mail: drdonna@rediffmail.com
DOR: 25.04.13 DOA: 04.10.13

Hence, the need for trained physicians in Forensic Medicine is acutely felt in day-to-day medical practice.

Status of Forensic Practice:

Medico-legal autopsies across the state are performed by doctors with no additional forensic training. At present, they are conducted at primary and community health centres and civil hospitals in all districts. The average number of cases at the civil hospital in Shillong is 30 per month. A good chunk of potential medico-legal cases (including motor vehicular accidents) are exempted from postmortem examination by the Deputy Commissioner of the district on the request of the relatives.

The natural inclination to accept autopsy, even as part of the investigative process, is low among the locals and tribals of the state. Perhaps people would rather 'forgive and forget' than go through the ordeal of having deceased loved ones 'mutilated' by medical men, as if their untimely and unnatural loss was not tragic enough. Of course, as a forensic doctor, one has to be absolutely sure that 'old wounds' will not be reopened at a later date.

Therefore, it is always better to advise a postmortem whenever the situation is likely to lead to legal proceedings in future, no matter how innocuous it may seem at the moment. The doctor has to strike a balance between respecting the sentiments of the people and

awareness of possible litigation in a particular case scenario.

Clinical Forensic Medicine:

Clinical Forensic Medicine is a subspecialty of Forensic Medicine, which deals with the application of forensic techniques to survivors of violent crime, and is intimately associated with the justice system of a country. Although several countries have informal arrangements to deal with forensic patients there are no international standards of practice or training in this discipline. [2]

In recent years, increased vehicular movement and rapid urbanization have resulted in more casualties due to road traffic accidents (Table 1). Moreover, the spurt in crimes like physical and sexual assaults reflect moral degeneration in society (Table 2). [3] Thus, a government doctor not only has to manage sick patients but also face a host of medico-legal challenges in routine practice.

The changing trends in society emphasize the need for trained doctors, who have the expertise to handle cases of medico-legal nature. The neglected area of 'forensic examination' of the living has therefore assumed fresh importance.

The spectrum of cases requiring forensic opinion are injury reports, certificate of drunkenness, examination of victims and perpetrators in sexual assaults and cases brought for age estimation. The first three are dealt with routinely by medical officers posted in health centres and hospitals in all districts.

However, for age estimation, civil and criminal cases are either referred to Civil Hospital for radiological opinion or to NEIGRIHMS Hospital (under Ministry of Health and Family Welfare, Government of India) for forensic opinion.

Recommendations of the Central Medico-legal Advisory Committee:

In its first meeting in 1956, the Central Medico-legal Advisory Committee recommended that each state should give advance medico-legal training to at least one officer in each district. Every medical officer on his/her first appointment to Government Service should receive three months training in medico-legal work under a Professor of Forensic Medicine.

Officers at the district level should receive further advanced training for six months under a Professor of Forensic Medicine. The Ministry of Health, Government of India, stressed on the state governments the need for training medical officers in medico-legal work. [4]

Forensic Expertise:

The number of forensic experts available in India, compared to the number required, is very small. [5] At present, there are three qualified Forensic Specialists in Meghalaya. Health authorities have engaged their services to train medical officers posted in district and state hospitals. In the past few years since the Forensic Medicine department at our teaching hospital made its debut, three Forensic training sessions have been held in two districts (East and West Khasi Hills) in 2011, 2012 and 2013 for medical officers and police personnel.

The first programme was training on medico-legal procedures for doctors of a local Government hospital in Shillong. In July 2012, a workshop on Medico-legal topics was held at Nongstoin in West Khasi Hills District.

As part of a gender sensitization programme focusing on crimes against women in March 2013, there was a session on forensic evidence collection for medical officers from remote areas and officers-in-charge of police stations in the state.

Till date, there is only one medical college (NEIGRIHMS, run by the Central Government) in the whole of Meghalaya. Although two state-run medical Colleges in two districts have been proposed, it will be another couple of years before they actually come into existence. Therefore, the state is facing a dearth of forensic expertise, which can only be bridged by a greater turnover of postgraduates in this discipline.

Forensic Laboratory Services:

The Forensic Science Laboratory in Shillong was set up in January 1987. [6] It is headed by a Director, and currently has four functioning technical divisions, which are as follows:

- Physical division for examination of firearm ammunition, exhibits from accident cases, explosive substances, metal and metallic fragments, etc.
- Chemical division for examination of drugs and narcotic substances, chemicals, fire debris, poisons and viscera for determination of cause of death.
- Biology division for examining exhibits like skeletal remains, plant poisons, blood, semen and other body fluids from murder and rape cases.
- Questioned documents division for examination of forgeries, currency notes and other questionable documents.

Suggestions for Improvement:

It has been observed that there is currently a pressing demand for forensic expertise in the state of Meghalaya. Forensic doctors have to be posted in all districts of the state to ensure that medico-legal work is performed efficiently and competently. This, in turn, would help medical officers to avoid pitfalls while carrying out their day-to-day duties, which could occur due to ignorance of the legal aspects of medical practice. Regular training and orientation programmes for Government doctors are suggested so that they are well-versed on the Forensic aspects of cases, especially in sexual offences, where sensitivity towards the victim is of the utmost importance. The medical examination of victims should not be an ordeal, as it is often perceived.

The state would benefit from having a Medical College of its own, as this would ensure a regular turnover of graduates and post-graduates in every discipline, including Forensic Medicine, rather than depending on institutions outside the state for the same.

Appointment of specialist doctors, who are experts in their field, would definitely be a boon for medical services in Meghalaya. In this regard, the post of a qualified 'Medico-legal advisor' or 'Forensic medical expert' would serve as an initial step in the improvement of forensic medical services in the state.

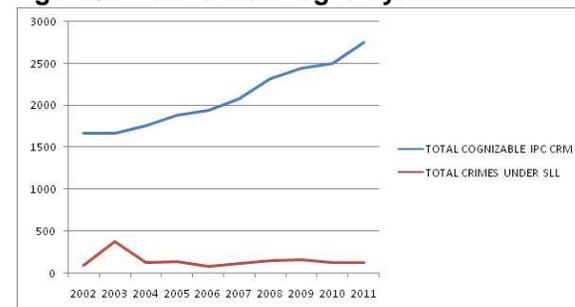
Conclusion:

The state of Meghalaya has a long way to go as far as forensic training and practice are concerned. A state-run Medical College would be of benefit by ensuring a regular turnover of doctors in all disciplines, including Forensic Medicine. The services and expertise of qualified doctors should be properly utilized. Meanwhile, forensic orientation programmes may be conducted more regularly to equip medical officers with updated knowledge and skills for handling medico-legal cases.

References:

1. Islam MN. Forensic medicine in Bangladesh. Legal Medicine (Tokyo) 2003 Mar; 5 Suppl 1: S357-9.
2. Kodikara S. Practice of Forensic Medicine in Sri Lanka: Does it need a new era? Legal Medicine (Tokyo) 2012 Jul; 14(4):167-71.
3. Statistics-Government of Meghalaya, Home (Police) Department. Available from: http://meghpol.nic.in/crime_statistics.htm. Accessed June 8, 2012.
4. Khandekar I et al. Development of Clinical Forensic Medicine in India: A need of time. J of Ind Acad of For Med 2010; 32(1): 85-90.
5. Jagadeesh N. The status of Forensic Medicine in India. Ind J Med Ethics 2008 Oct-Dec; 5(4):154-6
6. Forensic science laboratory Meghalaya, Home (Police) Department. Available from: <http://meghpol.nic.in/infosl.html>. Accessed April 13, 2013.

Fig.1: Crime chart of Meghalaya



(Source: State Crime Records Bureau)

Table 1: Medico-legal cases Presenting to NEIGRIHMS Casualty

Particulars	2010	2011	2012
RTA	193	179	187
Blunt injury	94	62	66
Fall from height	40	34	36
Poisoning	17	24	30
Sharp injury	18	13	14
Brought Dead	1	20	32
Electrocution	5	2	4
Firearm	3	2	3
Bomb Blast	0	2	3
Hanging	1	2	1
Strangulation	1	0	1
Burns	1	2	2
Sexual Assault	1	2	0
Alcohol Intoxication	1	9	12
Others	5	5	21
Total	381	358	412

**Table 2
Incidence of Crimes against the Human Body**

CRIME	2005	2006	2007	2008	2009	2010	2011
Murder	134	157	114	126	128	134	170
Attempt to Commit Murder	35	42	49	55	39	60	51
Rape	63	74	82	88	112	149	130
Kidnapping & Abduction	48	57	52	56	56	71	87
Riots	42	7	33	8	18	7	8
Dowry Death	1	6	2	2	0	0	1
Molestation	44	57	45	54	72	48	74

(Source: State Crime Records Bureau)

Case Report

Acute Severe Suicidal Poisoning by Celphos Powder A Rare Case Report from Rural India

*Alok Kumar, **C.V. Singh, ***Seema Dayal, ****V.K. Gupta, ****Suraj Kumar, **Archana Verma

Abstract

Acute Aluminum Phosphide (ALP) or Celphos poisoning is extremely lethal and invariably suicidal in nature. Unfortunately its high toxicity and absence of a specific antidote results in very high mortality. The key to treatment lies in rapid decontamination and early institution of resuscitative measures. It is a major cause of morbidity and mortality in northwest and central India. The outcome is poor, largely due to delay in appropriate management and skepticism amongst clinicians regarding the outcome. Things are further complicated by limited resources in tier 3 cities and villages where most of the cases present initially. ALP is commonly available and ingested in the form of Tablets / pellets of known amount and composition which renders a fair idea about the ingested dose of the poison. Surprisingly, in our case the victim ingested a massive dose of ALP powder to commit suicide. He could survive just because of instant and excessive vomiting, and meticulous management without any delay. Such an incidence with powder form of ALP is extremely rare and has not been reported so far, to the best of our knowledge.

Key Words: Celphos Powder, Aluminum Phosphide Poisoning, Phosphine

Introduction:

Pesticide poisoning is the single most important means of suicide globally. It is a major public health problem in rural Asia, where it has led to a very high-case fatality ratios than in the developed world. Suicide is an important cause of premature mortality accounting for an estimated 849,000 deaths every year [WHO]. [1]

Based on the finding that pesticide ingestion accounted for over 60% of suicides in many rural areas of China and South-East Asia, Gunnell and Eddleston [2] estimated that there may be as many as 300,000 deaths each year from intentional pesticide poisoning in these regions alone. This makes it likely that pesticide poisoning is the most frequently used method of suicide worldwide. This is principally committed by the ingestion of Organophosphates (most common in India), Organochlorines and Aluminium Phosphide compounds.

These are an integral part of agriculture & are readily available at a cheap rate. Their poisoning is typically suicidal, at times accidental and rarely homicidal in nature. [3] Pesticide poisoning invariably presents as deliberate self-ingestion in young (20-30 yrs). It is quite unusual in other forms and in elderly.

However a case of a 55 years old farmer has also been reported, who developed significant severe toxicity by accidental inhalational exposure during handling of multiple OP pesticides. [3]

Aluminium phosphide [AIP] is one of the most common agrochemical poisons being consumed in Asia. AIP is a solid fumigant which has been in extensive use since the 1940s.

It has rapidly become one of the favorite grain fumigants because of its properties which are considered to be near ideal; it is toxic to all stages of insects, highly potent, does not affect seed viability, is free from toxic residues and leaves little residue on food grains. Unfortunately, its widespread use has been associated with a galloping rise in the incidence of its severe acute poisoning.

The first ever case of AIP poisoning was reported in 1981 in India, since then, such incidences have been relentlessly increasing, particularly in rural region of northwest and central India largely due to lack of awareness and poor regulation regarding the accessibility of this gravely toxic compound. [4]

Corresponding Author:

*Addl. Professor & Head,
Department of Forensic Medicine & Toxicology
UP Rural Institute of Medical Sciences and Research,
Saifai, Etawah. -206301 (U.P.), India.
E-mail: drsalok@rediffmail.com
**Assoc. Prof, Pharmacology
*** Assist. Prof, Pathology
**** Lecturer, Pharmacology
**** Lecturer, Physiotherapy
**Assoc. Prof, Neurology
DOR: 1.8.12 DOA: 19.8.13

Its poisoning shows a distinct male preponderance in the lower socio-economic strata and in rural areas, probably due to the heavy social stress burden. Easy availability, low cost, efficacy of action, & rapid death all make it an ideal choice as a suicidal agent.

Physical and Chemical Properties:

AIP is available in the form of 3 gm tablets or 0.6 gm pellets. Tablets are dark brown or grayish in colour and contain two compounds: aluminium phosphide and aluminium carbonate in a ratio of 56:44. Aluminium phosphide is the active component of the mixture whereas aluminium carbonate is added to prevent self-ignition of Phosphine (PH₃) which is liberated when it comes in contact with moisture or HCl in stomach.



$\text{AIP} + 3\text{HCl} = \text{AlCl}_3 + \text{PH}_3$ (in air and stomach)

Each 3 gm tablet releases 1 gm and each 0.6 gm pellet 0.2 gm of phosphine gas on exposure to moisture and leaves behind a non-toxic grayish residue of aluminium hydroxide. Phosphine gas on exposure to air it gives a foul odour (garlicky or decaying fish) due to the presence of substituted phosphines and diphosphines. Though the exact mechanism of action is still not clear, it is supposed to act like cyanide by producing non-competitive inhibition of cytochrome C oxidase leading to inhibition of mitochondrial oxidative phosphorylation. [5]

Fatal Dose:

The LD₅₀ dose of ALP is 10 mg/kg of body weight. The specified fatal dose is 0.15-0.5 gm. However, most of the patients present with ingestion of three or more tablets which invariably results in death. For a 70 kg man 0.5 gm. ALP is lethal, but the survival of our patient (even after taking about 15 gm of ALP powder) is attributed to the immediate and massive vomiting, induced by the poison itself and timely management. In India, especially in remote areas most of such patients succumb to its toxicity because of the delay in the initiation of proper treatment. This has led to widely prevalent skepticism among physicians while managing cases of Celphos poisoning.

Case Report:

A 35-year-old male farmer was admitted in the casualty at 1.05 pm with complaints of excruciating colicky pain epigastrium, difficulty in breathing, suffocation, vomiting, and sweating for about 2.00 hrs. He had no previous history of any premorbid illness. According to his relatives, he consumed a sachet (10 Grams) of Celphos powder to end his life, but a large amount

vomited out immediately, therefore he again ingested one more sachet with water but fortunately it again went in vain and vomiting occur after sometime. When family members came to know this incident, they immediately brought him to the hospital where gastric lavage was done at once. His past history was not suggestive of any major disease or psychiatric illness but suicidal tendency was revealed, he has also committed similar suicidal attempts few month back.

The physical examination revealed a distressed patient with a pale and anxious look, low volume irregular pulse of 92/min, BP of 126/70 mm of Hg, R/R 20/min, peripheral cyanosis, and cold sweaty skin. Abdominal examination showed generalized colonic tenderness with minimal guarding but no distension, rigidity, rebound tenderness, or hepato-splenomegaly. CVS examination revealed tachycardia. Respiratory and neurological systems were normal. Immediate resuscitation measures were started after withdrawing blood for investigations.

Investigations at admission showed normal renal functions, and normal serum levels of sodium, potassium, calcium, and magnesium. Liver functions were deranged with SGOT & SGPT 72.2 and 70 IU/ Lt. respectively and ALP was 142 IU/ Lt. Blood picture (Hb 16 g/dl, TLC 12,000/cu mm) and urine examination were normal. The patient presented with typical features of ALP poisoning and was managed well with saline lavage, IV Fluids, inj. Magnesium sulphate, inj. Hydrocortisone and broad spectrum antibiotics.

We kept talking to relatives as well as the patient and this unfortunate incidence was found to be purely suicidal in nature. The diagnosis was made by the reliable information from the victim, his relatives, typical clinical features and empty sachet of the poison brought by them. (Fig.1)

His Psychiatric evaluation revealed irritability, impulsivity, depressive mood, and suicidality; for which medication and counseling was given. On follow up after a week the patient showed marked improvement in depressive mood, impulsivity and suicidality and was found fit to resume his work. All the legal protocols were done as per the rules.

Discussion:

Aluminium phosphide is a solid fumigant pesticide that has been in use in India for decades. It is cheap, easy to use, efficacious, and freely available in the market under various brand names such as Celphos, Alphos,

Quickphos, Phosphotex, etc. ALP is very effective as a fumigant pesticide to protect grains, and is also capable of killing rodents. [6] But its ingestion releases Phosphine (PH₃) gas which is rapidly absorbed via lungs and gut and is responsible for its toxic effects. Phosphine gas can get absorbed by direct inhalation, dermally, or by the gastrointestinal tract. [7] ALP is being extensively reported as one of the commonest means of poisoning in North India. [8]

With no known antidote, ingestion of 'unexposed' (fresh) tablets has greater risk of fatal outcome. Severe poisoning causes death in about 3 hrs, ranging between 1 - 48 hrs. Clinical presentation depends upon the time elapsed from the time of ingestion. Emergency staff handling patients within one hour of ingestion needs extra protection to avoid contamination. Qualitative silver nitrate paper test (turns black on reaction) or liquid gas chromatography can confirm presence of phosphine in gastric fluids and exhaled breath.

Ironically, day-by-day, suicides due to this chemical are steadily increasing and at several places it has acquired the dubious distinction of being the leading method of suicide, even surpassing OP compounds. In a few studies it was found to be responsible for the maximum number of deaths. [9] Phosphine causes widespread organ damage. It binds with and blocks Cytochrome oxidase, resulting in cellular hypoxia. It also causes focal myocardial necrosis that probably results in transmembranal exchange of ions (Na⁺, K⁺, Mg⁺, Ca⁺) causing arrhythmias and rapid death. [6] Exposure of ALP has multisystem manifestations as it affects multiple systems, including GI, respiratory, CNS, CVS, musculoskeletal, and urinary System. [10,11]

Intentional or unintentional exposure to this compound can result in nausea, vomiting, abdominal pain, diarrhoea, thirst, arrhythmia, sino-atrial block, chest tightness, decreased EF on echocardiography, dyspnoea, pulmonary edema, muscle pain, fatigue, chills, stupor, syncope, vertigo, parasthesia, electrolyte imbalance, burning sternal pain, and renal and liver damage. [10,11]

As the compound is reported to hold lethal and delayed effects, therefore, an observational period of 72 hours is recommended to enable identification and management of pulmonary edema in the victims. [10, 11] In the absence of any specific antidote, management of Celphos poisoning hinges on early aggressive gastric lavage and appropriate supportive measures dictated by the presenting sign and symptoms of the patient. The role of

Magnesium Sulphate is not clearly documented, but it is used widely based on the membrane stabilizing action and hypo-magnesemia.

Mortality rate in ALP Poisoning varies from 35% to 100% and principally depends upon the amount consumed, the relative freshness or otherwise of the compound, promptness or delay in treatment, duration of shock, and efficacy of treatment. The mode of poisoning is usually intentional (suicidal), occasionally accidental, and rarely homicidal. Homicidal cases are generally seen in children, invariably administered by their parents, as part of a suicide pact. Fatal accidental cases have been reported when ALP was used as a grain fumigant for bulk shipment of food.

After accidents and maternal mortality; suicide is the leading cause of death among the young in India, with an average age of 34 yrs. for male and just 25 yrs. for female. It has a high prevalence in rural areas. It could soon become the leading cause of death among young women in India. Ingestion of agrochemical compounds is the principle mode for suicide. Of the 1.87 lakh people who committed suicide in India in 2010, around half (49% men and 44% women) consumed poison, mainly pesticides. [12]

Their poisoning is typically suicidal, at times accidental and rarely homicidal in nature. [3] In developing countries, the mortality is much greater with high-case fatality up to 46% (generally more than 15%). [13]

Due to their very high intrinsic toxicity, new compounds of high potency and low toxicity continue to be developed e.g. Imidacloprid, Pendimethiline, and Pencycuron etc. Their Substitution for existing highly toxic compounds may save a number of precious lives. They are classified as a 'moderate toxic' and generally demonstrate low human lethality but at times they may be hazardous. [14]

Such incidences are again a big challenge and their exposure should not be ignored, especially in rural areas where health care facilities are sorely lacking. [15] This is again an important emerging problem in the tropics. North, Northwest and Central India commonly report poisoning due to ALP.

In 1990s, it was the leading cause of suicidal poisoning in North India. ALP has no specific antidote, therefore favorable outcome correlated best with the severity of vomiting and the promptness of the initiation of treatment after toxicity.

To sum up, the main guiding principles of management are early aggressive lavage with KMnO₄ and treatment of hypotension and shock. Other appropriate supportive measures

which are tailored to requirements of the patient complete the management of ALP poisoning. Also, it is important that we must be aware of this poisoning because it is available quite freely and used extensively.

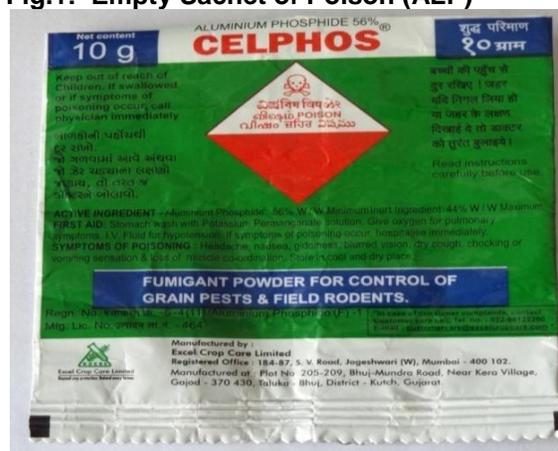
The favourable outcome of Celphos poisoning correlates best with the prompt removal of poison from the body and good supportive treatment. Moreover, regardless of the route of poisoning, attendants should be asked to bring the specimen to the hospital setting.

References:

1. World Health Organization. The World Health Report 2002: Reducing Risks, Promoting Healthy Life. Geneva: WHO; 2002..
2. **Gunnell D , Eddleston M** . Suicide by intentional ingestion of pesticides: a continuing tragedy in developing countries . Int J Epidemiol 2003 ;32 : 902 – 909
3. **Kumar A, Pathak A, Verma A, Kumar S** . Accidental inhalational poisoning by multiple pesticides of organophosphorus group in an aged person; an uncommon occurrence . J Forensic Med Toxicol 2012 ;29 : 78 – 83 .
4. **Meena HS, Murthy OP, Bose S, Bhatia S, Dogra TD**. Aluminum phosphide poisoning, J Forensic Med Toxicol. 1989; 11: 19-30.
5. **Singh S, Bhalla A, Verma SK, Gill K**. Cytochrome c oxidase inhibition in 26 aluminum phosphide poisoned patients. Clin Toxicol (Phila) 2006; 44 (2): 155-8.
6. **Vij K**. Forensic Medicine and Toxicology. 2nd edn. New Delhi: BI Churchill Livingstone; 2002. p. 969-975.
7. World Health Organization. Environmental Health Criteria # 73. Phosphine and selected metal phosphides. Geneva: WHO, 1988.
8. **Eddleston M**. Patterns and problems of deliberate self poisoning in the developing World. Q J Med 2000; 93: 715-31.
9. **Sheikh MI, et al**. Changing trends of poisoning in Surat. Intl J Med Toxicol Legal Med. 2004; 6:17-21.

10. **Popp W, Mentfewitz J, Gotz R, Voshaar T**. Phosphine poisoning in a German office. Lancet 2002; 359:1574.
11. **Musshoff F, Preuss J, Lignitz E, Madea B**. A gas chromatographic analysis of phosphine in biological material in a case of suicide. Forensic Science International 2008; 177:e35-e38.
12. **Sinha K** . 40% of India ' s suicides in four southern states; the Times of India , 23 June , 2012.
13. **Eddleston M , Buckley NA , Eyer P , Dawson AH** . Management of acute organophosphorus pesticide poisoning. Lancet 2008; 371: 597– 607 .
14. **Kumar A, Srivastava R, Vishwakarma P, Pant MK, Verma A**. Suicidal Human Poisoning with Fungicide Pancyuron; a Rare Case Report from Rural India with Brief Review of Literature. International Journal of Medical Toxicology and Forensic Medicine. 2012; 2(4):148-152.
15. **Kumar A , Verma A** . Emergence of new poisons: A case of pendimethalin poisoning from rural India. Clinical Toxicology (2013), Early Online: 1–2. DOI: 10.3109/15563650.2013.796379.

Fig.1: Empty Sachet of Poison (ALP)



Case Report

Traecheostomy Associated Artefact Mimic Strangulation Injuries: A Case Report

*Jatin Bodwal, **Mamta Panwar, ***Manish Kumath

Abstract

Any change produced, or feature introduced, in a body after death, which is accidentally or physiologically unrelated to the natural state of the body is termed as an artefacts. Since artefacts may lead to misinterpretation of post-mortem findings, it is important to rule them out. Artefacts may be produced for a variety of reasons. A case is reported where a chronic alcoholic old male suffering from schizophrenia found dead at his home. At autopsy partially healed scar was present on his neck with effusion of blood in neck structures. Due to non corroboration of history and findings, reinter view of relatives was done which revealed Traecheostomy was done recently. Hereby, the importance of proper history taking is emphasized to distinguish between artefacts and inflicted injuries.

Key Words: Artefacts, Strangulation injuries, Traecheostomy

Introduction:

Artefacts may be introduced before death, at the time of death or after the death and, therefore, may accordingly be labeled as therapeutic artefacts, agonal artefacts and postmortem artefacts. [1] The importance of proper interpretation of artefacts at autopsy becomes the deciding factor for impartial administration of justice. The artefacts present or produced in the body at times may mislead to both the treating doctor and investigating agencies. The distinction between inflicted injuries and artefacts may be crucial in the final diagnosis and disposition of certain deaths.

Traecheostomy is a creation of permanent or semi permanent opening in the trachea. The main indication is in upper airway obstruction i.e. Trauma Foreign body, Infections, Malignant lesions, etc. In an elective Traecheostomy incision is given horizontally between cricoid cartilage and suprasternal notch and tube is placed in trachea. The Traecheostomy wound heals in about 15-20 days. [2] There are several reports in the clinical literature regarding intubation injury which includes tracheotomy also; references in the Forensic literature are scarce. [3]

Corresponding Author:

*Senior Resident, Department of Forensic Medicine
MAMC, New Delhi

E-mail: jatinbodwal@yahoo.co.in

**Assist. Prof, Dept. of Anaesthesia,

*** Assoc. Prof, VMMC, SJH, New Delhi

DOR: 13.9.13 DOA: 19.8.13

Although the clinical reports record mucosal lacerations [4, 5], tracheal rupture and cricoid cartilage fractures. [6, 7] Other reports focus on long-term effects of intubation, including tracheal stenosis. [7] More important to the forensic pathologist are the acute and relatively minor injuries of tracheostomy because they may be masquerade as injuries produced by strangulation or neck compression.

Case Report:

The deceased was in his fifties suffering from schizophrenia and chronic alcoholic for many years. On the fateful day, he was found lying in the bed in supine position by his son in evening and not responding.

He was declared brought dead on arrival at hospital on 23/6/10 at 19:45 hrs. Past medical history revealed that he was on antipsychotic drugs since 1993 and daily consumption of alcohol was 30-40 ml for last many years. He met with two road traffic accidents in first in 1993 and recently in March 16, 2010, in both the incidences, he sustained grievous injuries and tracheostomy was done.

Autopsy was conducted at Safdarjung Hospital, New Delhi on 24/6/10 at 14:35 hrs. Eyes were closed and corneas hazy. Post-mortem lividity fixed in dependent areas and rigor mortis was well developed.

A scar mark measuring 4cm x 1cm was horizontally placed in the midline of neck just above the thyroid cartilage. On dissection of neck, effusion of blood was seen underneath scar mark and subcutaneous tissue. (Fig 1 & 2)

On further dissection effusion is seen at base of tongue, anterior surface of larynx and fracture of tracheal rings was noticed at mid trachea. Hyoid bone, cricoid cartilage and thyroid cartilage are intact. Stomach contained 100cc semi digested food with smell of alcohol and walls were congested. Dissection of heart established almost complete obliteration of left anterior descending artery and right coronary artery also showed significant obliteration. Rest of the organs was congested. Viscera have been

Discussion:

There is dictum “Dead Body speaks for itself” but this case refutes it substantially. In the present case the contradiction between history and neck findings compelled us to reinter view the relatives while autopsy was being conducted. This time they came up with real facts of tracheostomy. Final autopsy report based on sole neck findings would have otherwise proved catastrophic to relatives and could mislead the investigation agency.

Artefacts of various natures are known to be misinterpreted by investigating agencies and even by autopsy surgeon. [8, 9] Fatal neck compression (strangulation or hanging) injuries in the standard textbooks is described with a paucity of autopsy findings but can include congestion, swelling, petechial hemorrhages, retinal hemorrhages and ligature mark.

Death due to neck compression can often only be diagnosed by careful assessment of the history and circumstances surrounding the death and exclusion of other causes of death.

In addition, there is recognition of artefacts in cases without evidence of neck compression, such as the "Prinsloo and Gordon artefact" (haemorrhage around the posterior surface of the esophagus and anterior longitudinal ligament of the cervical spine) and banding artefact of the esophagus. [10]

Cases has been reported where “auto pulse resuscitation device” which was used in some states of America for resuscitation cause significant therapeutic artefacts which appears as bruise and superficial burn on anterior part of chest at autopsy. [11]

In this case neck findings mimic strangulation injuries but circumstances of death, history and no allegations by his relatives rule out any foul play.

History of tracheostomy and absence of signs of asphyxia approves of therapeutic artefacts. The exact cause of death will be ascertained after receipt of viscera analysis

report which may take a considerable amount time in India.

Conclusion:

Although tracheostomy causes significant injury to neck structures, proper history and experience of autopsy surgeon helps in distinguishing between the artefacts and strangulation injuries

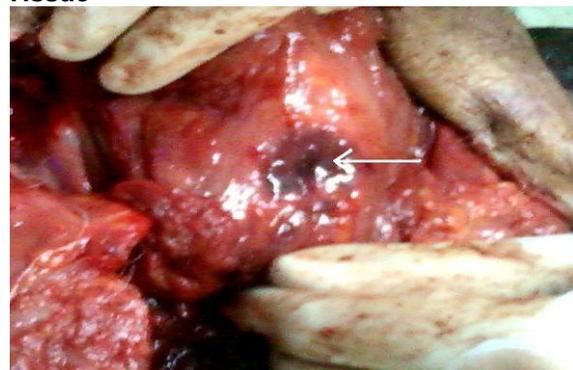
References:

1. Vij K. Text Book of Forensic Medicine and Toxicology. 4th Edition; Elsevier, 2008
2. Oberoi G. Anaesthesia & Emergency Situations: A Management Guide 1st Edition, 2000
3. Leadbeatter S, Knight B. Resuscitation artefact. Med Sci Law 1988; 28:200-4
4. Massard G, Rouge C, Dabbagh A, et al. Tracheobronchial Lacerations after intubation and tracheostomy. Ann Thorac Surg 1996; 61:1483-7
5. Kautzky M, Franz P, Krafft P, Fitzgerald RD. Traumatizing effects of blind oral intubation using the Augustine guide. J Oral Maxillofacial Surg 1996; 54:156-61
6. Heath K, Palmer M, Fletcher S. Fracture of the cricoid cartilage after Sellick's manoeuvre. Br J Anaesth 1996; 76:877-8
7. Streitz Jr J, Shapshay S. Airway injury after tracheostomy and endotracheal intubations. Surg Clin North Am 1991; 6:71.
8. Parikh CK. Text book of Forensic Medical Jurisprudence; Forensic Medicine and Toxicology 6th Edition. CBS Publishers and Distributors, 2002
9. Bhardwaj DN, Sharma SK, Gupta S, Hemorrhoids leading to post-mortem artefact: A case report. Med Sci Law. 2005 Jul; 45(3):265-6.
10. Saukko PJ, Knight B. Knight's Forensic Pathology. 3rd ed. London: Arnold; New York: Distributed in the U.S. by Oxford University Press, 2004.
11. Amy P., Hart Venus J. Azar, Katherine R. Hart, and Boyd G. Stephens. J Forensic Sci, Jan. 2005, Vol. 50, No. 1

Fig.1: Effusion of Blood under Neck Scar



Fig. 2: Effusion of Blood in Subcutaneous Tissue



Case Report

Fatal Radiation Exposure due to Careless Disposal of Cobalt-60 from a University Lab

*S.R. Singh, **Karthik Krishna, ***C Behera, ****Tabin Millo, *****D.N Bhardwaj, **R Swain

Abstract

Many radioactive materials are also used in laboratories for experimental works. The methods of disposal of these residual radioactive materials are always a concern, as it can adversely affect the environment as well as the health of the exposed persons. Eight persons including a scrap dealer were accidentally exposed to radiation by a Cobalt-60 irradiator in a scrap shop at Mayapuri, New Delhi, India. The source of irradiator was traced back to Chemistry department laboratory of Delhi University, where it was used for experimental analysis of effect of gamma rays on chemicals. It was sold to the scrap dealer without following proper guidelines. All persons suffered acute radiation syndrome, but the laborer who had dismantled the irradiator and touched the pencils suffered the maximum exposure. He later died during treatment at All India Institute of Medical Sciences (AIIMS) Hospital, New Delhi. The clinical course, autopsy findings of the deceased and legal aspects of this incident are discussed in this paper.

Key Words: Cobalt-60; Radiation; Death; Autopsy; Legal

Introduction:

In this modern age, many radioactive materials are used in hospitals as well as laboratories of teaching institutions. In hospitals, it is used for both diagnostic and therapeutic purposes. Many radioactive materials are also used in laboratories for experimental works.

The methods of disposal of these residual radioactive materials are always a concern, as it can adversely affect the environment as well as the health of the exposed persons. The population exposed to such events not only suffer acute radiation syndrome, but also bear the brunt of its long term sequel like malignancies. We are reporting a case, where one person died and seven others suffered acute radiation syndrome due to the residual radioactivity from a Cobalt-60 irradiator used in laboratory of a University.

Case History:

A scrap dealer purchased an irradiator. This was not in use, since past 25 years, in the chemistry laboratory of Delhi University, India.

The irradiator was dismantled by the dealer in late March, 2010 and was kept in his shop at Mayapuri, New Delhi. Within a week, he observed skin hyper-pigmentation of the hands and forearm, loss of scalp hair, nausea and fatigue. He came to emergency Department of AIIMS, New Delhi for treatment.

With these clinical signs, symptoms and history, he case was diagnosed as a case of suspected radiation injury. The National Disaster Management Authority (NDMA) was informed.

One emergency team from NDMA rushed to the suspected area and cordoned off the whole area. Subsequently teams from Bhaba Atomic Research Center (BARC), Mumbai and Narora atomic power plant, Narora, reached the spot and the article emitting harmful radiation was detected. The article was identified as a Gamma irradiator & the radioactive material as Cobalt-60. The Gamma irradiator was purchased by the Delhi University from Canada in 1968 and was condemned in 1985.

It was since then lying unused in their store and was sold to the scrap dealer without measuring its residual activity. Meanwhile, the patient who had presented with the symptoms, opted to shift to a private hospital, where he was treated and discharged afterwards.

This incident attracted huge media attention in India. Seven other persons working in that shop during that period were also traced, who had already developed similar skin manifestations and fatigue. They were initially

Corresponding Author:

***Assistant Professor

Department of Forensic Medicine and Toxicology,
All India Institute of Medical Sciences, New Delhi
E-mail: drchitta75@rediffmail.com

*Senior Resident

**Junior resident

****Additional Professor

*****Professor and Head

DOR: 28.12.12 DOA: 14.8.13

treated in a private hospital, out of which five were shifted to AIIMS hospital.

All five were diagnosed and treated for Acute Radiation Syndrome out of which one died, during the course of treatment. Two other exposed sufferers were treated at a different hospital and were discharged too.

Clinical Course of Patient Who Died: [1]

The patient was admitted to AIIMS hospital on 9th April 2010. The patient had history of exposure to radiation of about 2 weeks. He revealed that, he had broken the protective lead of the irradiator and had touched the cobalt-60 'pencils'. He used to work in that shop for 12-14 hours per day, where the pencils were kept.

He also gave history of gum bleeding, 2-3 episodes/day and epistaxis, 10-15 episodes/day for the past 5 days before admission. He had blackish discoloration of fingers and toes for 7 days and black spot over forearm and left shoulder since the past 2-3 days. The patient's vitals were stable at the time of admission.

The haemogram profile at the time of admission was Hemoglobin (Hb) -9.4 gm%, Total Leukocyte Count (TLC)-600/cmm, platelets -10,000/cmm. On second day the Hb, TLC and Platelet count decreased further and he was labeled as a case of pancytopenia. As the condition started deteriorating, transfusion of packed RBC and platelets were started.

On fourth day, the patient developed signs and symptoms of pneumonia. The etiology was established to be fungal by High Resolution Computer Tomography (HRCT) & Broncho-alveolar Lavage (BAL) microscopy. This fungal etiology was further confirmed by culture.

Despite repeated transfusion of platelets and packed RBC the haemogram profile did not improve. Bone marrow biopsy was also done which confirmed bone marrow suppression.

Bone marrow transplantation was planned, for which HLA typing of blood relatives were carried out. Despite vigorous treatment with antibiotics, febrile neutropenia regimen, systemic antifungal, repeated transfusion of packed RBCs, platelets, fluids etc, the patient's condition kept deteriorating. Gradually he developed Acute Renal Failure, Acute Respiratory Distress Syndrome (ARDS) along with paralytic ileus, pyelonephritis and pulmonary Aspergillosis.

The patient was shifted to ICU on 15th day of admission, intubated and was kept on total parental nutrition. Despite round the clock

close monitoring in ICU and treatment, he died on 26/04/2010.

The cause of death was mentioned by the treating physicians as "**Septic shock with sepsis**" (disease or condition directly leading to death) and "multi organ dysfunction with bilateral pneumonia with ARDS with pancytopenia with radiation exposure" (antecedent cause) in the International Form of Medical Certificate of cause of death.

The total radiation dose was calculated in patient during the course of treatment was 3.1Gy by BARC scientists. The body was declared safe for handling. Then body was transferred to morgue and the postmortem examination was carried out on the next day.

Autopsy Findings:

The body was that of a 26 year old male, average built.

External Examination:

A blackish patch of size (6x3) cm was present on right hand. Multiple hyper-pigmented areas were present on the body. (Fig.1) Sclera and nails showed yellowish discoloration.

Internal Examination:

Pleural cavities showed straw-coloured colored effusion, of about 300ml. Both lungs were heavy, edematous and showed diffuse consolidation with purulent exudates coming out of cut section. (Fig.2) Histopathology of lungs revealed dilated alveoli filled with fluid as well as fibrin deposits (Fig.3).

Peritoneal cavity showed effusion of fluid about 600ml. External examination of stomach wall showed a reddish-black discoloration of size (2x2) cm on fundal surface. (Fig.4) Stomach mucosa showed diffuse congestion and minute ulcerations. All other organs were congested.

Histopathological examination of coronaries and myocardium revealed no abnormality. Histopathological examination of kidney revealed congestion of glomeruli, peritubular capillaries and medulla. Patchy tubular atrophy was observed. (Fig.5) Liver architecture was maintained. Portal tracts were within normal histological limits. Sinusoids were dilated and congested. Hepatocytes were within normal limits. Few areas showed signs of autolysis. (Fig.6)

After perusal of treatment records, inquest papers, and autopsy, with histopathological examination, the cause of death was concluded to be shock due to septicemia consequent to acute radiation exposure.

Discussion:

In the last century, numerous radioactive accidents were reported from different parts of the globe, in various set-ups like power plants; hospitals etc. [2] However radiation exposure from Cobalt-60 in civilian set up is rarely reported. An accident involving Cobalt-60 (tele-therapy heads) was reported in Thailand during year 2000, in which total 10 persons were affected and 3 died, due to acute radiation sickness. [3]. Very few cases of radiation accidents were reported from India; however no fatalities were reported till date. [4-7]

Death due to such radioactive exposure is hence unique and first of its kind in India. The victim in our case was a laborer, who had broken the protective lead covering of the irradiator and separated the pencils to individual one. He had directly touched the radioactive material Cobalt-60 which resulted in maximum exposure.

In our case the radiation dose (3.1 Gy) was detected in the victim. He presented with gingival bleeding, epistaxis and hyperpigmentation on the right forehead. During the course of treatment pancytopenia, fungal pneumonia and bone marrow suppression was diagnosed. During treatment he developed paralytic ileus, ARDS, acute renal failure.

By postmortem and histopathology of organs septicemia, pneumonia, ARDS, gastric ulcerations and acute renal failure were confirmed. These findings further strengthened the clinical diagnosis. The explanation to the clinical course is that, the exposure caused hematopoietic depression due to bone marrow suppression. He developed infections and bleeding, secondary to low leukocyte and platelet counts, respectively.

In this case gastro-Intestinal syndrome accompanied the hematopoietic manifestations, further worsened the patient's condition, by compromising the absorptive layer of the gut altering absorption of fluids, electrolytes, and nutrients. GI injury had led to GI bleeding, sepsis, electrolyte and fluid imbalance in our patient, whose blood counts were compromised for a period of weeks, leading to death. [8]

There are statutory bodies in India who safeguard different aspects of radiation and its related events like Atomic Energy Regulatory Board (AERB), Safety Review Committee for Application of Radiation (SARCAR), but incidents like our case, raises concern on handling hazardous radio-isotopes in a civilian setup. [9] The authorities had effectively

decontaminated the vicinity where the scrap dealer's shop was located.

Following the incident, AERB had banned the use of the radioactive isotope of Cobalt in the University. [10] After investigation by Delhi Police, six Professors of Chemistry Faculty of Delhi University were charged with criminal negligence under sections 337 (causing hurt by act endangering life or personal safety of others) and 338 (causing grievous hurt by act endangering life or personal safety of others), and 304A (causing death by negligence) of the Indian Penal Code. [11]

A Task Force for radiation accidents was constituted by The Ministry of Health and Family Welfare, for framing protocol for the medical fraternity to respond to emergencies, arising out of radiation exposure in the future. Though the victims exposed to the radiation, were efficiently traced and treated, one of them was unfortunate and died.

We highlight the undue negligence on the part of the authorities who had carelessly disposed off the hazardous radioactive materials. The authors stress the importance of following the protocols in handling such materials as per the existing guidelines, in order to avoid repetitions of such incidents in the future.

References:

1. Dey AB, Mohanan S, Damodaran D, Soneja M, Jain N, Mohan A et al. Radiation accident at Mayapuri scrap market, Delhi, 2010. *Radiation Protection Dosimetry*; 2012: 1-7.
2. List of nuclear and radiation accidents by country. http://en.wikipedia.org/wiki/Nuclear_and_radiation_accidents_by_country. (Last checked on 03.09.2012)
3. Thongraparn T, Chaudakshetrin P, Buranapong P. Lesson learned from Co-60 accident in Thailand. *Australas Phys Eng Sci Med*. 2002 Dec; 25(4):172-4.
4. Gangadharan P., Lakshmiathy A. V., Murthy, B. K. S., Varadharajan G. Assessment of radiation exposure to a non-radiation worker in an industrial radiography source transport accident. In: 7th IRPA Congress Proceedings (1988). www.2000.irpa.net/irpa7/cdrom/VOL.2/S2_75.PDF. Last checked on 04.09.2012.
5. Anspaugh L. et al. Sources and effects of ionizing radiation: United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2000 Report to the General Assembly, with Scientific Annexes. Vol. I. UNSCEAR (2000). www.unscear.org/docs/reports/annexe.pdf (Last checked on 04.09.2012)
6. Bhushan V. Large radiation exposure. In: 3rd IRPA Congress Proceedings (1973). www.2000.irpa.net/irpa3/cdrom/VOL.3A/W3A_116.PDF (Last checked on 04.09.2012)
7. Rao S., Iyer P. S., Kannan A., Zapparde S. P., Subrahmanian G. Radiation injury from analytical x-ray equipment. In: 4th IRPA Congress Proceedings (1977). www.2000.irpa.net/irpa4/cdrom/VOL.3/P3_60.PDF (Last checked on 05.09.2012)
8. Longo DL., Fauci AS., Kasper DL., Hauser SL., Jameson JL., Loscalzo J. Harrison's principles of Internal Medicine, 18th ed. (1) Mc Graw Hill Medical, 2012:1789-1791.
9. The Indian Penal Code. Universal Law Publishing Co. Pvt. Ltd, 2002: 111-121.
10. Six DU professors charged for Mayapuri radiation leak. <http://articles.timesofindia.indiatimes.com/2011-09-03/delhi/>

30109365 _1_ national-radiation-emergency-response-mayapuri-scrap-gamma-irradiator. (Last checked on 08.09.2012).

11. Atomic Energy Regulatory Board. [http:// www.aerb.gov.in](http://www.aerb.gov.in). (Last checked on 09.09.2012)

Fig.1: Body showing Hyperpigmentation



Fig.2: Both lungs are Voluminous and Heavy



Fig.3: Histopathology of Lungs Showing Dilated Alveoli Filled With Fibrin & Edema Fluid

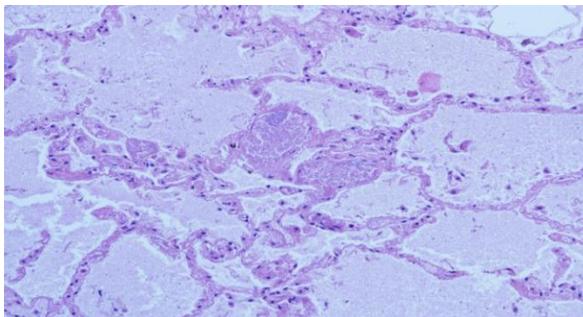


Fig. 4: Stomach Outer Wall Showing Reddish-Black Patch



Fig.5: Histopathology of Kidney Showing Patchy Tubular Atrophy and Glomerular Congestion

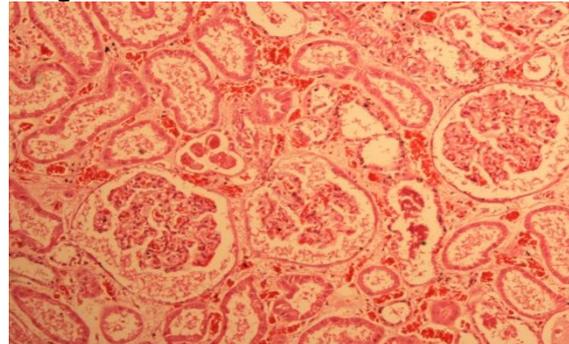
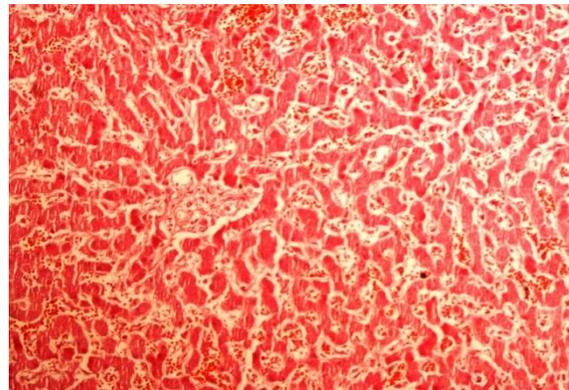


Fig.6: Histopathology of Liver Showing Dilated Sinusoids



Case Report

Fatal Stab at an Unusual Site: A Case Report

*Garudadhri GV, **Raghavendra R, ***Devadass PK

Abstract

Homicide means killing of one human being as a result of act of another. It may be lawful as in killing in self defense in certain circumstances and in judicial execution, as well as unlawful. For the purpose of homicide the death may be caused either by an act of commission or by an act of omission but in either case they must be proved to be the consequence of the alleged killer. Young medical practitioners often have the confusion and have misinterpreted few culpable homicides which they come across while deciding whether such a case is a murder or it will not amount to murder. Basic knowledge about Sections 299 and 300 of IPC and its proper interpretation would often help many of the practitioners. Here we are reporting such a fatal case of stab at an unusual site, further we will brief the literature & its interpretation with respect to the culpable homicide.

Key Words: Culpable homicide, Murder, Stab injury, Act of omission

Introduction:

Violence has been always an integral part of the human civilization since its inception. Human beings have been progressively become expert in producing various types of weapons for offensive and defensive purpose.

Globally around 5,20,000 people die each year as a result of interpersonal violence, which equates to 1400 deaths every single day.

Homicide means the death of the one human being as a result of conduct of another. It may be lawful, as killing in self defense in certain circumstances and in judicial execution.

For the purpose of homicide the death may be caused either by an act of commission or by an act of omission but in either case they must be proved to be the consequence of the alleged killer.

In humanity, taking away the life of an individual is the highest level of aggression found in all cultures. Since ages the very reason or motive for these killings has remained the same, viz – lust for money, women and land.

Homicidal pattern vary from country to country and are influenced by many factors.

Factors are like easily available weapons, method of killing, motive behind killing, family relationship like marital disputes, cultural, psychological, social influences, religious attitude, criminal activities, drug culture, political factors, unemployment and low social economic status.

The various patterns of homicidal deaths include assault by sharp weapon, blunt weapon, fire arms, strangulation, homicidal hanging, smothering, drowning, burns, poisoning etc. Here we are reporting a fatal case of stab at an unusual site and brief the literature & its medico-legal aspects.

Case Report:

A 23 yr old man was found dead in a pool of blood in the busy street of Bengaluru at around 7:00PM. On investigation, it was found that he had quarrel with his friend over an issue on money that he had borrowed from his friend. As the death was unnatural, the body was subjected to Medico-legal Post Mortem examination at Victoria Hospital, Bangalore Medical College & Research Institute, Bengaluru.

On autopsy, the dead body was that of adult male, moderately built and moderately nourished with brownish complexion, measuring 174 cm in length. The eyes were open and cornea hazy.

Rigor mortis was demonstrated all over the body. Post-mortem staining was demonstrated over back of the body.

Externally a perforating wound present over upper part of right thigh having:

- a) Entry wound, measuring 1.4cm x 0.9cm, wedge shaped, obliquely placed over front

Correspondent Author:

*Senior Resident, Department of Forensic Medicine, Bangalore Medical College & Research Institute, Bengaluru.

Email: garudagv2@gmail.com

**Post Graduate,

***Prof & Head

DOR: 6.2.13 DOA: 17.6.13

aspect of thigh, at 13 cm below and outer to pubic symphysis, base of wedge is placed downwards and inwards and apex upwards and outwards.(Fig. 1)

- b) Exit wound, measuring 1cm x 0.7cm, wedge shaped, obliquely placed over back of thigh, at 23cm below iliac crest, base of wedge is downwards and inwards and apex upwards and outwards. (Fig. 2)

Track of wound was filled with blood and measures 16.4 cm in length. On dissection, underlying muscles and femoral vein was injured. Track was directed before backwards, upwards and outwards. On internal examination, all organs were pale. Further an incised wound over top of head and a bright red abrasion over front aspect of right leg were present.

Finally, we opined the death is due to hemorrhagic shock as a result of injury sustained to thigh. Perforating wound is caused by single edged sharp pointed object.

Discussion:

Stab wound is an injury caused by a more or less pointed weapon when it is driven in through the skin and the depth being its greatest dimension. Such weapons include knife, dagger, needle, spear, arrow, scissors, etc.

Atypical appearance may also result when the injury is caused blunt edged weapon. When the weapon after penetrating the body tissues, comes out from the other side making an exit wound, injury is termed as a perforating wound (transfixing wound). A knife with one sharp edge and other blunt edge may produce a wedge shaped injury. A double edged knife produce an elliptical injury, a round pointed weapon a circular injury. It may be suicidal, homicidal or accidental.

Generally speaking, stab wounds are most commonly homicidal, usually more than one in number, and may be located anywhere on the body, including self unapproachable parts. In homicidal cases, the covering clothes usually bear corresponding cut marks. Defense wounds and signs of struggle may be present on the body. The weapon of offence may not be available on the spot.

Bilgen S [1] at Uludag University in 2009 retrospectively studied 63 autopsy cases of Peripheral vascular injury related deaths between 1996 and 2006. Of these, 57 cases (90.55%) were men and 6 were women. 58.7% of the cases were due to stab wounds. The femoral artery and vein were the most frequently injured vessels. The cause of death was Hypovolemia in 61 cases (96.8%) and various complications in 2 (3.2%). The origin was a

homicide in 85.7% of the cases. Blood alcohol levels were between 44 and 256 mg% in 25% of the cases. Limb vascular injury patients are generally young adults. [2, 3]

In 2004, Guraya SY [3] studied 57 cases of extremity vascular trauma in Pakistan at Jinnah hospital and Allama Iqbal Medical College, Lahore. In this study, injury to the vessel was sustained in 31 cases by firearm, 10 by blunt trauma, 7 by stab, 6 by machinery work and 3 by crush injury. In 15 of the cases femoral vessel were traumatized.

Jacob AO [4] studied 1550 stab injury cases during a 7 year period (July 1998 to June 2005) at Alice Spring Hospital, Australia. The most common site of the stab injuries was the thigh with a total of 605 cases (38%). Stab injuries to abdomen were significantly low with 68 cases. Of the victims, 31% (481) were under the influence of alcohol. A particular pattern of traditional stab injuries was also noted; medial thigh to kill, posterior thigh to permanently disable and lateral thigh to punish.

In few of such cases, it is the duty of Forensic Pathologist to determine death by such injuries is murder or homicide not amounting to murder, if it is culpable.

Section 299 IPC [5] says Causing death by doing an act

- 1. with the intention of causing death, or
- 2. with the intention of causing such bodily injury as is likely to cause death, or
- 3. with the knowledge that he is likely by such act to cause death,

Section 300 IPC [5] says Causing death by doing an act

- 1. with the intention of causing death, or
- 2. with the intention of causing such bodily injury as the offender knows to be likely to cause the death of the person to whom the harm is caused, or
- 3. with the intention of causing bodily injury to any person and the bodily injury intended to be inflicted is sufficient in the ordinary course of nature to cause death, or
- 4. person committing the act knows that it is so imminently dangerous that it must, in all probability cause death, and commits such act without any excuse for incurring the risk of causing death or such injury

Generally, it is considered that injuries over head, neck, chest and abdomen with underlying injuries are, sufficient to cause death in the ordinary course of nature. And any injuries over extremities with underlying vascular or neural breach and superficial injuries to head, neck and trunk are, likely to cause death.

If the injury is sufficient to cause death in the ordinary course of nature, the culprits will be dealt under Sec 300 and 302 IPC. [5] If the injury is likely to cause death, it may be culpable homicide amounting to murder if the offender knows that such an injury is likely to cause death as in Sec 300 IPC as well as it may be culpable homicide not amounting to murder if the offender does not know that such an injury is likely to cause death as in Sec 299 IPC. So, the Forensic Pathologist while giving opinion in such cases which are likely to cause death has to consider circumstantial evidence and findings of crime scene investigation.

Conclusion:

Registered Medical Practitioners/ Forensic Pathologists often come across cases of death due to superficial injuries to head, neck and trunk, and any kind of injuries to the extremities which are likely to cause death. Hence, while giving opinion in such cases the Forensic Pathologists/ Registered Medical Practitioners have to consider the circumstantial evidence and findings of crime scene investigation in addition to autopsy findings.

References:

1. **Bilgen S, Turkmen N, Eren B, Fedakar R.** Peripheral vascular injury related death. *Ulus truma acil cerrahi. Turkey. Derg.* 2009 July; 15(4):57-67.
2. **Goren S, Tirasci Y.** Retrospective evaluation of extremity vascular injuries. *The Bulletin of Legal Medicine.* 2000; 5:112-3.
3. **Guraya SY.** Extremity vascular trauma in Pakistan. *Saudi Med J.* 2004; 25:498-501.
4. **Jacob AQ, Boseto F, Ollapallil J.** Epidemic of stab injuries; an alicie spring dilemma. *Anz j surg.* 77(8); 621-5.
5. **Indian Penal Code (45 of 1860). Universal's Criminal Manual.** Universal Law Publishing Co Pvt Ltd. Delhi. 2012:506-16.

Fig. 1: Perforating (Entry) Wound over Front Aspect of Thigh



Fig. 2: Perforating (Exit) Wound over Back of Thigh



Fig 3: Injury to Femoral Vein



Case Report

Death due to Medical Negligence: A Case Report

*N. Srinivasaragavan, **Kadhirazhagan, ***K. Thunderchief, ****J. Magendran

Abstract

Medical negligence is a broad term which came under lime light due to the development in Forensic Medicine; it has now become the duty of the Forensic Pathologist to explore and maintain the transparency between the doctors, patients and the law, in order to bring a high degree of standard in the ethical aspect of medical practice. In this case, a patient who is alleged to have sustained a road traffic accident was brought to the hospital and diagnosed to have had a head injury, and while treating the patient collapsed. Later, during the autopsy it was found that the cause of death was Hemorrhagic shock due to pelvic injuries, which was entirely different from that of the clinical diagnosis. Was the recommended protocol followed, or was it just an assumption made? Grossly neglected findings from the patient remain open for analysis.

Key Words: Medical negligence, Head injury, Pelvic fracture, Hemorrhagic shock, Death

Introduction:

Despite public awareness of Medical Negligence growing in India, it is not uncommon in day to day practice. Hospitals and their managements are increasingly facing complaints regarding the facilities, standards of professional competence, and the appropriateness of their therapeutic and diagnostic methods.

Though unknowingly done, in most of the cases it is felt at a later stage that the damage is due to the professional incompetence or poor standard of care at the cost of vital damage to the patient including loss of life.

Medical negligence is defined as an act of omission or commission by a health care provider in which the treatment provided falls below the accepted standard of practice in the medical community and causes injury or death of the patient, with most cases involving medical error". [1] This is a medical negligence case involving a road traffic accident victim with undiagnosed catastrophic pelvic injury, which resulted in death of the individual.

Case Summary:

According to the hospital record on 4th April 2011, a 49 year old patient was brought to the casualty and admitted in the ward at 10:50 PM with alleged history of road traffic accident. Patient had history of projectile vomiting (two episodes) and brief unconsciousness. No history of seizure/ ENT bleeding was recorded. (Fig.1)

On Clinical evaluation, the conscious level was 13/15 (Glasgow coma scale) E₃V₅M₅. Airway, breathing and circulation adequate. Pulse rate: 88/min BP: 100/70 mmHg. **Clinically there was no evidence of pelvic, long bone and spinal bone injury** as per the medical record. Neurosurgeon opinion obtained and suggested CT Brain. Since the patient became hemodynamically unstable with progressive fall in BP (80/60) and tachycardia (120/min), he had not been shifted for the CT brain investigation.

Dopamine drip and IV fluids started. Later around 11:50 PM, Patient developed sudden cardio respiratory arrest and was revived. He was put on mechanical ventilatory support. Patient developed second episode of cardio respiratory arrest at 12:30AM. CPR started and continued for 30 minutes, which failed to yield the desired result. Patient could not be revived in spite of all resuscitative measures. Death was declared at 1:00 AM on 21/4/2011.

The clinical cause of death was "**Severe head injury as a result of road traffic accident.**" (Fig. 2) Since it was a medico-legal case, the body was sent for autopsy to find out the actual cause of death. Autopsy was conducted on the body of the deceased on 21/4/2011 morning.

Corresponding Author:

****Assistant Professor,
Department of Forensic medicine,
Saveetha Medical College, Saveetha University,
Thandalam, Chennai- 602105, Tamil Nadu, India
E-mail: ragavan6464@gmail.com

*Professor,

**Undergraduate Student,

***PG Student, Dept. of Forensic Medicine,
Madras Medical College, Chennai

DOR: 15.1.13 DOA: 9.8.13

Autopsy Findings:

External Examination:

- Reddish abrasions measuring 8 x 5 cm - front of the left knee, 1 x 0.5 cm - back of the left hand, 8 x 4 cm - inner aspect of left leg, 1 x 1 cm - over the right foot, 1 x 1 cm - front of the left ankle.

Internal Examination:

- Left side 2nd-4th ribs were found fractured over the mid clavicular line with bruising of the surrounding soft tissues. (Fig. 3)
- Heart was normal in size. Cardiac chambers contained few ml of fluid blood, great vessels normal and coronaries patent.
- Both lungs were normal in size and cut section pale. No evidences of petechial hemorrhages or features suggestive of fat embolism.
- Abdominal cavity contained 1200 ml of fluid blood and few grams of clotted blood.
- Stomach contained 50 ml of yellow colored fluid, with no specific odour, mucosa pale.
- Liver, spleen and kidney: normal in size and pale on cut section.
- Urinary bladder was empty and the anterior wall of the bladder was found contused.
- Retro-peritoneal hematoma was found involving an extent of 18x16 cm covering both sides. (Fig. 4) The pelvis showed
- Comminuted fracture in the left iliac bone and acetabular cavity involving an extent of 7 x 5.2 cm, through which the head of the femur was clearly visible on viewing from the abdominal cavity.
- Another 12 cm long fissured fracture in the left iliac bone extending onto superior ramus of the left pubic bone with surrounding soft tissues contusion (Fig. 5)
- No bruising in the scalp tissues, the cranial vault was found intact. Meninges were normal and intact. Brain was found normal and cut section pale. (Fig. 6)
- No evidences of petechial hemorrhages or features suggestive of fat embolism. Base of the skull was found to be intact (Fig.7)
- Hyoid bone and spinal column were found to be normal and intact.

Cause of Death: **“hemorrhagic shock due to pelvic injury sustained.”**

Discussion:

On careful reading of the case report given by both the doctor and the Forensic Pathologist about the cause of death, they are in conflict with each other. Considering the evidences provided by the Forensic Pathologist,

it is proved beyond reasonable doubt that there is a gross medical error in the clinical diagnosis.

Intact skull base, dura, brain found on autopsy contradicts the clinical finding of the head injury as the cause of death. There is negligence on the part of the doctors responsible as they missed such a huge finding of comminuted pelvic fracture which had a distinctive feature of exposing the femoral head through it. They also recorded that **there is no long bone, pelvic and spinal fracture**, which clearly shows that there is a very high degree of professional incompetence on the part of treating physician.

They also missed fracture of left ribs which was never mentioned in clinical report. Nevertheless it could be due to the effect of the cardiopulmonary resuscitation. It is clear that the clinicians initially suspected a head injury, focusing their view entirely towards it for almost one and half hour but failed miserably in following the recommended protocol of ATLS [2] in assessing such cases.

According to Advanced Trauma Life Support (ATLS), treatment of all patients with major trauma passes through the following phases:

- Primary survey
- Resuscitation phase
- Secondary survey
- Definitive care phase

A key feature of ATLS is frequent re-evaluation of the patient's problems and the response to treatment. Any deterioration necessitates a return to evaluate the airway, breathing and circulation.

The above recommendation is either not followed properly or mentioned as followed in case records without any actual clinical examination. The pulse rate and the blood pressure would have indicated the impending disaster much earlier, but no attention was given to their re-evaluation, which if effectively done, would have saved the patient.

The patient was not undressed to evaluate completely thus they missed a characteristic attitude of a pelvic and femoral fracture. So in the primary survey they did fail to address the problem. Coming on to the secondary survey which clearly indicated that all patients with major trauma require: blood grouping, BMG, X-rays, ABG.

But the investigators ignored all these recommended investigations and suggested CT brain which no way proved fruitful in this case. They entirely stuck with their initial suspicion of head injury and followed the case till the patient

Case Report

Sudden Death due to Ventricular Free Wall Rupture Following Acute Myocardial Infarction: A Rare One

*Abhishek Das, **Sujash Biswas, **Chandan Bandyopadhyay, ***Chittaranjan Bhattacharya, ***Deepsekhar Dalal

Abstract

Hemo-pericardium due to ventricular free wall rupture (FWR) as an immediate complication (within 1 to 14 days) of acute myocardial infarction is a rare cause of sudden death. It is infrequent occurring in 2–6% of all infarctions, but having high mortality (20–30%). The patho-physiological process of FWR involves thinning of myocardial wall with the intensity of necrosis occurring at distal end of the vessel where there is often poor collateral flow. The shearing effect of myocardial contraction against a stiffened necrotic area causes rupture. Most common rupture location is on the anterior or lateral wall of left ventricle. A mid-ventricular position along apex-base axis is most common. Such a case was declared brought dead in emergency of NRS Medical College and Hospital and post-mortem examination was done which revealed ventricular free wall rupture adjacent to left anterior descending artery occlusion leading to Hemo-pericardium as cause of death. About 450 gm clotted blood was present surrounding the heart. It has been attempted in this presentation to put forward findings of such a rare case and relevant discussions.

Key Words: Haemo-pericardium, Ventricular free wall rupture, Death, Left anterior descending artery

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. Natural death means that the death was caused entirely by the disease, and the trauma or poison did not play any part. [6] Cardiovascular causes are most commonly responsible for this in about 45-50% cases and Acute Myocardial Infarction (AMI) is leading entity. [5]

A hemopericardium due to left ventricular free wall rupture (LVFWR) is a complication of acute myocardial infarction (AMI) and is rare cause of sudden death. A careful dissection and observation during autopsy can detect such an unusual finding as the cause of death.

Case History:

The subject was a 60 years male patient who suddenly fell down from the staircase after having a sudden syncopal attack and was unresponsive since then. He was brought to the Emergency Department of NRS Medical College and Hospital where he was declared brought dead. Police made an inquest as it was a case of sudden death and referred for medico-legal autopsy to the mortuary wing of Department of Forensic and State Medicine, N. R. S. Medical College, Kolkata, West Bengal.

Autopsy Findings:

External Examination:

The subject was moderately nourished and of medium complexion. On examination rigor mortis was present all over the body, pupils were bilaterally dilated and fixed, and cornea was hazy. Externally a bruise of dimension 1"x1" was found on the left malar prominence which was red in colour and showed the signs of vital reactions on examination. No other external injury was found even after careful examination with a hand lens.

Internal Examination:

Pericardial sac was full of clotted blood weighing 450grams. The layer of clot covered almost whole of the heart when pericardium was dissected out. On removal of the clot and separation of the pericardium a large sized heart

Corresponding Author:

* Post Graduate Trainee IInd Year,
Department of Forensic and State Medicine,
N. R. S. Medical College,
Kolkata-700014, West Bengal
E-mail: abhishek.das.forensic@gmail.com
**3rd year Post Graduate Trainee IIIrd Year
*** Post Graduate Trainee IInd Year
DOR: 16.5.13 DOA: 19.8.13

was visible weighing 500 grams. Heart was dissected carefully and on dissection both the ventricles were found enlarged along with grade II and grade III atheroma at the root of the great vessels. An atheroma was found to occlude the anterior descending branch of left coronary artery. A region of erosion of left ventricular wall was found along with evidence of blood clots at places.

Discussion:

Myocardial rupture is an early complication of AMI with bimodal peak of incidence (within 24 hours and 3-5 days), range being 1-14 days. It may present as ventricular free wall rupture, papillary muscle rupture or ventricular septal rupture. [1]

Ruptured heart is the most common cause of hemo-pericardium and cardiac tamponade, the rupture always occurring through an infarct. [2]

The overall rate of mortality due to ischemic heart disease is known to increase progressively with age. [3] First attack of AMI, h/o hypertension, no previous h/o angina pectoris and relatively large q wave infarct are associated with higher incidence of cardiac rupture. The traditional risk factors of LVFWR are older age, female sex, previous hypertension, and a first lateral or anterior-wall AMI. [4] Clinical presentation is sudden loss of consciousness, pulse and blood pressure.

Myocardium continues to contract but forward flow is not maintained as blood escapes into pericardial cavity. Cardiac tamponade ensues and closed chest massage becomes ineffective. Though AMI is the commonest cause, sudden, but death due to LVFWR following AMI leading to hemopericardium is very rare. It is almost always fatal yet dramatic cases of pericardiocentesis followed by successful surgical repair have been reported.

Conclusion:

Medico-legal autopsy is done in cases of sudden, suspicious and unnatural deaths. Though AMI is the most common cause of sudden death, yet ventricular free wall rupture as a complication of AMI is furthermore rare cause. Detection of such rare finding may guide and help to take precautionary measures to save the life of individuals who have a history of AMI as these complications remain unnoticed and often ignored clinically. Therefore careful dissection and thorough examination during autopsy is the only key to success for finding the cause of death.

References:

1. Antman EM et al. Myocardial infarction: Management in Braunwald's Heart Disease, 9th Ed, RO Bonow et al. (eds.), Elsevier Saunders, 2012, 1146-1148
2. Knight B, Saukko P. The pathology of sudden death in Knight's Forensic Pathology, 3rd Ed, P Saukko & B Knight (eds.), Arnold, 2004, 497-526
3. Maggioni AP et al. Age-related increase in mortality among patients with first myocardial infarctions treated with thrombolysis. *N Engl J Med* 1993; 329:1442-1448.
4. Amir O et al. Left ventricular free wall rupture in acute myocardial infarction. *Tex Heart Inst J.* 2005; 32(3):424-426
5. Mukherjee JB. Injury and its Medico-legal aspects 2007, 3rd ed, Karmakar R.N., Academic publisher, p226-228.
6. Reddy KSN. The Essentials of Forensic Medicine and Toxicology, 30th Edition. K.Saguna Devi, Hyderabad, 2010; p128-136.

Fig. 1: Cardiomegaly



Fig. 2: Blood Clot Covering the Heart after Removal of Pericardium

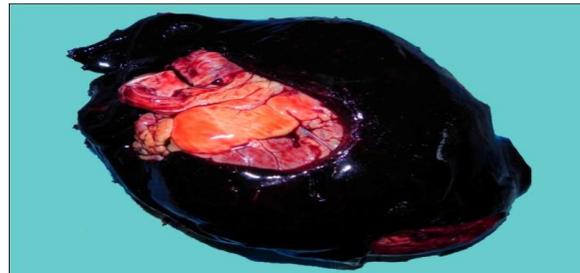


Fig. 3: Infarct Area of Heart Pointed with Scalpel

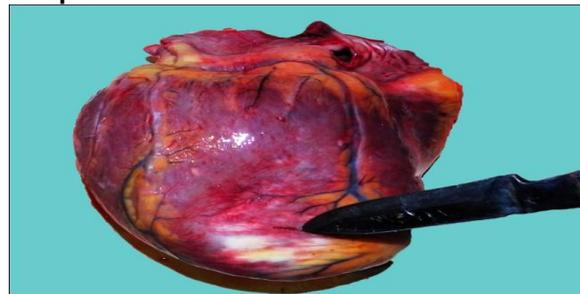


Fig. 4: Area of Ventricular Free Wall Rupture Pointed With Arrow



Case Report

Mysterious Death of a Young Adult

*Anand P. Rayamane, **Pradeepkumar M. V, ***Ambika Prasad Patra, ****Chandrashekaraiaha C. S, *****R. B. Kotabagi, *****T Rajaram

Abstract

Sudden unexpected deaths in apparently healthy adults in remote places often lead to speculation of foul play. Sudden unexpected natural death (SUND) is defined as natural death occurring instantaneously or within 24 hours of onset of symptoms, in a patient who may or may not have a known pre-existing disease but in whom mode and time of death is unexpected. Common causes of sudden death are coronary heart disease, intracranial hemorrhage, meningitis, pneumonia etc. Here, we are reporting a case of sudden death of a young adult, where the investigating police officer suspected electrocution and fellow workers who witnessed the death were unable to explain the circumstances of death, as the deceased screamed and collapsed. Preliminary autopsy was unrewarding. Histopathological investigation helped to decide the cause of death. With this case we have reviewed and discussed sudden death due to malaria.

Key Words: Sudden Death, Malaria, Autopsy, Coronary artery disease, Intra cranial Haemorrhage

Introduction:

The present state of malaria remains same as it has been for centuries - a heavy burden on tropical countries like India. Malaria is one of the most common infectious diseases and enormous public health problem. According to World Malaria Report 2010, 225 million cases of malaria and 7, 81,000 deaths were reported worldwide and in India alone 1,133 deaths due to malaria were reported. [1]

Sudden unexpected natural death (SUND) is defined as, natural death occurring instantaneously or within 24 hours of onset of symptoms, in a patient who may or may not have a known pre-existing disease but in whom mode and time of death is unexpected. [2]

Corresponding Author:

*Assistant Professor,
Department of Forensic Medicine,
Mysore Medical College and Research institute
Mysore-570001, Karnataka, India
E-mail:anandprayamane@gmail.com

**Prof, Rajarajeshwari Medical College and Hospital,
Bangalore

***Senior Resident, Dept of Forensic Medicine
JIPMER Puducherry

****Prof & HOD, RRMCHI, Bangalore

*****Prof & HOD, Dept of Forensic Medicine
SDM College of Medical Sciences and Hospital,
Dharwar Karnataka

*****Prof & HOD, Dept. of Pathology
RRMCH, Bangalore

DOR: 22.03.13 DOA: 19.8.13

Common causes of sudden death are coronary heart disease, intracranial hemorrhage, meningitis, pneumonia, peritonitis, malaria, etc.

Malaria is both an acute and chronic disease caused by protozoa of the genus Plasmodium, transmitted to humans by female mosquitoes of the genus Anopheles (Transmission can also occur by direct inoculation of infected red blood cells via transfusion, needles, or congenitally).

Temperature between 20°C and 30°C and a mean relative humidity of 60% are environmental conditions optimal for anopheline mosquito vector and parasite development. Sunlit streams, shaded lagoons, rice fields, and marshes are all breeding habitats for different species of Anopheles mosquitoes. Four species of malarial parasites cause human malaria: P. falciparum, P. vivax, P. malariae, and P. ovale. Among the four species, serious and fatal complications are caused by P.falciparum.

This is rare with P.vivax, P.ovale and P. malariae. Hyperparasitemia is defined as a parasite count of greater than 2, 50, 000 per micro liter of blood, or as having greater than 5% of red blood cells parasitized. [3]

About 1% of the patients with P. falciparum infections that are hyperparasitemic develop more severe manifestations culminating in multi-organ failure. [4]

Clinical symptoms and signs of malaria occur shortly before or at the time of red blood cells lysis. The definitive diagnosis of malaria is made by the identification of malarial parasites

in a peripheral blood film. In some cases, diagnosis of *P. falciparum* infection is made difficult because no parasites are seen on peripheral blood smears, as they are sequestered in the host's microvasculature. *P. falciparum* malaria is the only type that causes microvascular disease which causes severe anemia, cerebral symptoms, renal failure, pulmonary edema and death. [3]

Here we are reporting a case of sudden unexpected death due to falciparum malaria in a young adult. The importance of complete and meticulous autopsy with ancillary investigations in sudden unexpected deaths is stressed.

Case History:

According to the investigating police officer, the deceased, a young male adult, aged about 28 years, construction worker by occupation, was found dead at a remote construction site. The deceased screamed and collapsed to the ground while opening metal door of his office, which was witnessed by his fellow workers. Immediately he was shifted to a nearby hospital where he was declared dead on arrival. On preliminary investigation, police suspected it as a case of electrocution.

Upon interrogating the relatives of the deceased and his fellow workers we were unable to rule out any definitive history of illness that could have resulted in the death of the individual. Also there was no past history of sudden death within the family of the deceased.

Autopsy Findings:

The deceased was a well built and well nourished male. Other external appearances were unremarkable except for a small abrasion over front of right wrist.

On internal examination, contusion under scalp was present on right temple region. Meninges were severely congested and brain was edematous. Heart appeared normal with petechial hemorrhages at its apex. Coronaries were patent and myocardium showed severe congestion. Valves and chambers of the heart appeared normal. Lungs, kidneys, liver and spleen were unremarkable. Cut section of adrenals showed hemorrhage. Pancreas was severely congested. Stomach showed hemorrhagic mucosa.

Autopsy failed to decide the exact cause of death. The postmortem findings were not consistent with the history of electrocution as given by the investigating police officer. The cause of death was reserved pending for histopathological and chemical analysis reports.

Histopathological Examination:

Brain (Fig. 1), kidneys, and heart showed dilated capillaries engorged with numerous RBC's containing malarial pigment with extravasation of RBC's into surrounding tissues. Lungs showed alveolar hemorrhages with patchy pulmonary edema. RBC's containing malarial pigment was seen in few areas of lung parenchyma. Hepatic sinusoids were engorged with RBC's having malarial pigment. Portal tracts contain scattered lymphocytes. Spleen showed sinusoidal congestion.

Adrenal gland was engorged with RBC's containing malarial pigment with diffuse hemorrhage. (Fig. 2) Skin at the region of abrasion was sent for histopathological examination to rule out the possibility of electrocution. Skin sections showed dilated vessels engorged with RBC's containing malarial pigment.

Diagnosis on histopathological examination was patient suffered from falciparum malaria. Chemical analysis report did not detect any toxicological substances. Based on postmortem findings and histopathological report final cause of death was opined as "Cerebral Malaria".

Discussion:

A subject of interest among medical professionals is a sudden death in a young adult without any significant past history of prolonged illness. Surfing through the literature showed that few cases of sudden death were due to malaria having been found out.

In one such study, authors done a Clinico-pathological study in cases of sudden unexpected natural death in young adults aged 18 to 35 years, during a 9 year span, scrutinizing 6,453 cases, had found only 4 cases of sudden death due to malaria. [5] Sudden unexplained death caused by malaria in an apparently healthy individual emphasizes the need for an autopsy with ancillary investigations to find the cause of death. [6, 7]

Plasmodium falciparum malaria is a microvascular disease with a substantial metabolic element that damages tissues. It causes high levels of parasitemia leading to severe anemia, cerebral symptoms, renal failure, pulmonary edema, and death.

Uncomplicated, treated falciparum malaria carries a mortality rate of ~0.1%. However once vital-organ dysfunction occurs or the total proportion of erythrocytes infected increases to >2% (a level corresponding to >10¹² parasites in adult), mortality risk increases steeply. [8]The pathogenicity of *P. falciparum* is

due to its high infectivity of RBCs of any age leading to high parasitemia and infected blood cells clump together (rosetting) and stick to endothelial cells of small blood vessels (sequestration) which blocks microcirculation.

The histopathology in the present case showed dilated capillaries which were engorged with numerous RBC's containing malarial parasites involving heart, brain, kidneys, hepatic sinusoids, adrenals which confirmed infection by *Plasmodium falciparum*. [9] Parasites consume glucose and produce lactate, causing acidemia and release tumour necrosis factor. Lack of oxygen and increased concentrations of toxic metabolites cause capillaries to become more permeable, allowing leakage of protein and fluids. In the present case, there was extravasation of RBC's into surrounding tissues of brain, heart and kidneys. Lungs showed diffuse alveolar hemorrhage with patchy pulmonary edema. Pulmonary edema is more related to release of tumour necrosis factor, than to the effects of microvascular obstruction. [3]

According to the history available the deceased who was working, suddenly screamed at the time of his death, collapsed and died. The fellow workers and the relatives did not provide the history of malaria. Electrocutation was suspected by the investigating officer. This can be explained as it might be a generalized convulsion, causing coma and immediate death.

This is supported by histopathology of brain in the present case which shows severe parasitemia in brain vessels. Other possible cause of death may be sudden hypotension and shock (Algid Malaria). [10]

Conclusion:

Sudden death in apparently healthy young adults raises many questions of Forensic importance. Interrogating the individuals present at the time of death, complete and meticulous autopsy, and histopathological investigation may help to determine cause of death and solve the mystery regarding the sudden death.

References:

1. WHO World Malaria Report 2010 assessed from http://www.who.int/world_malaria_report_2010/worldmaliareport2010.pdf (last checked on 8 December 2011)
2. **Kasturi A S, Handa A, Niyogi M, Choudhari JC.** Sudden Death: A Clinico-pathological study. *J Assoc Physicians of India* 2002; 50: 551-3
3. **Lamar E. J.** Navy Medical Department Pocket Guide to Malaria Prevention and Control.

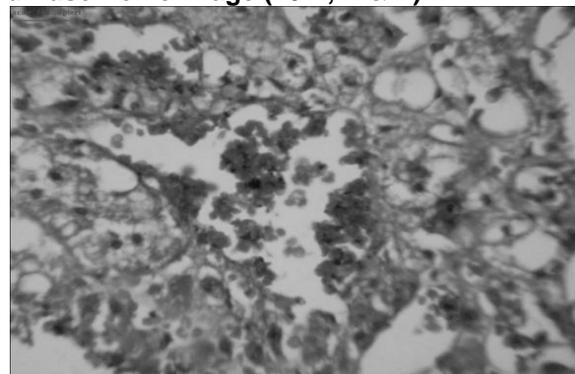
<http://www.fas.org/irp/doddir/milmed/malaria.pdf> (last checked on 19 January 2012)

4. **Shah N S.** Infectious Diseases, Association of Physicians of India Textbook of Medicine 7th edn. India. The API publishers, 2003: 105
5. **Madhu Chaturvedi, Meera Satoskar, Manisha S Khare, Alka D Kalgutkar.** Sudden, unexpected and natural death in young adults of age between 18 and 35 years: A Clinico-pathological study. *Indian Journal of Pathology and Microbiology* Jan-March 2011: 54(1), 47-50
6. **Prateek Rastogi, K R Nagesh, Tanuj Kanchan, Ritesh G Menezes, P P Jagdish Rao.** Study of sudden death due to malaria in Mangalore – A malaria endemic zone in south India. *J Forensic Medicine and Toxicology* ; July-Dec 2010; 27(2), 29-31
7. **Menezes R G, Kanchan T, Rai S. et al.** An autopsy case of sudden unexplained death due to malaria. *J Forensic Sci* 2010; 55(3) 835-8 E pub 010 Feb 25
8. **Fauci A S, Braunwald E, Kasper L D et al.** Infectious diseases. *Harrison's Principles of Internal Medicine*. 17th ed. (Vol 1) USA Mc Graw Hill Company 2008: 1283-84
9. **Kumar V, Abbas A K, Fausto N.** Infectious Diseases. *Robbins and Cotran Pathologic Basis of Disease*. 7th ed. Elsevier Pennsylvania 2004: 402
10. **Dharmeshkumar N Patel, P Pradeep, MM Surti, SB Agarwal.** Clinical Manifestations of Complicated Malaria –An Overview, *Journal, Indian Academy of Clinical Medicine* Oct-Dec 2003; 4(4): 323-31

Fig 1: White Matter Capillaries Engorged with Numerous RBCs containing Malarial Pigment (10X, H & E)



Fig. 2: Adrenal Gland Capillaries Engorged with RBC's Containing Malarial Pigment with diffuse Hemorrhage (10 X, H & E)



Case Report

Autopsy Diagnosis of Thanatophoric Dysplasia

*Hemalatha A. Lingappa, **Shilpa Karra, ***Anubha Aditya, ***Nishtha Batra, ***Neelima P. Chamarchy,
* K. W. D. Ravi Chander

Abstract

Thanatophoric Dysplasia is a rare form of neonatal lethal skeletal dysplasia, which affects 1 in 20,000 to 40,000 live births. It is characterized by underdevelopment of skeleton and short limb dwarfism. Infants with this condition have disproportionately short arms and legs with extra folds of skin. Other signs include a narrow chest, small ribs, underdeveloped lungs, enlarged head with large forehead, prominent, widely spaced eyes. A short neck, protuberant abdomen, depressed nasal bridge and hypoplastic mandible, may also be present. Based on the morphological characters, this condition is sub-divided as Type 1 and Type 2. Fetuses with this condition are either still-born or die shortly after birth. Prematurity is more likely, if not too severe, a neonate born with Thanatophoric Dysplasia, who receives ventilator support from birth has good chance of survival.

Considering the rarity of its occurrence, a case of a stillborn fetus with Thanatophoric Dysplasia of Type 1, born to an eighteen year old primi-parous lady who presented directly to the labor ward with premature rupture of membranes at 28 weeks of gestation is discussed here.

Key Words: Thanatophoric Dysplasia; Lethal; Congenital; Skeletal dysplasia

Introduction:

Thanatophoric Dysplasia (TD) is a rare lethal kind of short limb neonatal dwarfism syndrome that is usually lethal in the perinatal period. [1] It is a form of lethal congenital skeletal dysplasia with an incidence of 1 in 20,000 to 40,000 live births. [2]

It was first described in 1967 by Maroteaux and Lamy. [3]The name TD is derived from a Greek word which means "Death bearing". [2] It is caused by mutation in the trans-membrane domains of FGFR - 3 gene.

Activation of FGFR - 3 gene results in increased proliferation and decreased apoptosis. [4] TD is divided into Type I, characterized by micromelia with bowed femurs and Type II, characterized by micromelia with straight femurs. [1, 5] There are differences in opinion regarding its mode of inheritance. It is thought to be either sporadic or autosomal dominant. [6]

Corresponding Author:

*Professor & HOD,
Department of Pathology,
Mysore Medical College and Research Institute,
Mysore. 570001
Email: halingappa@gmail.com

**Assoc. Prof,

*** PG student

* Prof & HOD, Dept. of Forensic Medicine,
Siddhartha Medical College, Tumkur

DOR: 15.4.13 DOA: 17.8.13

Since the clinical profile of this anomaly is rarely reported, we discuss the anatomical abnormalities and clinical profile of TD, in this report.

Case Report:

An eighteen year old primiparous lady, who hailed from an illiterate and poor socio-economic background and had not attended antenatal clinics, presented with severe toxemia and premature rupture of membranes, at 28 weeks of gestation. Her pregnancy had to be terminated by inducing labor. She delivered a premature still-born female fetus with multiple anatomical abnormalities.

At autopsy, the fetus weighed 1300 gm and measured 31 cm in length. The multiple anomalies included occipital encephalocele, depressed nasal bridge, low-set malformed ears, hypoplastic mandible, short neck, protuberant abdomen and short extremities. (Fig. 1) The postmortem radiography revealed platyspondylia, widened disc spaces, small ilea, curved appendicular bones and telephone receiver - like femora.

Microscopic examination of the cartilage showed irregular Chondrocytes and lack of column formation. (Fig. 2)

Discussion:

TD is characterized by abnormalities of head, face, thorax and skeletal system. Abnormalities of the head include megacephaly, occasionally with 'clover - leaf

shaped' skull known as "kleesblattschödel". [1] In the face, excess skin usually yields a 'boxer's face' appearance with frontal bossing and depressed nasal bridge.

The abdomen is protuberant. The thorax is classically bell-shaped which is similar to 'champagne bottle cork' and results in pulmonary hypoplasia. [1]

The ribs are hypoplastic and the long bones of the extremities are short and curved. The proximal portions of the limbs are small giving a 'rhizomelic appearance'. The vertebrae are flattened with diminution of inter-vertebral spaces.

The present case exhibited majority of these diagnostic features including occipital encephalocele, depressed nasal bridge, low-set malformed ears, hypoplastic mandible, short neck, protuberant abdomen and short extremities. (Fig.1)

Two forms of TD have been identified:

- **Type I:** is more common and is characterized by marked underdevelopment of the entire skeleton.

The long bones are short and curved (with a telephone receiver appearance). Metaphyseal flaring is also seen. The pelvic bones are noticeably underdeveloped. Acetabular roof (platyspondyly) and underdeveloped clover-leaf skull may or may not be present. [7]

- **Type II TD:** the involved bones are shorter than in type I and they are not bent or bowed. The metaphyses are flared and cupped. The vertebral bodies are flat but not as much in Type I TD. [8] Almost all the fetuses with Type II deformity have severe clover-leaf skull which has been associated with premature closure of coronal and lambdoid sutures. [4]

The morphological features in the present case were consistent with those of Type I. Radiological imaging plays a major role in making an accurate diagnosis of skeletal dysplasia, but despite recent advances in imaging, fetal skeletal dysplasia's are difficult to diagnose in-utero due to a number of factors, which include large number of skeletal dysplasia's and their phenotypic variability with overlapping features.

Lack of precise molecular diagnosis for many disorders, lack of systematic approach, the inability of ultra-sonography (USG) to provide an integrated view and variability in times at which findings manifest in some skeletal dysplasia's. [9]

Hence prenatal diagnosis of TD by USG in the second trimester is not always possible, in which case molecular genetic analysis of FGFR-3 gene is useful. [1]

Differentiation of TD from other forms of dwarfism, such as Achondroplasia and Diastrophic Dysplasia of the family of osteochondrodysplasia can be difficult. In TD, shortening of long bones, the appearance of skull, the presence of spinal curvature and the narrowing of spinal canal have similar configuration as that of achondroplasia.

However, the most important difference between these entities is that, TD is characterized by severe shortening of ribs, restricted lung volume and severe respiratory distress that leads to death within a few hours after birth. In TD, the vertebral bodies are flat and underdeveloped, whereas, in typical form of achondroplasia, the vertebral bodies are square and Cuboid. [4]

As the names 'thanatophoric' or 'death bearing' suggest, the condition is frequently lethal in-utero or shortly after birth. [6] The cause of death which occurs within 48 hours is, respiratory failure that may be secondary to the narrow chest cavity and hypoplastic lungs or brainstem compression by the narrow foramen magnum or a combination of both. [6] Surgical intervention by decompression of brainstem in cases with small foramen magnum has allowed prolonged survival. [10]

Recently, many reports of infants with TD surviving till 4-9 years of age, have been documented in literature. [10]

Though TD is a rare condition, a basic knowledge of the distinctive dysmorphic anatomical features is necessary for its prompt recognition by the medical personnel from various specialties like Anatomy, Pathology, Radiology, Obstetrics, Neonatology and Forensic Pathology.

References:

1. Noe E.J, Yoo H.W, Kim K.N, Lee S.Y. A case of thanatophoric dysplasia type 1 with an R248C mutation in the FGFR3 gene. *Korean J Pediatrics* 2010; 53(12):1022-25.
2. Orioli, I. M., E. E. Castilla, J. G. Barbosa Neto. "The birth prevalence rates for the skeletal dysplasias." *Journal of medical genetics* 23.4 (1986): 328-332.
3. Maroteaux P, Lamy M, Robert JM. Thanatophoric dwarfism. *Presse Med* 1967; 75:2519-24.
4. Miller, Elka, et al. "Brain and bone abnormalities of thanatophoric dwarfism." *American Journal of Roentgenology* 192.1 (2009): 48-51.
5. Fink, I. J., Filly R. A., Callen P. W., Fiske C. C. Sonographic diagnosis of thanatophoric dwarfism in utero. *Journal of Ultrasound in Medicine*, 1982; 1(8), 337-339.
6. Naveen, N. S., Murlimanju B. V., Kumar V., Pulakunta T. Thanatophoric Dysplasia: A Rare Entity. *Oman Medical Journal*, 2011; 26(3), 196.

7. Langer, Leonard O. et al. "Thanatophoric dysplasia and cloverleaf skull." American Journal of Medical Genetics 28.S3 (2005): 167-179.
8. Swischuk, Leonard E. Imaging of the newborn, infant, and young child. Lippincott Williams & Wilkins, 2004
9. Abdul Kadir A. Y., Isyaku K., Dare, A., Abdullahi S. G., Idris S. K., Tabari, A. M. Prenatal Third Trimester Sonographic Behavior of a Thanatophoric Dwarf. Journal of Prenatal Medicine, 2008; 2(4), 42.
10. MacDonald, I. M., Hunter, A. G., MacLeod, P. M., & MacMurray, S. B. Growth and development in thanatophoric dysplasia. American Journal of Medical Genetics, 2005; 33(4), 508-512.

Fig 2: Section from Cartilage Showing Irregular Chondrocytes & Lack of Column Formation (H&E 40x)

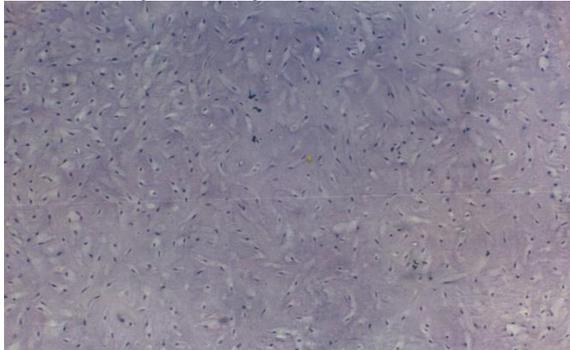


Fig 1: A stillborn fetus with Thanatophoric dysplasia



Obituary

*Your Affection was unmatched,
Your benevolence immense,
The void will forever remain,
And so will your substance.
The greatest loss was not losing you,
It was losing the part of us that went with you.*



Dr. Arshad Anjum
(30th April-1981 to 25th May 2013)

Dr. Arshad Anjum, MBBS, DCH, MD, PGDHA, was working as Assistant Professor in the Department of Forensic Medicine, J. N. Medical College, AMU, Aligarh, and Life Member, Indian Academy of Forensic Medicine. He is survived by his wife, Dr. Maria and son Sarim.