July - December 2022 Volume 31 Issue 2
PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW

Official Publication of Medicolegal Association of Maharashtra

MULTISPECIALITY, MULTIDISCIPLINARY, NATIONAL
PEER REVIEWED, OPEN ACCESS, MLAM (SOCIETY) JOURNAL
Indexed with Scopus (Elsevier) & Index Copernicus (Poland)

Editorial Office Address
Department of Forensic Medicine & Toxicology, Third Floor, Library Building, Seth G S Medical College & KEM Hospital, Parel, Mumbai, Maharashtra, India. Pin-400 012. Email id: mlameditor@gmail.com Phone: 022-24107620 Mobile No. +91-9423016325.

Medicolegal Association of Maharashtra- Executive Committee 2022-2024

PRESIDENT

Dr Kalidas D Chavan

SECRETARY

Dr Rajesh C Dere

Advisors

Dr S C Mohite Dr R S Bangal Dr K U Zine Dr S M Patil
Dr M B Shrigiriwar Dr R V Kachare Dr V N Ambade

Vice-President

Dr Naresh Zanjad

Joint Secretary

Dr A H Hosmani

Treasurer

Dr H G Kukde

Editor-in-chief

Dr Ravindra B Deokar

Associate Editors

Dr Sadanand S Bhise Dr Sachin S Patil

Executive Committee Members

Dr B G Chikhalkar Dr S S Kadu Dr M N Pawar
Dr V D Sonar Dr M E Bansode Dr P R Sabale
Dr A B Shinde Dr M V Sonawane Dr Shivaji Patil

Co-opted Members

Dr P R Tekade Dr S B Bhoi Dr N M Varma
Dr Rahul Wagh Dr S Kadavkar

Bank Account Details

Bank Account Name: Medicolegal Association of Maharashtra
Account No. 50292010017478 **IFSC Code-** CNRB0015029
MICR: 400015219 **Bank:** CANARA Bank Byculla II **Branch:** Byculla II, Mumbai.
MLAM MEMBERSHIP FEES: Rs. 4000/-
Website: http://www.mlam.in

Secretariat Office Address
Department of Forensic Medicine & Toxicology, L T Municipal Medical College & LTMG Hospital, Sion West, Sion Mumbai-400 022
Email id: mlamsecretary@gmail.com Phone: 022-24063172 Mobile No. +91-9769616777

Journal of Forensic Medicine Science and Law

PRINT ISSN: 2277-1867 **ONLINE ISSN**: 2277-8853

Editorial Board

Website: http://www.mlam.in

Editorial Office Address

Department of Forensic Medicine & Toxicology, Third Floor, Library Building, Seth G S Medical College & KEM Hospital, Parel, Mumbai, Maharashtra, India. Pin-400 012. Email id: mlameditor@gmail.com Phone: 022-24107620 Mobile No. +91-9423016325.

Instruction to Author:

1. Aims and Scope

Journal of Forensic Medicine Science and Law (**JFMSL**) is an official scientific publication of Medicolegal Association of Maharashtra. The basic ideology of publication of this journal is based on the objectives of MLAM. It is a biannual, multidisciplinary, Multispeciality, National, peer reviewed MLAM (society) journal published as a medium for the advancement of scientific knowledge of forensic medicine, allied sciences and law.

The contents of the journal are in the form of Original research articles, Commentary, Review articles, Case reports, Letters to editor, Short communication, Medical quiz and any other form of publication with the approval by the editorial board. All manuscripts are required to be submitted only online in Microsoft word file format on email ID: mlameditor@gmail.com .

Articles should be typed in **single space, Calibri font (letter size 11 for body of text and headings and sub-headings in bold with size 11).** Manuscript should conform to the general instructions (Vancouver style) "Uniform requirements for manuscripts submitted to biomedical journals" (1994), Lancet 1996, V2, 1-4 and Annals of Internal Medicine 1988, 108:258- 265. The submitted manuscripts should be accompanied by a statement / certificate undersigned by all listed authors in authorised copyright format. Copy of format of certificate by Authors can be obtained from editorial office of Journal of Medicolegal Association of Maharashtra. All submitted articles are reviewed by editorial board, specialists and subjected to double blind peer review system. The Editorial board reserves the right to ask for revision in the manuscripts according to reviewers comments and to make final decision on acceptance.

2. Ethics and Policy in Clinical Study:

Human studies should have been conducted in accordance with the principals of the declaration of Helsinki (1964, revised in 1975 and 1983). Animal experiments should have been performed as per the guide lines of CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals). Also, see www.cpcsea.com while submitting papers on clinical trials. The authors are requested to ensure that all requirements of appropriate regulatory bodies have been complied with. The authors should submit copy of Ethical approval of the study obtained from Institutional Ethical Committee in case of original research articles.

3. Units of Measurement:

All Measurements must be expressed in metric system and / or the system International „Units" (SI)

4. Submission Format:

Submit as **single manuscript word file** including title page, abstract, keywords, and main article manuscript text (Introduction, material & methods, Results, discussion, conclusion, recommendations/ suggestions, references –Vancouver style). Add tables and figure as an attachment separately and also in manuscript file at relevant places. Various ready formats available on website http://www.mlam.in/journal.htm

An abridged version is outlined below:

Title Page (Page 1): Page 1 should include the following

Type of paper: Original Research article, Review article, Short communication, Case report, Letter to the editor, etc.

Title: Title of the Article (About 10-12 words). If more add running Title of less than 12 words.

Author details: Full name of the authors along with their Degrees, Designations, Departments, and Institution and National affiliation. Complete address of the corresponding author & all other authors along with E-mail address & contact number (preferably WhatsApp). Number of pages in the manuscript, Number of Photographs, Number of Figures, Number of Tables, Acknowledgement, ethical clearance, Conflict of interest, funding & author contributor-ship declaration.

Abstract (Page 2): It should contain factual and comprehensive summary of the entire paper in not more than 200 words. It should be a **structured** and should include Introduction/background/aims, material and methods, results and conclusions of paper. At the end of the abstract 3-5 **key words** are required to be endorsed for indexing purpose.

Manuscript main Text (Page 3 onwards): The main text should be arranged in the following sequence:

Introduction: It should contain the review, aim of the study and its rationale. **Materials and methods:** This should include sufficient details so that the reader can understand how the results were obtained. **Results:** Should be presented in proper sequence. Statistical methods used for analysis should be stated in brief.

Discussion: Should include the relationship of the results with the hypotheses tested as outlined in aims and objectives and the findings of the study compared with those reported by other workers.

Conclusion: Should be completely supported by the data in the text.

Acknowledgments: Contribution that fall short of authorship should be included here. Please do not hesitate acknowledging some one's contributions in your research.

Case Report: The reports should be limited to 1500 words and should be described in the following sequence : Abstract with key words, Introduction, Clinical summary, Pathological findings, Management and outcome of case, Discussion, Recommendations and References.

Figures: Figures should be cited in the text and numbered sequentially with Arabic numerals. A brief descriptive legend should be provided with each figure. Photographs of identifiable persons must accompany the consent of the individual. Illustrations from already published articles / books, the permission of author and the publisher must accompany each illustration. In addition, all figures should be submitted separately in "jpg" format with good resolution and figure legends in word file along with manuscript.

Tables: Tables should be numbered as they appear in the text and each table should have a short title. The data given in the table should be clear and logical. It should supplement and not duplicate information present in the text.

Proof: Proof will be sent to the corresponding authors who should be carefully checked and returned to Editorial office within two days of the receipt. Accepted manuscript by Editorial Board will not be returned.

Reprints: Authors desirous of reprints of the published articles may approach the Editorial Office. The reprints will be provided at nominal printing cost.

References:

References should be endorsed as laid out in International Committee of Medical Journal Editors 1997; 126:36-47. References should be arranged in Vancouver style conforming to the pattern of NLM in Index Medicus. Responsibility of accuracy of references will rest entirely with the authors. References should be listed in the order as they appear in the text. They should be indicated by Arabic numerals. For example: 1,2 and so on as superscript. For correct abbreviations of the journal please refer to last Index Medicus. Names of one word journals and unindexed journals should be written in full form. Number of references should not be more than 5 for letters to editor, 10 for case reports, 20 for original articles and 25 for a review articles.

Some of the sample references are as given below :

a. **Journals:** Jain R, Awasthi A, Basappa A. Hematological profile of leukemias, Int J of Hemat 2006; 10:104-106. Kurien D, Khandekar LL, Dash S et al. Cytodiagnosis of hydatid disease presenting with Horner"s Syndrome A case report. Acta Cytol 2001; 45: 74-78.

b. **Books and Monograph:** Anemia, In: Cotran RS, Kumar V, Collins T. Robbins Pathologic Basis of Disease. 6th ed. Singapore. WB Saunders Company, 1999: 1300-1321. Wetzler M, Bloomfield CD. Acute and chronic myloid leukemia . In: Harrison"s Principles of Internal Medicine. 14th ed. Fauci AS, Braunwald E, Isselbacher K, et al, Eds McGrawHill, New york, 1998; 684-695.

c. **Conferences Proceedings:** Vivian VL, Editor. Child abuse and neglect; A medical community response. Proceedings of the First AMA National Conference on child Abuse and Neglect 1984; Mar 30-31; Chicago: American Medical Association, 1985.

Advertising policy: The Journal accepts display & classified advertising. For details write us on- mlameditor@gmail.com

Manuscript Handling Charges: Rs. 4000/- Foreign Author: Rs. 5000/-

Subscription Charges: Individual: Rs. 5000/- Institutional: Rs. 7000/- Agency (Third Party): Rs. 8000/- (with 10% Agency Discount).

For further details contact to:

Editorial Office Address: Department of Forensic Medicine, Third Floor, Library building, Seth GS Medical College and KEM Hospital, Parel, Mumbai, State: Maharashtra, India Pin: 400012
Phone: 022-24107620 WhatsApp: +91-9423016325.
Email: mlameditor@gmail.com Website: www.mlam.in

Publisher Details: Dr Ravindra Deokar, Editor-in-Chief, JFMSL, MLAM.
Department of Forensic Medicine, Seth GS Medical College and KEM Hospital, Parel, Mumbai, State: Maharashtra, India Pin: 400012
Phone: 022-24107620 WhatsApp: +91-9423016325.

Published by(Co-owner): Medicolegal Association of Maharashtra (MLAM), Maharashtra, India.

Printed by:
Nisar Stationary & Printing house, Bandra (E), Mumbai-400051.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW

(Official Publication of Medicolegal Association of Maharashtra)

PRINT ISSN: 2277-1867 ONLINE ISSN: 2277-8853 Email.id: mlameditor@gmail.com

Mobile: +91 9423016325

Journal of Forensic Medicine Science and Law – Review Process

http://www.mlam.in/journal.htm

Journal of Forensic Medicine Science & Law (JFMSL) follows all standard norms of double blind peer review process. Appropriate confidentiality maintained with complete anonymity in regards to the article review process. Declaration of conflict of interest, if any is mandatory for every reviewer prior to accept articles for review. The researchers/ authors need to submit the manuscript files abiding the JFMSL author guidelines as a complete manuscript word file on email – mlameditor@gmail.com

- Average time for initial editorial review – 02 to 03 days.
- Average time for Blind review process – 07 to 15 days.
- Average time for acceptance of article after revision – 30 days.

The detailed steps in review process is as follows-

1. Initial submission of article in accordance with norms at par 'JFMSL- author guidelines' (http://www.mlam.in/journal.htm)

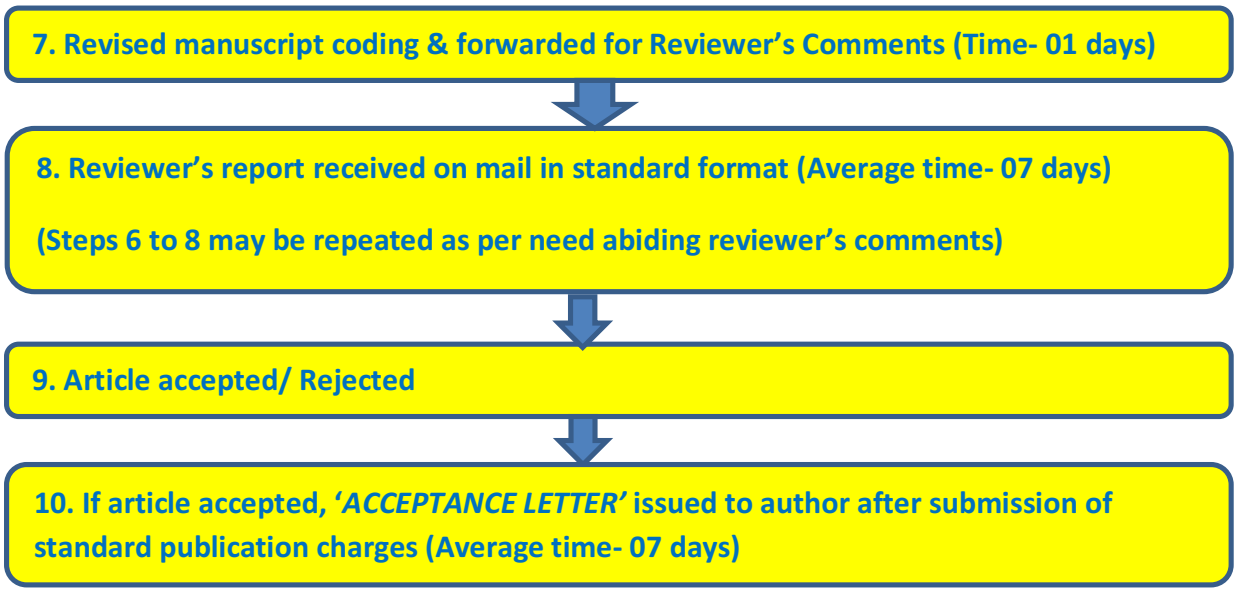
2. Initial Editorial technical review for language, format & submission abiding JFMSL author guidelines (Average time- 02 to 03 days).

3. Article passed through Editorial review downloaded and given a specific code maintaining anonymity of authors (Average time- 01 days).

4. Coded file of Article & standard 'JFMSL-reviewer form' forwarded to 03 to 05 independent reviewer (at least one international reviewer & one out of the state) for blind review abiding standard norms with maintaining confidentiality (Average time- 01 days).

5. Reviewer's report received on mail in standard format (Average time- 07 days)

6. Revised manuscript submission abiding Reviewer's Comments (Time- 03 days)



Aims and Scope

Journal of Forensic Medicine Science and Law (**JFMSL**) is an official scientific publication of Medicolegal Association of Maharashtra. The basic ideology of publication of this journal is based on the objectives of MLAM. It is a biannual, multidisciplinary, multispeciality, National, peer reviewed MLAM (society) journal published as a medium for the advancement of scientific knowledge of forensic medicine, allied sciences and law. The contents of the journal are in the form of Original research articles, Commentary, Review articles, Case reports, Letters to editor, Short communication, Medical quiz and any other form of publication with the approval by the editorial board. All manuscripts are required to be submitted only online in Microsoft word file format on email ID: mlameditor@gmail.com.

Submission Format: An abridged version is outlined below:

1. **Copyright Form (available on website -** http://www.mlam.in/journal.htm under author guidelines).
2. **Covering letter.**
3. **Complete Manuscript file with author details including title page, all tables & figures.**
4. **Manuscript file without author details.**
5. **Additionally- all figures as separate JPG image files with figure numbers.**

Articles should be typed in single space, Calibri font (letter size 12 for body of text and headings and sub-headings in bold with size 12).

Title Page (Page 1) Page 1 should include the following **Type of paper:** Original Research article, Review article, Short communication, Case report, Letter to the editor, etc. **Title** of the Article (About 10-12 words). If more add running Title of less than 12 words. Full name of the authors along with their Degrees, Designations, Departments, and Institution and National affiliation, contact number & email id of all authors. Number of pages in the manuscript, Number of Photographs, Number of Figures, Number of Tables. Complete address of the corresponding author along with E-mail address & contact number (preferably whatsapp). Declaration of author on contributor ship of authors, conflict of interest, Ethical clearance, etc.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW

(Official Publication of Medicolegal Association of Maharashtra)

PRINT ISSN: 2277-1867 ONLINE ISSN: 2277-8853 Email.id: mlameditor@gmail.com

Mobile: +91 9423016325

REVIEWER LIST

The list of reviewers collaborating with the journal is as follows –

#	First name and Last name	Affiliation	Country	Email
1	Dr Kalpesh Shah	Dean & Professor, B. J. Medical College & Civil Hospital, Ahmedabad, Gujrat, India.	India	drkalpeshashah@yahoo.com
2	Dr Shailesh C Mohite	Dean & Professor, HBTMC & Dr RN Cooper Hospital, Juhu, Mumbai, Maharashtra, India.	India	sm_fm_66@yahoo.com
3	Dr V V Pillay	Professor & Head of Forensic Medicine and Medical Toxicology in Amrita School of Medicine (Amrita VishwaVidyapeetham), Cochin.	India	drvvpillay@gmail.com
4	Dr Cyriac Job	Professor and Head, Department of Forensic Medicine & Toxicology, GMC, Manjeri, Kerala.	India	job@yahoo.co.in
5	Dr Anil Agarwal	Professor and Head, Department of Forensic Medicine & Toxicology, MAMC, New Delhi.	India	anilaagrwal@gmail.com
6	Dr P C Vyas	Senior Professor & Head, Department of Forensic Medicine & Toxicology, Dr S N Medical College, Jodhpur, Rajasthan – 342003.	India	Pcvyas28@gmail.com
7	Dr Chetan B Jani	Professor, FMT, GCS Medical College, Ahmedabad	India	fm.chetan@gmail.com
8	Dr P G Dixit	Professor and Head, Department of Forensic Medicine & Toxicology, GMC Miraj, Sangli, Maharshtra.	India	pgdixit2008@gmail.com
9	Dr Rajesh C Dere	Professor and Head, Department of Forensic Medicine & Toxicology, LTTMC, Mumbai.	India	dr.rajeshdere@gmail.com
10	Dr Ajit Malani	Professor and Head, Department of Forensic Medicine & Toxicology, AIIMS, Udaypur.	India	ajit_malani@rediffmail.com
11	Dr Tanuj Kanchan	Professor (Additional),Department of Forensic Medicine & Toxicology, AIIMS, Jodhpur	India	tanujkanchan@yahoo.com
12	Dr Manish Nigam	Professor and Head, Department of Forensic Medicine & Toxicology, Sri Aurobindo Institute of Medical Sciences, Indore, Madhya Pradesh.	India	jointeditorjiafm@gmail.com
13	Dr Adarsh Kumar	Professor, FMT, AIIMS New Delhi, India	India	dradarshk@gmail.com
14	Dr G M Krishna Rao	Professor and Head, Department of Forensic Medicine & Toxicology Santhiram Medical College, Nandyal, Andhra Pradesh.	India	gmkrishnarao@gmail.com
15	Dr Zenab Yusuf Tambawala	Specialist Senior, Department of Obstetrics and Gynaecology Dubai Hospital, Dubai, UAE.	UAE	zentambawala@gmail.com
16	Dr Kisan Khade	Professor & Head, Department of Forensic Medicine & Toxicology, DY Patil Medical College, Navi Mumbai, Maharashtra.	India	kisan.khade@gmail.com

#	First name and Last name	Affiliation	Country	Email
17	Dr Manish Shrigiriwar	Professor & Head, Department of Forensic Medicine & Toxicology, AIIMS, Nagpur, Maharashtra.	India	drmanishshrigiriwar@aiimsnagpur.edu.in
18	Dr Anil Batra	Professor and Head, Department of Forensic Medicine & Toxicology, GMC, Akola.	India	akkbatra@yahoo.co.in
19	Dr Pragnesh Parmar	Additional Professor & Head, Department of Forensic Medicine & Toxicology, AIIMS, Bibanagar, Telangana – 508126.	India	drprag@gmail.com
20	Dr Mohan Pawar	Professor & Head, Department of Forensic Medicine 7 Toxicology, PIMS & Rural Medical College, Loni, Ahmednagar, Maharashtra.	India	pravaraforensicon2019@gmail.com
21	Dr Mabalesh Shetty	Professor and Head, Department of Forensic Medicine & Toxicology K.S. Hegde Medical Academy, Mangalore.	India	drmabs@yahoo.co.in
22	Dr Seema S Sutay	Professor & HOD, Department of Forensic Medicine & Toxicology, GMC, Khandwa, Mandya Pradesh.	India	dr_seemasutay@rediffmail.com
23	Dr Atul Keche	Associate Professor, Department of Forensic Medicine & Toxicology, AIIMS, Bhopal, Madhya Pradesh, India.	India	dratul73keche@rediffmail.com
24	Dr Mukesh Yadav	Principal & Professor, GAMC, Banda, Uttar Pradesh (UP), India.	India	drmukesh65@gmail.com
25	Dr P K Tiwari	Senior Professor, Former Head of Department and Medical Superintendent MBS Hospital Kota, Government Medical College Kota, Rajasthan	India	drpktiwari96@gmail.com
26	Dr Madhu Ghodkirekar	Professor, Department of Forensic Medicine & Toxicology, GMC, Goa.	India	madhughodkirekar@gmail.com
27	Dr Kailash U Zine	Professor &Head,Department of Forensic Medicine & Toxicology, Government Medical College, Aurangabad, Maharashtra.	India	kailashzine@gmail.com
28	Dr Vipul Ambade	Professor and Head, Department of Forensic Medicine & Toxicology, Shri. V N Government Medical College Yavatmal, Maharashtra.	India	vipulambade@rediffmail.com
29	Dr Sandeep Kadu	Professor and Head, Department of Forensic Medicine, PDVVP Medical College, Ahmednagar, Maharashtra, India.	India	dr.sandeepkadu@gmail.com
30	Dr Rajesh Bangal	Professor and Head, Department of Forensic Medicine & Toxicology, SKN Medical College, Pune, Maharshtra, India.	India	rbangal@gmail.com
31	Dr Dayanand G Gannur	Professor & Head, Department of Forensic Medicine & Toxicology Shri B M Patil Medical College, Hospital & Research centre, Bijapur, Karnataka.	India	dayanandgannur@gmail.com
32	Dr Ajay Shendarkar	Professor & Head, Department of Forensic Medicine & Toxicology, MGM medical College, Navi Mumbai, Maharahtra.	India	ajayshendarkar@yahoo.com
33	Dr Mandar Karmarkar	Professor & Vice Dean(UG Academics), Department of Forensic Medicine & Toxicology, BharatiVidyapeeth University Medical College, Pune, Maharashtra.	India	mdkarmarkar@gmail.com
34	Dr Dhananjay Mankar	Associate Professor, School for Health Management, Tata Institute of Social Sciences, Chembur, Mumbai, Maharashtra.	India	dhananjaymk23@gmail.com
35	Dr Ranjit M Tandle	Professor & Head, Department of Forensic Medicine & Toxicology, SMBT Medical College, Got, Nashik, Maharashtra.	India	ranjit_tandle@rediffmail.com
36	Dr H G Kukde	Additional Professor. Department of Forensic Medicine & Toxicology, LTMMC, Mumbai, Maharashtra.	India	hkukde@gmail.com

#	First name and Last name	Affiliation	Country	Email
37	Dr Mahadev Bansude	Associate Professor, Department of Forensic Medicine & Toxicology, GMC, Latur	India	bansude_mahadev@rediffmail.com
38	Dr Dhiraj Bhuchade	Professor, Department of Forensic Medicine & Toxicology, MAMC, New Delhi	India	dhirajfmt@gmail.com
39	Dr Pawan Sable	Professor (Additional), Department of Forensic Medicine & Toxicology, TNMC, Mumbai, Maharashtra.	India	25.pawan@gmail.com
40	Dr Ganesh Niturkar	Associate Professor, Department of Forensic Medicine & Toxicology, GMC, Aurangabad, Maharashtra.	India	niturkarg@gmail.com
41	Dr Amol Shinde	Professor & Head, Department of Forensic Medicine & Toxicology, GMC, Baramati, Maharashtra, India.	India	dramolbshinde@yahoo.co.in
42	Dr Hitesh Chawala	Associate Professor,Department of Forensic Medicine & Toxicology SHKM Medical College, Haryana.	India	drhiteshchawala@rediffmail.com
43	Dr Abhishek Das	Assistant Professor,Department of Forensic Medicine & Toxicology, GMC, Kolkata, West Bengal.	India	abhishek.das.forensic@gmail.com
44	Dr Girish Tasgaonkar	Associate Professor, Department of Forensic Medicine & Toxicology, Seth G S Medical College &KEM Hospital, Parel, Mumbai	India	drgirish.tasgaonkar7@gmail.com
45	Dr Nilesh Tumram	Professor & Head, Department of Forensic Medicine & Toxicology, GMC, Nandurbar, Maharashtra, India.	India	ntumram@gmail.com
46	Dr Utsav Parekh	Associate Professor,Department of Forensic Medicine & Toxicology, Karamsad, Gujarat.	India	dr.utsav.parekh@gmail.com
47	Dr Pratik Tarvadi	Associate Professor Department of Forensic Medicine Government Medical College, Bhavnagar, Gujrat.	India	drpratiktarvadi@gmail.com
48	Dr Santosh Bhosle	Associate professor, VNFGMC, Yavatmal, Maharashtra	India	santoshbhosle09@gmail.com
49	Dr Deepali Kale	Assistant Professor, OBGY, Wadia Maternity Institute, Mumbai, Maharashtra.	India	deepalikale13@gmail.com
50	Dr Manoj Gupta	Sailee Hospital & Adroit Consultancy Medicolegal Services, Mumbai, Maharshtra.	India	Drmdg1973@gmail.com
51	Dr K Padmkumar	Professor, Jubilee Mission Medical College & Research Institute, Thrissur, Kerala.	India	drpkfmt@gmail.com
52	Dr Sachin Sonawane	Associate Professor, FMT, HBTMC, Juhu, Mumbai, Maharashtra.	India	sachinsonawane105@gmail.com
53	Dr Vinod Chaudhari	Associate Professor, FMT, JIPMER, Pondicherry, India.	India	drvinodchaudhari@gmail.com
54	Dr Manoj Parchake	Associate Professor, FMT, Seth GSMC & KEMH, Mumbai, Maharashtra.	India	manoj.prchake@gmail.com
55	Dr Vinita Murgod	Reader, Oral & Maxillofacial Pathology & Microbiology, Sarawati Dhanvantari Dental College & Hospital, Parbhani, Maharashtra.	India	drvinita.murgod@gmail.com
56	Dr Shashank Tyagi	Assistant Professor, FMT, Seth GSMC & KEMH, Mumbai, Maharashtra.	India	Shankstag011@yahoo.in
57	Dr Amit Patil	Professor and Head, Department of Forensic Medicine, AIIMS, Patna, Buhar.	India	Dramp1976@gmail.com

#	First name and Last name	Affiliation	Country	Email
58	Dr M. Ziyauddin G. Saited	Associate Professor, GCS Medical, Hospital & Research Centre, Ahmedabad, Gujrat, India. 380025	India.	dr.ziya.saiyed@gmail.com
59	Dr Sanjay Gupta	Professor & Head, FMT, All India Institute of Medical Sciences (AIIMS), Rajkot, Gujrat.	India.	drsanjaymdfm@gmail.com
60	Dr Richa Choudhury	Professor & Head, FMT, Dr RML Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.	India.	Drricha_c@hotmail.com
61	Dr Nagesh K R	Professor & Head, FMT, Father Mullar Medical College, Kankanady, Manglore, Karnataka, Inia. 575002	India.	anandgaik01@gmail.com
62	Dr Anand Pal Singh	St. Johns house hospital, priory group. Diss, Co Norfolk UK.	UK	alsingh67@yahoo.ie
63	Dr. UJS Bedi	Consultant Psychiatrist, Berkshire Healthcare NHS Foundation Trust, UK	UK	usbedi@hotmail.com
64	Dr Sandeep R Biraris	Orthopaedic Centre of the West 2122 East Highland Ave Ste 100 Phoenix, AZ 85016 USA	US	sandeepb143@yahoo.com
65	Dr Niranjan Kavadi	University of Oklahoma, Oklahoma City, USA	US	drkniranjan@gmail.com
66	Shashank S. Shettar	University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma, Country: USA.	US	ShashankShashank-Shettar@ouhsc.edu
67	Dr Abhishek Parashar	Lecturer, Department of Forensic Medicine, Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal.	Nepal	drabhishekparashar@gmail.com
68	Dr Vikrant Landge	Memorial Hospital, Sitwell, Oklahoma, USA.	US	vikrant.landge@gmail.com
69	Dr Geetanjali Pai	MD AAHIVS Memorial Hospital, Sitwell, Oklahoma, USA.	US	dr.paigg@gmail.com
70	Dr Ruta Bhargava	Hospitalist, Internal Medicine, Saint Banaras Medical Centre, Livingston NJ 07039, US.	US	drrutabendre@gmail.com
71	Dr Siddharth Virani	Shoulder & Elbow Surgery, East Kent Hospitals NHS Foundation Trust Pluto House, Ashford, Kent, UK.	UK	Siddharth.virani@nhs.net
72	Dr Rahul Tambade	ICU Gold Coast University Hospital, Australia.	Australia.	dr.rahultambade@gmail.com
73	Dr Anand B. Gaikwad	Consultant Radiologist, Southcoast Radiology, Australia.	Australia.	anandgaik01@gmail.com
74	Dr Arun M	Professor & Head, Department of Forensic Medicine & Toxicology, JSS Medical College, Mysuru, Karnataka – 570015.	India	arunmohanram@gmail.com
75	Dr T K Bose	Professor & Head, Department of Forensic Medicine & Toxicology, JIMSH, Budge Budge, Kolkata, India. 700137	India	drtapasbose@gmail.com
76	Dr O Gambhir Singh	Professor & Head, Department of Forensic Medicine, SRM Medical College, Potheri, Chennai- 603203.	India	drgambhirsingh@gmail.com
77	Dr S K Dhattarwal	Professor, Department of Forensic Medicine & Toxicology, Postgraduate Institute of Medical Sciences, Rohtak, Haryana- 124001.	India	drskdhattarwal@gmail.com

#	First name and Last name	Affiliation	Country	Email
78	Dr Uday Basu Roychowdhury	Professor & Head, Department of Forensic Medicine, Midnapore Medical College, West Bengal- 721101.	India	udayfsm@gmail.com
79	Dr T K Naidu	Professor & Head, Department of Forensic Medicine, Prathima Institute of Medical Sciences, Mukkrampura, Karimnagar, Telangana – 505001.	India	tekyamnaidu@gmail.com
80	Dr Pratik Rastogi	Professor & Head, Department of Forensic Medicine & Toxicology, Kasturba Medical College, Mangalore, Karnataka- 575001.	India	Prateek.rastogi@manipal.edu
81	Dr Gautam Biswas	Professor & Head, Department of Forensic Medicine, Dayanand Medical College & Hospital, Ludhiyana, Punjab- 141001.	India	gautamdmc@rediffmail.com
82	Dr Mohammed Iliyas Sheikh	Professor & Head, Department of Forensic Medicine, SMIMER, Surat, Gujrat.	India	drmiliyas@gmail.com
83	Dr B Suresh Kumar Shetty	Professor, Department of Forensic Medicine & Toxicology, Kasturba Medical College, Mangalore, Karnataka- 575001.	India	Suresh.shetty@manipal.edu
84	Dr Harshwardhan Khartade	Associate Professor & Head, Department of Forensic Medicine & Toxicology, Shyam Shah medical College, Rewa, Madhya Pradesh – 486001.	India	Harshwardhan.khartade@gmail.com
85	Dr Haneil L D'Souza	Associate Professor, Department of Forensic Medicine & Toxicology, Kasturba Medical College, Mangalore, Karnataka- 575001.	India	hanihere@gmail.com
86	Dr Vikas Meshram	Associate Professor & Head, Department of Forensic Medicine & Toxicology, AIIMS Jodhpur, Rajashtan.	India	Drvpm26@gmail.com
87	Dr Kalpesh Zanzrukiya	Associate Professor & Head, Department of Forensic Medicine & Toxicology, SBKS MI & RC, Sumandeep Vidyapeeth, Vadodara, Gujrat.	India	Kalpeshzrk1987@gmail.com
88	Dr Raviraj KG	Assistant Professor, Department of Forensic Medicine & Toxicology, Vydehi Institute of Medical Sciences & Research Centre, Bangalore, Karnataka- 560066.	India	drkgraviraj@gmail.com
89	Dr Mohit Chauhan	Assistant Professor, Department of Forensic Medicine & Toxicology, Government Medical college & Hospital, Chandigarh-160030.	India	Maahi474@gmail.com
90	Dr Senthil Kumaran	Assistant Professor & Head, Department of Forensic Medicine & Toxicology, AIIMS Mangalgiri, Andhra Pradesh.	India	Srsenthilkumaran84@gmail.com
91	Dr Rajiv Joshi	Professor, Department of Forensic Medicine, GGS Medical College, Faridkot, Punjab, India.	India	drrajivacme@gmail.com
92	Dr T Nataraja Moorthy	Professor of Forensic Sciences, Faculty of Health and Life Sciences, Managemnent and Science University, Sha Alam, Selangor, Malaysia.	Malaysia	natrajamoorthy@rediffmail.com

Common Guidelines to reviewer:

1. Fill out the review form with your comments, providing a rating for each aspect of the article. You may also make comments on the research publication/review article by simply highlighting your comments in yellow; or by typing your comments in red font.
2. All research publication/review article/Case Study submitted to **The Journal of Forensic Medicine, Science and Law (JFMSL)** are subject to peer review and it is **mandatory to reviewers to maintain confidentiality of the review process.** Submission of declaration on statement of conflict of interest is mandatory before accepting the article for review.
3. Reviewer requested to submit the review report in 03 working days.
4. After complete editing, rename file with Code **number of article - reviewer's name** and send it to mlameditor@gmail.com

JOURNAL OF FORENSIC MEDICINE, SCIENCE AND LAW

(Official Publication of Medicolegal Association of Maharashtra)
PRINT ISSN: 2277-1867 ONLINE ISSN: 2277-8853 Email.id: mlameditor@gmail.com
Mobile: +91 9423016325

Date: / /20

To,
The Editor in Chief,
Journal of Forensic Medicine Science and Law
(Official Publication of Medicolegal Association of Maharashtra)
Website: http://www.mlam.in Email id: mlameditor@gmail.com
Editorial Office: Department of Forensic Medicine & Toxicology, Third Floor, Library Building, Seth G S Medical College & KEM Hospital, Mumbai- 400012
Contact No. 022-24107620/ 022-24107000. Mobile: +91-9423016325

Subject: **Annual subscription** of **Journal of Forensic Medicine Science and Law**- Official publication of Medicolegal Association of Maharashtra (MLAM).

I/We, am/are interested to become annual subscriber to the **Journal of Forensic Medicine Science and Law**- Official publication of Medicolegal Association of Maharashtra (MLAM) from the current year.

Details of Subscriber-

Individual/ Institutional	
Name	
Address: (Copy of the journal will be sent on this address)	
Pin code	
Contact No.	
Email	

Yearly Subscription fees: Biannual Journal(yearly two copies- Issue1 & Issue 2)- **(Year 2023).**

Individual	**Rs. 5000/-**	(Rs. Five thousand only)
Institutional	**Rs. 7000/-**	(Rs. Seven thousand only)
Third Party (with 10% Agency discount)	**Rs. 8000/-**	(Rs. Eight thousand only)

Account Details:

Bank Account Details
Bank Account Name: Medicolegal Association of Maharashtra
Account No. 50292010017478 **IFSC Code-** CNRB0015029
MICR: 400015219 **Bank:** CANARA Bank Byculla. **Branch:** Byculla II, Mumbai.
Mode of Payment: Payment can be done as online transfer- IMPS/NEFT/Quick transfer.

Payment Details:

Transaction Id		
Date		

The subscription form copy & payment details sent on mail- mlameditor@gmail.com
Kind request to send the copies on above-mentioned address.

Seal **Signature of Authority**

COPYRIGHT FORM

To,

The Editor-in-Chief

Journal of Forensic Medicine Science & Law (JFMSL)-

An official publication of **Medicolegal Association of Maharashtra (MLAM).**

I, the undersigned, DR**. …….**

hereby declare that the manuscript entitled-

_____

_____

submitted for publication to **Journal of Forensic Medicine Science & Law (JFMSL)** is not send to any other journal or magazine for Publication or in process of review with any other journal or magazine or is not published as full article or partly in any journal or magazine or in any medium either in the form of print or electronic.

The work submitted by the author is original & completed under supervision of first/corresponding author. All the other authors also actively participated in concerned work.

We give written consent for publication in **Journal of Forensic Medicine Science & Law (JFMSL).** We do not have any conflict of interest by any mean. The content mentioned in the said manuscript by words, in the form of charts or table or figures are original from authors & no part is in the form of reproducible or copied or by any means conflicting.

S. No	Name of Author	Designation & Affiliation	Mobile No. & Email	Signature with date
1				
2				
3				
4				
4				

Corresponding author details:

Name: DR. ……

Designation:

Affiliation:

Email:

Contact number:

Name of the Institution where work is completed:

Source of support:

CONFLICT OF INTERESTS:

ETHICAL CLEARANCE:

Ethical Clearance/ Ethics Statement:

Author/S Contributor Ship Statement:

Signature

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW

(Official Publication of Medicolegal Association of Maharashtra)

PRINT ISSN: 2277-1867 ONLINE ISSN: 2277-8853 Email.id: mlameditor@gmail.com

Mobile: +91 9423016325

Kindly join to **Reviewer Board** of **Journal of Forensic Medicine Science and Law** (an official Publication of Medicolegal Association of Maharashtra). Please fill the **consent form** and send the Form (scan copy) along with your **CV** to email Id: mlameditor@gmail.com. With your consent, your name will be added in the Editorial Board of this journal on website, print & online version of this Journal.

MEMBER FORM (REVIEWER BOARD)

PARTICULARS	DETAILS
Name	
Qualifications	
Designation	
Department / Institution	
Specializations	
Area of Interest	
Publication Details- Citations (Add separate sheet, if needed)	
Year of Editing / Review Experience	
Correspondence Address	
Email Id	
Contact Details	
Experience of the Editor/Reviewer/ Advisory Board, if any.	
Recommended By (Name of faculty from MLAM/IAFM EC MEMBER/ Editorial Board)	

I, ... do hereby give my consent for **Journal of Forensic Medicine Science and Law** to include me as a member of **Editorial Board & Reviewer Board.**

Date: .....

Signature with seal

JOURNAL OF FORENSIC MEDICINESCIENCE AND LAW
Volume 31, Issue 2, July - December 2022
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Table of Contents

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Editorial

Issues Related to Cadaver Organ Retrieval in Medicolegal Cases.

Ravindra B Deokar[a*], Sachin S Patil[b]

[a]Professor (Additional), Department of Forensic Medicine & Toxicology, Seth G S Medical college & KEM Hospital, Parel, Mumbai-400012.
[b]Associate Professor, Department of Forensic Medicine & Toxicology, Lokmanya Tilak Municipal Medical college & LTMG Hospital, Sion, Mumbai-400022.

1. Introduction

With advancement of sciences and technologies, new practices and procedures are being implemented in medicinal field. Organ transplantation is a procedure in which an organ is removed from a one person's body whether dead or alive and placed in the recipient's body. It replaces the damaged or missing organ in recipient's body. The donor is a person who donates the organ and recipient is a person who receives the organ. The organ can be retrieved from dead or brain dead person and used for transplantation abiding the Transplantation of Human Organ Act 1994. Amongst the transplanted organs kidneys, heart, liver, lungs, pancreas and intestines are most commonly transplanted organs. Amongst the transplanted tissues includes bones, skin, tendons, ligaments, heart valves, blood vessels and corneas, etc are most commonly transplanted tissues.

The Transplantation of Human Organ Act 1994: Transplantation of Human Organs Act (THOA) 1994 was enacted to provide for removal, storage and transplantation of human organs for therapeutic purposes. It aims to prevent the commercial dealings in human organs. It is now adopted by all States except J&K.[1]

The Transplantation of Human Organ & Tissues Amendment Act (THOTA) 2011: The Government of India enacted the Transplantation of Human Organs (Amendment) Act, 2011. It allows swapping of organs. It also included grandparents and grandchildren in the list to widen the donor pool. It applies to the States of Goa, Himachal Pradesh and West Bengal and to all the Union territories and it shall also apply to such other State which adopts this Act (**Table no. 1**) by resolution passed in that behalf under clause (1) of article 252 of the Constitution. The Transplantation of Human Organs and Tissues Rules, 2014 Published on 27th March 2014.[2]

Table 1: Applicability of THOA 1994 & THOTA 2011.

THOA 1994	THOTA 2011
Bihar	Assam, Chhattisgarh, Jharkhand
Gujarat	Goa, Himachal Pradesh, Kerala
Haryana	Maharashtra, Manipur, Odisha
Karnataka	Punjab, Rajasthan, Sikkim
Tamil Nadu	Uttar Pradesh, West Bengal,
Madhya Pradesh	Andaman and Nicobar, Chandigarh
Telangana	Delhi NCR, Dadra and Nagar Haveli
Uttarakhand	Lakshadweep, Daman and Diu
Andhra Pradesh	Jammu and Kashmir and Leh-Ladakh, Puducherry

Medicolegal Perspective as deceased organ donor: In India, road traffic accident (RTA) victims are the potential organ donor pool who have who have sustained traumatic head injuries and declared brain dead.

How to cite this article: Deokar RB, Patil SS. Issues Related to Cadaver Organ Retrieval in Medicolegal Cases. J For Med Sci Law 2022;31(2):1-3.

***Corresponding author**: Dr Ravindra B Deokar, Professor (Additional), Department of Forensic Medicine, Seth G S Medical College & KEM Hospital, Mumbai, Maharashtra, India. Email: ravindradeokar@kem.edu (M)+91-9423016325.
***Article Info:* Received on:** 11.12.2022; **Accepted on:** 28.12.2022.

As per the Global Status Report on Road Safety of 2018, the reported number of road traffic deaths in India was 150,785 in the year 2016 with the estimated road traffic death rate per hundred thousand population was 22.6. Across 199 countries reported in the World Road Statistics, 2018, India had been ranked number one in the number of road accident deaths.[3]

151,417 people succumbed to death on the Indian roads following vehicular accidents and most victims sustained head trauma in 2018.[4] A 5 years study of an Indian state's registry data showed that 79% of cases of organ donation came from victims of RTAs/ head trauma who had later progressed to brain death.[5]

Medicolegal cases includes all the vehicular and unnatural accidental cases, including the poisoning, suicide, and assault cases. There is a specific protocol laid down for organ or tissue donation in MLCs abiding the Transplantation of Human Organs Act (1994) and the Transplantation of Human Organs and Tissues (Amendment) Act 1994 (2011) of India. In a medicolegal case, the dead body is considered as state property. There is need to rule out any foul play while establishing the cause of death. Hence, while using any organ from cadaver in medicolegal cases there is need of an inquest by a police officer and further clearance from a forensic expert for organ retrieval who needs to certify that the organs can be retrieved from cadaver and not jeopardise the determination of the cause of death in that particular case.

All matters related to the organ donation and transplantation activities are coming under the purview of the **Ministry of Health and Family Welfare in India.** The matters related to the police fall under the Ministry of Home Affairs. To facilitate deceased organ donation, certain states like Tamil Nadu and Karnataka have been issued **Government Orders (GO)** to coordinate the MLC cases. The states like Maharashtra highlighted the **roles of police and forensic doctors** towards facilitating the speedy organ retrieval and successful organ donation. In India, we still faced with a **severe organ shortage in spite of having** availability of substantially **large pool of potential** organ donor.

Various Issues related to Organ retrieval: There are many differences in the protocols followed by the various states in the steps involved in processing and dealing of a medicolegal cases.[6]

1. **Conducting the inquest after death of a person-**
   A First Information Report (FIR) at a police station nearby the accident place was registered. Based on the FIR, police starts their investigation to determine the cause of death. After FIR, the inquest is conducted abiding Section 174 of Criminal Procedure Code by the investigation officer (IO) from local jurisdiction where FIR registered. This procedure is followed in Maharashtra (Mumbai), Madhya Pradesh, Kerala, Telangana, Rajasthan and Punjab the inquest is conducted by the Investigating Officer (IO) from the local jurisdiction where the FIR was filed. Whereas, in the states of Tamil Nadu, Maharashtra (Pune area), and Delhi, to avoid delay, an investigation officer from the nearest police station start investigating till the IO from the local jurisdiction arrives.
2. **Police Inquest and organ retrieval-**
   In Madhya Pradesh, Maharashtra (Pune area) and Kerala the police inquest is carried out after organ retrieval. In other states, the IO initiates the police inquest before organ retrieval and complete it after the retrieval process.
3. **Conducting the Postmortem Examination-**
   The Postmortem examination is being performed in the same operation theatre where the organ retrieval procedures were carried out, in the states of Rajasthan Telangana and Madhya Pradesh. In contrast to this, in the states like Maharashtra, Punjab, Tamil Nadu, Kerala, and Delhi, the body is being moved to a mortuary to conduct the post-mortem examination.
4. **Examination of the head and cranial cavity during Postmortem Examination-**
   In most of the states, the skull cap is removed to examine the cranial cavity during the post-mortem examination. Exceptions are the Rajasthan and Telangana states.
5. **No objection certificate from IO for organ retrieval-**
   In Maharashtra, Rajasthan, Madhya Pradesh, Delhi and Punjab, a no-objection certificate (NOC) has to be mandatorily obtained from the police before proceeding with organ retrieval procedure. However, the IO's role is limited to expediting the inquest and post-mortem procedures in the state of Tamil Nadu and Telangana. Further, the forensic autopsy surgeon authorizes the organ retrieval and further complete the post-mortem examination.

Approval from neither the police nor the forensic expert is required in the retrieval process in the state of Kerala.

Dealing with the medicolegal cases is inherently complex matter with the involvement of multiple players including the extensive documentation. In this, there are two important stakeholders i.e. the **police (IO)** and the team of **forensic experts** conducting the post-mortem examination. The police are responsible for conducting an **inquest** to determine the cause of death. The forensic team need to ensure the organ retrieval process does not jeopardise with determining the cause of death.

The **Tamil Nadu GO No. 86, 2011** is **path-breaking Government Orders (GO)** issued by Tamil Nadu State which turned useful to facilitate the cadaver organ retrieval. It was issued specifically to facilitate the medicolegal organ donation cases, simplifying many hurdles. T**hree exclusive forms** viz. request for police inquest, list of functional organs that could be retrieved, and a form authorizing organ retrieval are given as a part of this order. Also, by another circular, the state Government allowed the local police station IO to start inquest, if the police station where FIR was registered is too far.

Suggestions/ Recommendations-

1. There is need to resolve the disparities in inquest and post-mortem procedures followed by different states in MLCs. There is need of standard uniform procedures & protocols in such cases to facilitate the speedy organ retrieval.
2. The prompt execution of medicolegal formalities through designated police official in the shortest period will facilitate to ensure the grieving families are not further distressed waiting to receive the body of the loved ones.
3. Police personnel at all levels need to be trained in deceased donation procedures, transplant law as well as local state GOs. Government and non-government organisations need to take responsibility of the awareness on organ donation amongst the stakeholders.

References:

1. National Organ and Tissue Transplant Organization (NOTTO). The Transplantation of Human Organs Act; 1994. [Cited on 2023 Dec 07]. Available from: https:// notto.gov.in/WriteReadData/Portal/images/THOA-ACT-1994. pdf
2. National Organ and Tissue Transplant Organization (NOTTO). The Transplantation of Human Organs and Tissues Rules; 2014. [Cited on 2023 Dec 07]. Available from: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1606208.
3. World Health Organization. Global Status Report on Road Safety 2018. Geneva: World Health Organization; 2018. [Cited on 2023 Dec 05]. Available from: https:// www.who.int/violence_injury_prevention/road_safety_status/2018/ en/.
4. Road Accidents in India 2018. Transport Research Wing: Ministry of Road Transport and Highways. Government of India. [Cited on 2023 Dec 05]. Available from: http://www.morth.nic.in/sites/default/files/Road_Accidents_in_ India_2017.pdf.
5. Balaji P, Shroff S, Karunakaran CE. Tamil Nadu Deceased Donor Organ Transplantation, In: Annual Report from Tamil Nadu Organ Sharing Registry 2016-2017. Chennai, India: Transplant Authority of Tamil Nadu; 2017. p. 6-11.
6. Thyagarajan I, Kanvinde H, Shroff S, Sahi MK. Organ donation and the medicolegal aspects: A process analysis study of the Indian states - Observational study. Indian J Transplant. 2022; 16:184-8.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Fingerprint Pattern Distribution In A Cohort of Southeastern Haryana

Shribhagwan[a], Manmohan Singh[b]*, Harish Kumar S Agarwal[c]

[a]Assistant Professor Department of Forensic Medicine, Al-Falah School of Medical Science and Research Centre, Dahuj, Faridabad, Haryana, India. [b]Assistant Professor, [c]Associate Professor, Department of Forensic Medicine, Maharaja Agrasen Medical College, Agroha, Hisar, Haryana, India.

Article Info

Received on: 11.10.2021
Accepted on: 19.02.2022

Key words
Fingerprint pattern, Dermatoglyphic Indices, Pattern Intensity Index, Dankmeijer's Index, Furuhata's Index.

Abstract

Introduction: Fingerprint is the most common method of personal identification in forensic anthropology. Distribution of fingerprint is the most common method of personal identification. Variation in distribution of fingerprint pattern across the India is observed. **Material & Methods:** This study was conducted on 650 individuals comprising of 37.23% females and 62.77% males. **Results & Disscussion:** Fingerprint pattern in all the participants were in the order of Loop > Whorl >Composite > Arch. In male loops were higher than female (56.35% vs 53.88%), while whorl (32.45% vs 33.51%), composite (6.42% vs 6.86%) and arch (4.78% vs 5.76%) were more in female. Dermatoglyphic indices; Pattern Intensity Index (PII), Dankmeijer's Index (DI) and Furuhata's Index (FI) of the present population was 12.11, 15.93 and 59.89, respectively. Applying the Mann Whitney U test to the obtained results, gender differences were found to be statistically insignificant ($p > 0.05$). Comparison of available data was done with other studies and dendrogram. using Ward Linkage method has been drawn based on indices to know the degree of affinity with different population across India. **Conclusion:** The study population in present cohort showed closed ethnic affinity with the population from the central India and UP.

1. Introduction

Fingerprints are the commonest methods used for personal identification in forensic anthropology.[1] The ridges and the valleys on the skin of the human fingertip form distinctive patterns called dermatoglyphics. The term dermatoglyphic (derma – skin, glyphic – carve) was first coined by Cummins and Midlo.[2]

These patterns are developed entirely in utero and are permanent throughout their lifetime. Injuries like cuts, burns and, bruises can temporarily damage the quality of fingerprints but when fully healed, patterns are restored. Prints of these patterns are called fingerprints and the study of these prints in identification is called dactylography.[3] For the purpose of matching the fingerprints, analysis and subsequent comparison of various features of the fingerprint pattern is needed.

How to cite this article: Shribhagwan, Singh M, Agarwal HS. Fingerprint Pattern Distribution In A Cohort of Southeastern Haryana. J For Med Sci Law 2022;31(2):4-10.

*Corresponding author: Dr Manmohan Singh, Assistant Professor Department of Forensic Medicine, Maharaja Agrasen Medical College, Agroha, Hisar, Haryana, India. Email id: monusehrawat888@gmail.com

The analysis of fingerprint includes noting of characteristics pattern of ridges and minutiae points which are unique to each pattern.[4] It has been noted that there is normal variation in these traits representing hereditary differences between members of separate populations and within the same population. Hence dermatoglyphics traits are most useful in studying population dynamics.[5]

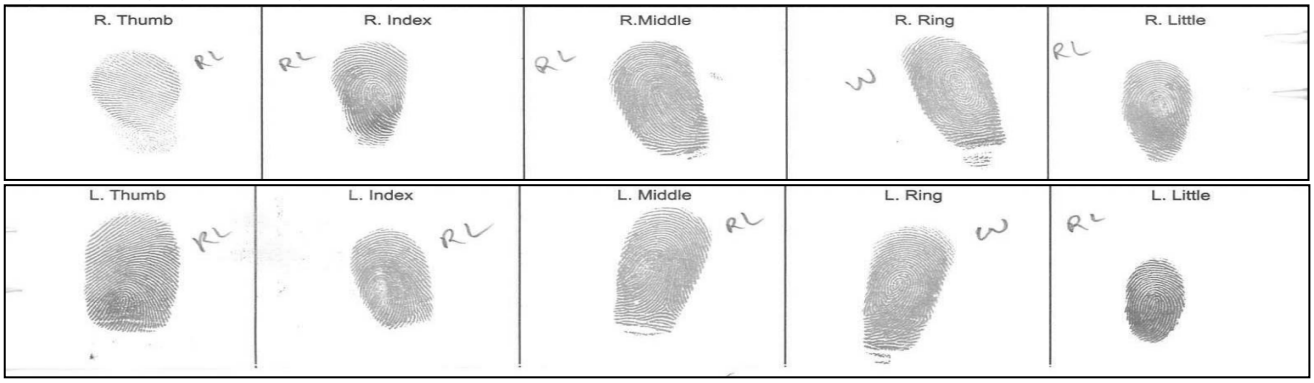
The present study was aimed to estimate the detailed frequency distribution of various fingerprint patterns in the present geographical locations, to establish the most and least predominant patterns, to find out the existence of any statistically significant gender differences, and to compare the results with the population of neighboring states.

2. Material & methods:

After the clearance from Institutional Ethical Committee, a cross-sectional study was conducted between November 2014 and November 2016. The study enlisted the participation of 650 people, with 242 (37.23%) females and 408 (62.77 %) males, with ages ranging from 18 to 66, with a mean of 24.83 years. The participants were chosen through a simple random sampling technique. All subjects were informed about the purpose and nature of the study. Only healthy individuals who have given written consent, were included in the study. Individuals with visible signs of any disease, deformities, injury to the palmer surface of the hand were excluded from the study.

Before taking prints, the subjects were instructed to wash, air-dry their hands. A self-inked pad (Kores India) was placed on a wooden table. The unglazed white bond paper was applied firmly over a wooden pad. The bond paper was divided into two (right and left), and each further into five columns marked as a thumb, index, middle, ring, and little. The subjects were asked to relax their arms and palmer aspects of the distal phalanges of the right hand were inked on the ink pad starting from the little finger.[6]

Fig. 1: Photograph showing the fingerprint impression.



To get a full print of the ridged region of the distal phalanges, the fingers were rolled from side to side. Any external pressure was avoided during the process to ensure that no smudging of the prints occurs. The same procedure was done for recording the fingerprint of the left hand. Thus, fingerprints of both hands were obtained and recorded (**Fig.1**).

Data analysis: The fingerprint obtained on the impression sheet were categorized according to Henery's classification[7] into various groups and subgroups. The observations were recorded on an excel spreadsheet. All types of whorls (concentric, single spiral, double spiral, accidental etc.) were grouped under the category of whorls. The loops were categorized into the ulnar loop and radial loop based on the opening of the loop. The arch was subdivided into plain and tented. All the composite whorls like central pocket loops, lateral pocket loops, and twin loops are grouped under the broad category of 'composite'. A quantitative assessment of the fingerprint pattern of the study population in each sex was done using the following calculations-

- **Pattern Intensity Index** (P.I.I)[8] = (2 x % whorl +1 x % loop) ÷10
- **Dankmeijer's Index** (D.I.)[9] = [(% arches x100)] ÷ % whorl).
- **Furuhata's Index** (F.I.)[10] = [(% whorl x 100)] ÷% loop.

All the observations of the present study were entered in Microsoft Excel 365 (Redmond, Washington USA). After completion, all the data was transferred into SPSS version 23.0 (IBM SPSS; Chicago, IL, USA) and further descriptive statistical analyses were carried out with the same. Applying the Shapiro-Wilk test using a histogram showed the absence of normality of distribution of fingerprint

pattern among the participants. Therefore, the Mann-Whitney U test was used to compare the distribution between male and female participants. The null hypothesis postulated that the distribution of fingerprint patterns is the same in both sexes. Value of $p \leq 0.05$ was decided to reject the null hypothesis. Biological relationships based on the P.I.I., D.I., and F.I. of dermatoglyphic patterns were established using the dendrogram analysis based on ward linkage cluster analysis with other populations of India.

3. Observations and results:

A total of 6500 fingerprints were studied in a total of 650 volunteers (408 males and 242 females) and their patterns were identified. The age of the volunteers was between 17 years to 65 years with a mean age of 24.87 years. Fingerprint patterns in all the participants were in the order of Loop > Whorl >Composite > Arch. The detailed frequencies are shown in **figure 2.** Detailed frequency distribution of major fingerprint patterns in each digit of both hands among both the sex is presented in **table no. 1 and 2.** Ulnar loop pattern was predominant in both males and females and the highest frequency was observed in the middle finger of both the sex. The frequency of tented arch was lowest in both the sex and particularly were absent in left the ring finger in the case of male and in the ring and little finger of both the hands in the case of female. The gender wise distribution of various major fingerprints is presented **in figure 3.**

Figure 2: Pie chart showing digital pattern distribution in all the participants.

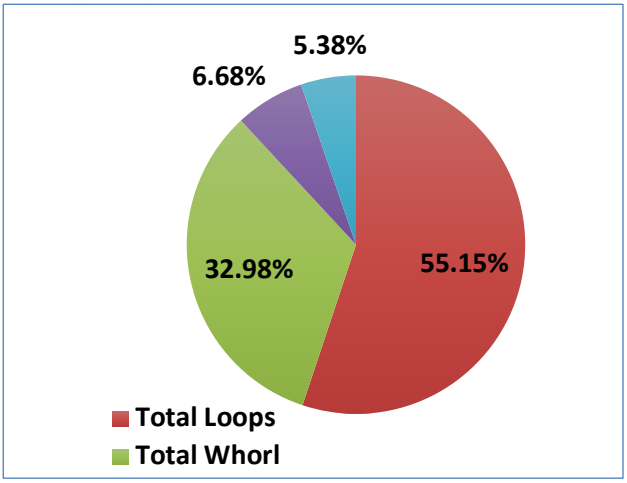


Figure 3: Graph showing different percentages of digital patterns in each sex.

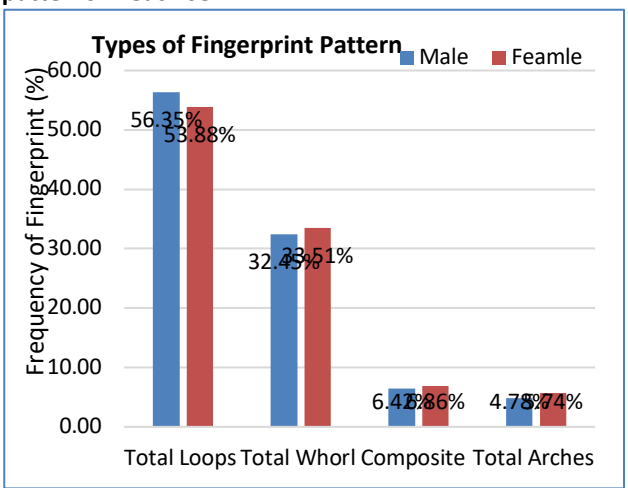


Table 1: Frequency distribution of fingerprints in the males in %

	Fingerprint Pattern						
	Finger	Loops %		Whorl %	Composite %	Arch %	
		Ulnar	Radial			Plain	Tented
Left Hand	Little	11.86	0.69	5.54	1.52	0.34	0.05
	Ring	10.98	1.67	6.18	0.98	0.2	0
	Middle	10.78	0.74	5.78	1.22	1.08	0.39
	Index	9.46	0.74	7.94	1.03	0.34	0.49
	Thumb	7.94	2.84	4.31	2.3	1.42	1.18
Sub Total		51.03	6.67	29.75	7.06	3.38	2.11
Right Hand	Thumb	8.48	2.75	6.47	1.52	0.44	0.34
	Index	7.6	0.29	9.75	0.78	0.98	0.59
	Middle	12.06	0.29	6.86	0.3	0.39	0.1
	Ring	9.9	1.03	6.32	1.61	1.08	0.05
	Little	11.7	0.88	5.74	1.57	0.05	0.05
Sub Total		49.75	5.25	35.15	5.79	2.94	1.13
Combined		50.4	5.96	32.5	6.43	3.16	1.62
		56.36		**32.45**	**6.43**	**4.78**	

Male (N= 408) has a larger mean rank Female (N= 242) in all the digits of both hands and thus tends to take larger values. The distribution of fingerprint patterns compared in both hands and with each sex on the Mann-Whitney U test. The results showed that fingerprint pattern distribution was different in both males and females in all the fingers except in the left thumb, where the difference was insignificant ($p < 0.001$) (**Table 3**). The P.I.I., D.I., and F.I. were calculated from finger pattern types. The overall mean values of P.I.I, D.I., and F.I. were observed to be 12.11, 15.93, and 59.89 respectively. Males exhibited a higher mean P.I.I, while the mean values of D.I. and F.I. were less compared to females. The frequency of fingerprint patterns and indices were compared with previous studies. (**Table 4 & 5**). A dendrogram using the Ward Linkage method has been drawn based on the frequency distributions of P.I.I., D.I. and F.I. reported for various studied populations of India to know the degree of affinity. (**Fig.4**).

Figure 4: Dendrogram of cluster analysis by Wald's Linkage method based on pattern intensity index (P.I.I.), Dankmeijer's index (D.I.), and Furuhata's index (F.I.) showing population affinity of the present study.

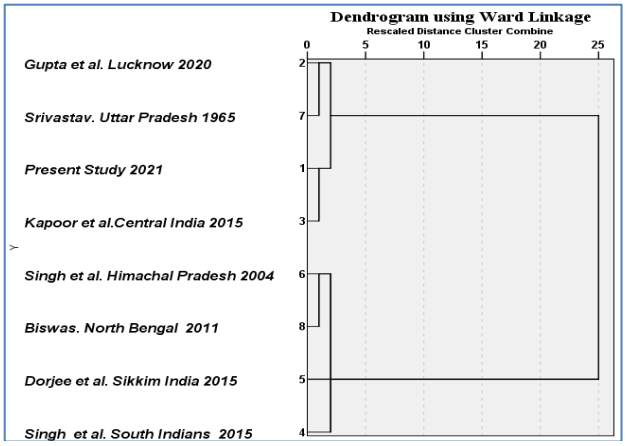


Table 2: Frequency distribution of fingerprints in female in (%)

	Fingerprint Pattern						
	Finger	Loops %		Whorl %	Composite %	Arch %	
		Ulnar	Radial			Plain	Tented
Left Hand	Little	8.6	1.4	8.43	1.16	0.41	0
	Ring	9.59	1.9	5.79	2.15	0.58	0
	Middle	9.67	0.99	6.86	0.41	1.82	0.25
	Index	9.92	1.82	5.7	1.16	0.99	0.41
	Thumb	9.75	0	5.37	2.23	0.99	1.65
Sub Total		47.52	6.12	32.15	7.11	4.79	2.31
Right Hand	Thumb	8.84	0.33	6.78	1.32	1.9	0.83
	Index	9.42	0.74	7.85	1.32	0.33	0.33
	Middle	11.16	0.5	7.11	0.58	0.58	0.08
	Ring	10.41	0.91	5.87	2.48	0.33	0
	Little	10.17	1.65	7.27	0.91	0	0
Sub Total		50	4.13	34.88	6.61	3.14	1.24
Combined		48.76	5.12	33.51	6.86	3.97	1.78
		53.88		**33.52**	**6.86**	**5.74**	

Table 3: Non-parametric test result of frequency of pattern of fingerprints in each digit compared with both sex.

		Left Thumb	Left Index	Left Middle	Left Ring	Left Little	Right Thumb	Right Index	Right Middle	Right Ring	Right Little
Mean Rank	Male	341.16	305.79	330.28	322.22	337.73	329.64	319.08	326.40	324.33	330.67
	Female	299.10	358.73	317.44	331.02	304.89	318.51	336.32	323.98	327.47	316.78
Mann-Whitney U test		42978	41327	47418	48031	44380	47677	46751	49000	48892	47258
Z test		-2.902	-3.784	-.925	-.635	-2.391	-.777	-1.237	-.183	-.224	-1.022
Asymp. Sig. (2-tailed)		.004	.000	.355	.526	.017	.437	.216	.855	.823	.307

Group Variable = Sex

Table 4: Comparison of frequency of fingerprint pattern of the present study with other studies.

Study Population	Sex	N	Loop %	Whorl %	Arch %	Composite %
Present Study 2021	M	408	56.35	32.45	4.78	6.42
	F	242	53.88	33.51	5.74	6.86
Gupta P et al 2020	M	28	55.66	40.28	3.22	
	F	28	56.76	38.57	5.00	
Joshi K 2018	M	100	55	32.5	5.3	7.2
	F	100	58	30	6.2	5.3
Kapoor et al 2015	M	240	52.33	28.17	3.5	16
	F	240	48.17	27.83	5.33	18.67
Singh et al 2015	M	48	42.2	41.08	3.74	-
	F	57	48.2	35.36	6.3	-
Dorjee et al 2015	M	150	64.33	31	4.67	
	F	150	75	21.33	3.66	
Singh et al 2004	M	50	49	49	2	
	F	50	53.33	46.86	1.81	
Srivastav 1965	M	90	54	41.55	4.44	
	F	91	56.15	40.21	3.62	
Banik et al 2009	M	104	47.7	52.19	0.11	
	F	103	42.81	55.69	1.5	
Biswas 2011	M	101	42.16	55.1	2.75	
	F	101	48.24	50.2	1.57	

Table 5: Comparison of fingerprint indices of the present study with other studies.

Study Population		Pattern Intensity Index	Dankmeijer's Index	Furuhata's Index
Present Study 2021	**M**	12.13	14.73	57.59
	F	12.09	17.13	62.19
	M+F	12.11	15.93	59.89
Gupta P et al 2020	**M**	14.16	7.38	73.28
	F	14.32	13.02	68.10
	M+F	14.24	10.20	70.69
Baryah et al 2019	**M**	13.88	12.49	152.7
	F	13.61	12.4	129
	M+F	13.75	12.45	140.85
Kapoor et al 2015	**M**	10.87	12.42	53.83
	F	10.38	19.15	57.77
	M+F	10.63	15.79	55.8
Singh et al 2015	**M**	33.6	6.79	137.4
	F	32.8	13.9	94.4
	M+F	33.2	10.35	115.9
Dorjee et al 2015	**M**	14.17	12.93	104.51
	F	13.92	12.24	89.57
	M+F	10.05	12.59	97.04
Singh et al 2004	**M**	14.7	4.08	100
	F	15	3.41	118
	M+F	14.85	3.75	109
Srivastav 1965	**M**	13.7	10.69	76.95
	F	13.65	9	71.62
	M+F	13.68	9.85	74.29
Biswas 2011	**M**	15.24	4.98	130.7
	F	14.86	3.13	104.07
	M+F	15.05	4.05	117.39

4. Discussion:

Dermatoglyphics have been used to examine the origin and structure of human populations.[11] Its utilization has become increasingly common as the perception grows that they may offer new insights regarding ancient affinities among the native population and variabilities in a multi-ethnic society. This assumption was reinforced by previous accounts that dermatoglyphics portrayed expected ethno historical and geographical patterns convincingly.[12] Comprehensive work done by Bhasin[13] on dermatoglyphics of Indian population supported cast, socioeconomic status, language found that the order of prevalence of whorl, loop, and arch within the overall Indian population was loop>whorl>arch. The same distribution of fingerprint patterns was noted in the present study. Analysis of quantitative characters of fingerprints of the Yadav by Gupta et al[14] in 2020 showed a frequency of loop pattern as the highest followed by whorl and arches.

In 2018, Sahoo[15] has conducted fingerprint analysis of 200 individuals from Punjab, Tamil Nadu, West Bengal, and Rajasthan and found the frequencies of various fingerprint patterns as follows: UL (58%) >W (32%)>RL (5%)>PA (3%)>TA (2%). The results are in consonance with the current study where distribution of fingerprint pattern follows the identical order as UL (49.58%) >W (32.98%)>RL (5.54%)>PA (3.57%)>TA (1.7%) (**fig.4**). General distribution of fingerprint within the present study as shown in **table 4**, agree with the study done by Joshi [16], who studied two hundred individuals from Delhi comprising of an equal number of male and female and found a loop (56.5%) as the most common pattern followed by whorl (31.25%), composite (6.25%) and arch (6%). The geographical proximity of the above population with the present study population might be the explanation for the congruent observation.

On observation of **table no. 5**, the frequency of loop pattern outnumbered the whorl except the study done by Banik et al [17] and Biswas [18]. Both the authors combined the composite pattern of fingerprints like twin loops, lateral pocket loops, central pocket loops, and accidentals in the whorl category leading to an increase of frequency of whorl. The frequency distribution of fingerprint pattern regarding sex showed the high rates of loops in males (56.35% vs. 53.88%) while other patterns (Whorl: 32.45% vs. 33.51%, Arch: 4.78% vs. 5.74%, and Composite: 6.42% vs. 6.86%) were found more in females. This is in contrast with most of the other studies. The reason for this variation could be ethnic diversity.

Cummins and Midlo [2] envisaged the effect of genetic and environmental factors on phenotypic variation of dermatoglyphics. On reviewing the literature myriad studies were conducted in the past to identify the dermatoglyphic traits of the Indian population based on geographical location and according race. On comparison of results of the present study showed the close affinity with the study done by Kapoor et al [19]on the Muslim population of Central India, the Rajput population of Himachal Pradesh done by Singh et al [20], and the work done by Shrivastav et al [21] on the population of Uttar Pradesh. Cluster analysis of the results of previous studies was done, based on PII, DI, and FI, and a dendrogram was obtained. From the dendrogram analysis based on finger pattern indices, it has been observed that the present study population is closely related to populations from Central India and Utter Pradesh. However, the present population is separated from others such as North Bengal [18], South Indians [22], and Sikkim [23].

The present study provides insight into the frequency distribution of various fingerprint patterns in males and females. The importance of the P.I.I. lies in its recognition as a valuable ethnic determinant.[24] Although the study population was not classified in any race in the present study, but the results of cluster analysis showed a racial affinity with the population of the neighboring state.

5. Conclusion:

The present study demonstrated the distribution of the fingerprint pattern was of the order that loops were the most common pattern (55.12%), followed by whorls (32.98%), composite (6.64%), and arches (5.26%) respectively. There was no statistically significant difference in fingerprint pattern found between males and females and among both hands ($p>0.05$). Results of this study were compared with the various population from India and differences were noted. Various indices were computed and compared with other studies. The study population in the present cohort showed a closed ethnic affinity with the population from central India and UP.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. Saraswathi TR, Mishra G, Ranganathan K. Study of lip prints. J Forensic Dent Sci. 2009; 1:28-31.
2. Cummins H, Midlo C. Palmar and plantar epidermal ridge configurations (dermatoglyphics) in European-Americans. Am J Phys Anthropol. 1926; 9: 471-502.
3. Adebisi S. Fingerprint Studies- Recent Challenges and Advancement: A Literary View. Internet J Biol anthropol. 2009; 2(2):1-9.
4. Cherry M, Imwinkelried E. A cautionary note about fingerprint analysis and reliance on digital technology. Judicature. 2006; 89(6):334-8.
5. Pernose LS. Fingerprints, palms and chromosomes. Nature. 1963; 197:933-8.
6. Nithin MD, Balaraj BM, Manjunatha B, Mestri SC. Study of fingerprint classification and their gender

distribution among South Indian population. J Forensic Leg. Med. 2009; 16:460-3.
7. Henry ER. Classification and uses of fingerprints. London (GB): G. Routledge; 1980.pp-17.
8. Basu A, Namboodiri KK. The relationship between total ridge count and pattern intensity index of digital dermatoglyphics. Am J Phys Anthropol. 1971; 34:165–73.
9. Dankmeijer J. Some anthropological data on fingerprints. Am J Phys Anthropol. 1938; 23:377–88.
10. Furuhata T. The difference of the index of fingerprints according to race. Japan Med World. 1927; 7:162–4.
11. Froehlich JW, Giles E. A multivariate approach to fingerprint variation in Papua New Guinea: implications for prehistory. Am J Phys Anthropol. 1981; 54(1):73–91.
12. Rudan P, Simic D, Bennett LA. Isolation by distance on the Island of Korcula: correlation analysis of distance measures. Am J Phys Anthropol. 1988; 77:97–103.
13. Bhasin MK: Genetics of Castes and Tribes of India: Dermatoglyphics. Int J Hum Genet. 2007; 7(2):175-215.
14. Gupta P, Singh UD. The study of finger dermatoglyphics among Yadav and Lodhis of Rudahi village of Lucknow. Indian J Phys Anthropol Hum Genet. 2020; 39(2):135-45.
15. Subhashree S. Determination of sex and hand from individual fingerprints. Int J Forensic Sci. 2017; 2:000120.
16. Joshi K. The distribution of fingerprint patterns with gender in Delhi, India population –A comparative study. Academic Journal of Anthropological Studies. 2018; 1(1): 15-24.
17. Banik SD, Pal P, Mukherjee DP. Finger dermatoglyphic variations in Rengma Nagas of Nagaland India. Coll Antropol. 2009; 33(1):31–5.
18. Biswas S. Finger and palmar dermatoglyphic study among the Dhimals of North Bengal, India. The Anthropologist. 2011; 13(3):235–8.
19. Kapoor N, Badiye A. Digital dermatoglyphics: A study on Muslim population from India. Egypt J Forensic Sci. 2015; 5(1):90–5.
20. Singh I, Garg RK. Finger dermatoglyphics: a study of the Rajputs of Himachal Pradesh. The Anthropologist. 2004; 6(2):155–6.
21. Srivastava RP. A study of fingerprints of the Danguria Tharu of Uttar Pradesh (India). Am J Phys Anthropol. 1963; 21:69–76.
22. Singh UP, Mishra G. Finger dermatoglyphics of the Toda tribals of Nilgiri hills in Tamil Nadu, India. Indian J Phys Anthropol Hum Genet. 2015:34 (1); 109-129.
23. Dorjee B, Das S, Mondal N, Sen Dermatoglyphic variation among the Limboo of Sikkim, India. Homo. 2015:66; 455–470.
24. Newman M.T. Populational analysis of finger and palm prints in Highland and Lowland Maya Indians. Am J Phys Anthropol. 1960; 18: 45–58.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Study of Disparity of Opinion Between Anatomical Examination of Bones and Police History in Medicolegal Cases

Hemlata Ambade[a], Ashita Kaore[a], Bharat Thakre[a], Vipul Ambade[b]*, Namdeo Kamdi[c]

[a]Assistant Professor, [c]Professor and Head, Department of Anatomy, Government Medical College, Nagpur, Maharashtra State, India. Pin-440003. [b]Professor and Head, Department of Forensic Medicine, Government Medical College, Gondia. Maharashtra, India.

Article Info

Received on: 21.10.2022
Accepted on: 30.12.2022

Key words
Anatomical examination, Medicolegal cases, Skeletal remains, Bone examination, Disparity of opinion.

Abstract

Background: Whenever skeletal remains/ bones were recovered, the investigation officer usually send it for anatomical examination for giving opinion about source, age, sex, stature, and injuries on the bone. Anatomical bone examination is carried out in disputed cases with respect to identification and cause of death from the skeletal remains. Against this background, the present study is being carried out to find out any disparity of anatomical opinion of bone from the police opinion based on the history. **Methods:** A cross-sectional study was carried out in the department of anatomy at government medical college, Nagpur. It included a total of 256 medicolegal cases for anatomical opinion from skeletal remains during 11 year study period. Then the percentage of disparity between anatomical opinion and police history has been calculated with respect to its source, age and sex. **Results:** The disparity between anatomical opinion and police history was noted in 8.98% in source, 20.56% in gender and 26.52% in age opinion. **Conclusions:** Anatomical bone examination plays an important role in the further investigation of the case and it gives direction to the investigation agencies in disputed cases.

1. Introduction

Anatomical examination of a bone in medicolegal case is a special type of investigation carried out in disputed cases. Recovered skeletal remain is the biggest challenge for the forensic expert and anatomist to give opinion with respect to identification of the deceased and the cause of death. The first question comes in the mind of investigating police officer after getting skeletal bones is where to send these remains.[1]

The investigating officer usually sends such skeletal remains to forensic medicine department for determination of cause of death; and then referred to the department of anatomy for further anatomical examination. In India, the medicolegal examination of bones are carried out by forensic department in some states.[2] However, in the state of Maharashtra, department of anatomy in most of the government medical colleges is authorized for anatomical examination of bones in medicolegal cases[3] for giving opinion about source, age, sex, stature and injuries on the bone.[1] Against this background, the present study is being carried out

How to cite this article: Ambade H, Kaore A, Thakre B, Ambade V, Kamdi N. Study of Disparity of Opinion Between Anatomical Examination of Bones and Police History in Medicolegal Cases. J For Med Sci Law 2022;31(2):11-14.

***Corresponding author:** Dr Vipul Ambade, Professor and Head, Department of Forensic Medicine, Government Medical College, Gondia. Maharashtra, India (441601). Email id: vipulambade@rediffmail.com

with a view to find out the disparity of opinion in medicolegal cases.

2. Methods:

The present cross-sectional study has been carried out in the department of anatomy at government medical college, Nagpur during the period January 2004 to December 2014. This is an authorized Apex Medical centre where bones were sent all across the Vidarbha region of Maharashtra for anatomical examination. A total of 256 medicolegal cases were examined in this apex centre during the study period; and were included in the present study with an average of 23.27 medicolegal cases per year. Most of the information of the deceased about age, sex, place of retrieval, condition of body and manner of death along with the history was gathered from the accompanying police papers after preliminary police investigation. Almost 50% medicolegal cases were recovered by police from the forest, barren land and farm; and 25% were retrieved from water bodies like lake, river, well, canal, septic tank and water tank. Anatomical examination report also provides confirmative information regarding age, sex, source, stature, injury, etc. Considering police papers and anatomical report of each medicolegal case, present study is conducted with a view to find out any disparity of anatomical opinion from the police history.

The percentage of disparity with respect to source, sex and age is calculated as follows:

$$\% \text{ of Disparity} = \frac{\text{Difference between anatomical opinion and police history}}{\text{Total number of particular cases}} \times 100$$

3. Results:

The body was usually found to be complete (21.09%) followed by partial (9.77%). The body was found in parts in 8.59% medicolegal cases (**Fig. 1**). The complete skeleton was recovered in 11.72% cases, but the remains in the form of dry, wet or separated bones were recovered in 41.02% cases. Only a piece of bone was available for anatomical opinion in 7.81% medicolegal cases. Thus, the bones were only available in 60% medicolegal cases referred by the investigating officer for anatomical opinion.

Fig 1: Distribution according to condition of body for anatomical examination.

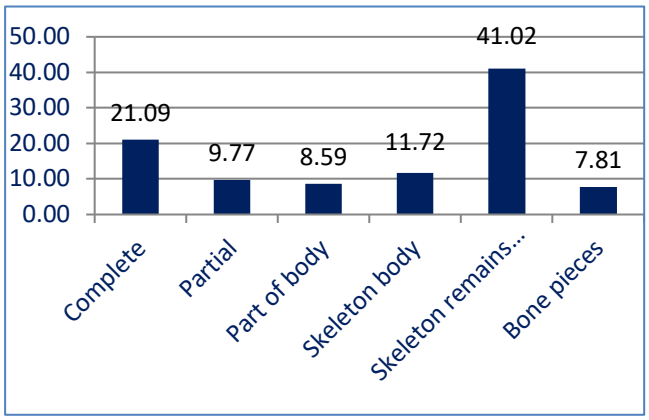


Fig 2 shows the distribution of source/ origin of medicolegal cases whether human or animal origin. After the anatomical opinion, 91.02% medicolegal cases belonged to human origin and 1.56% cases belonged to animal source. The source of skeletal remains was not known in 7.42% cases, mostly in burnt bone pieces. Thus, the disparity between anatomical opinion and police history was noted in 23 medicolegal cases (8.98%).

Fig 2: Distribution of source of medicolegal cases.

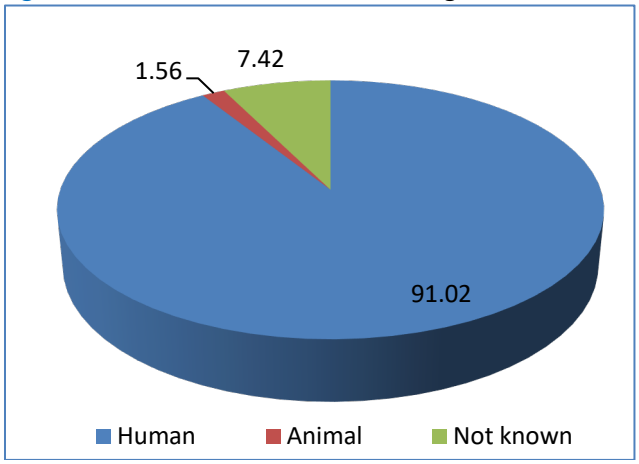


Table 1: Distribution of cases in relation to opinion for sex determination asked by police

Opinion for sex determination	Number	%
Asked by police	212	82.81
Not asked by police	44	17.19
Total	256	100.00

As per **table 1**, the anatomical opinion for sex determination was not asked by police in 17.19% (44 cases), as it was known and not required to confirm by the police due to availability of complete body and other evidence. Thus, as per **table 2**, the gender was confirmed as either male or female in 78.77% cases as per anatomical examination of bone from the

remaining 212 medicolegal cases. But, in 1.89% cases, the bones were turned out to be animal bones. However, in 71 medicolegal cases where the gender was not known as per police history, 41 turned out to be male and 8 females. The disparity between anatomical opinion and police history in male was found in 13.54% and in female in 35.56% cases. Thus, the overall disparity of opinion between anatomical opinion and police history in gender was observed in 20.56% out of 141 medicolegal cases.

As shown in **table 3**, the opinion about age was not asked in 26 cases (10.16%) as the body was identified beyond doubt by the relatives of the deceased. Out of the remaining 230 medicolegal cases for bone examination, the anatomical opinion about age was given in 88.69% cases. It was consistent with the police history in 63.91% cases and not consistent in 24.78% cases; and in four cases (1.74%), the bones were found to be of animal origin.

Table 2: Distribution of medicolegal cases for sex disparity from anatomical examination of bone (n=212).

As per police history		As per anatomical examination of bone				Disparity	
Gender	Number	Male	Female	Not known	Animal	Number	%
Male	96	83	1	10	2	13	13.54
Female	45	5	29	11	0	16	35.56
Not known	71	41	8	20	2	-	-
Total	212	129	38	41	4	29	-
%	-	60.85	17.92	19.34	1.89	20.56	-

Table 3: Distribution according to opinion of age asked by police or not.

Opinion of age	Number	%
Asked by police	230	89.94
Not asked by police	26	10.16

Table 4: Distribution of disparity about age opinion.

Anatomical opinion about age	Number	%
Consistence with police history	147	63.91
Not consistence with police history	57	24.78
Not known	22	9.57
Animal	4	1.74
Total	230	100.00
Disparity	61	26.52

Thus, the disparity of opinion of age between anatomical opinion and police history was noticed in 26.52% medicolegal cases. (**Table 4**).

4. Discussion:

It is always a challenging task for the forensic and anatomy experts to give opinion in medicolegal case with respect to identification and cause of death from the skeletal remains. The Supreme Court of India has directed that the decomposed dead body should be referred to anatomy expert, especially when the bones of dead body are fallen out and are separated.[4] In such cases, it is incumbent upon the doctor to have referred the matter to anatomy expert for skeletal identification, and failure of which is a serious lacuna to the prosecution case.[4,5] In the present study, in almost 60% medicolegal cases, only the bones/ skeleton were available for anatomical opinion with bone pieces in 7.81% cases. In such cases, opinion about the identity is usually requisitioned by the investigation agencies. It is purely given on the basis of bone examination after maceration by means of reconstructive identification like age, sex, stature, etc.[2]

In the present study, the bones were predominantly of human source with only 1.56% cases belonged to animal source as per anatomical opinion. In 7.42% cases, the source was not known even after anatomical examination due to small insufficient and charred bone pieces available for the opinion. Thus, the disparity of opinion was noted in 8.98% cases. The findings could not be compared as no such studies had been done earlier.

The opinion regarding age and sex from the anatomical examination of bone was not asked by the investigation officer in almost 10.16% and 17.19% cases respectively. The gender was confirmed as either male or female in 78.77% cases from bone examination with disparity of opinion between anatomical examination and police history in 20.56% medicolegal cases. Similarly, the anatomical opinion regarding age from bone examination was given in 88.69% with disparity of opinion between anatomical examination and police history in 26.52% medicolegal cases. These findings could not be compared as no similar studies had been carried out previously.

5. Conclusions:

Anatomical examination of bone is a special type of examination carried out to confirm the identity of the deceased in disputed medicolegal case. The disparity between anatomical opinion and police history was noted in 8.98% in source, 20.56% in gender and 26.52% in age opinion. Hence, anatomical examination of bones plays an important role in the further investigation of the case and it gives direction to the investigation agencies in disputed cases.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. Pawar SD, Dhapate SS. Examination of recovered human remains: Role of anatomist. J Medicolegal Association of Maharashtra. 2003; 14: 8-9.
2. Ambade HV, Kasote AP, Fulpatil MP, Meshram MM. Medicolegal cases for bone examination: 11-year retrospective study. J Indian Acad Forensic Med. 2018; 40(1): 102-6.
3. Government Resolution No. CRA-697 dated 6 Feb 1998, Home department, Government of Maharashtra regarding authorization of centers for bone examination.
4. Supreme Court in AIR 1975 SC 258: 1975 Cri LJ 282, State of Punjab v Bhajansingh – Supreme Court, India.
5. Bhanwar Singh v State of Rajasthan, 1988 Cri LJ 1054 –Rajasthan High Court, India.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Injuries in Riders and Pillion Riders of Fatal Two Wheeler Road Traffic Accidents in Raichur, Karnataka

Sidramappa Gouda[a], Gopinath M[b], Sharanabasavappa Karaddi[c]*, Suraj[b]

[a]Associate Professor, [b]Assistant Professor; Department of Forensic Medicine, Navodaya Medical College, Raichur. Karnataka, India. [c]Associate Professor, Department of Forensic Medicine, Raichur Institute of Medical Sciences, Raichur, Karnataka, India.

Article Info

Received on: 04.10.2021
Accepted on: 15.05.2022

Key words
Road traffic accidents,
Two-wheeler,
Pillion rider,
Rider.

Abstract

Background: As two-wheelers have become more popular in the absence of public transport, the number of road accidents is also growing. This has become a major issue and an epidemiological concern. **Materials and methods:** A retrospective study was conducted to include all deaths due to two-wheeler accidents involving riders and pillion riders from 1.1.2017 to 31.12.2019. A pretested Performa was used to determine the nature of the incident and the type of vehicle involved. In all 267 cases, autopsy findings were recorded and analyzed. **Results:** Fatal two-wheeler accidents constituted about 71.58% of total fatal road traffic accidents (RTA) during these three years, and 52.80% of them occurred between 6PM and 12PM. The majority of them were between the ages of 21 and 30. Abrasion in the upper limb, contusion and laceration on the head were the most common injuries documented. 59 (39.3%) and 78 (66.6%) of the fatalities were due to skull fractures among riders and pillion riders, respectively. Laceration of the brain was the most common injury found among all internal organ injuries. **Conclusion**: Around three-fourths of the RTA's were two-wheeler accidents. Strict enforcement of laws, improving the roads, and strengthening health care facilities will reduce two-wheeler RTA's.

1. Introduction

Two-wheeler riders' deaths in crashes have more than doubled in a decade, between 2009 and 2019, as these vehicles with the least protective features for occupants have become more popular as they are the most affordable and easiest mode of transport. The trend is almost similar in the case of occupants of cars and jeeps, though the numbers are much bigger in the case of two-wheeler occupants. The comparative analysis of the 10 years data of the National Crime Record Bureau (NCRB) shows that the share of two-wheeler occupants deaths has increased on a year-on-year basis.[1]

Rising fuel prices have also forced people to use two-wheel-drive vehicles as a means of transportation, after which accidents involving two-wheeled vehicles have become commonplace. At least 20 people sustained non-fatal injuries for each person who died in a street traffic crash. These accidents may have had a sizable impact on

How to cite this article: Gouda S, Gopinath M, Karaddi S, Suraj. Injuries in Riders and Pillion Riders of Fatal Two Wheeler Road Traffic Accidents in Raichur, Karnataka. J For Med Sci Law 2022;31(2):15-18.

*Corresponding author: Dr.Sharanabasavappa Karaddi, Associate Professor, Department of Forensic Medicine, Raichur Institute of Medical Sciences, Raichur, Karnataka, India. Email id: sharankaraddi@rediffmail.com

lifestyles and frequently entail tremendous economic fees.[2] This paper aims to examine a pattern of critical street accidents involving two-wheeler riders and pillion riders so that it will offer more current records on extreme bike injuries in terms of crash configurations and injury causes.

2. Materials and methods:

A retrospective study was conducted in the Department of Forensic Medicine, Navodaya Medical College and Hospital, Raichur. After getting permission from the head of the institute and approval from the Ethical Committee, RIMS, Raichur, all the autopsies conducted from 1st January 2017 to 31st December 2019 at RIMS mortuary were analysed. Out of 1028 autopsies conducted during this 3-year study period, 417 (40.56%) were due to road traffic accidents, out of which 267 (25.97%) were two-wheeler accidents. Data was collected from 267 autopsy reports and analysed. Autopsies where the nature of the incident could not be ascertained were excluded. A copy of the inquest report was used to extract information regarding the nature of the incident and the type of vehicle involved in the accident.

The data was tabulated and analyzed using Microsoft Excel. Frequencies and percentages were calculated for all the variables separately for riders and pillion riders.

3. Results:

Out of the total 1028 autopsies conducted during the study period, road traffic accidents constituted 417(40.56%). Of these, 267 cases (25.97%) involved two-wheeler riders and pillion riders. Fatal riders constituted 150(56.17%) while rest 117(43.82%) victims were pillion riders. Male victims (70.41%) outnumbered females (29.58%) in both groups. Majority of victims were from age group 21–30 years (34.08%) (**Table 1**).

Table 1: Gender and age distribution of two-wheeler road traffic accidents. (n=267)

Variable	Riders	Pillion riders	Total
Gender			
Males	119	69	188 (70.41%)
Females	31	48	79(29.58)
Age			
00 - 10	0	09	09 (3.37%)
11 – 20	17	13	30 (11.23%)
21 – 30	58	33	91 (34.08%)
31 - 40	28	13	41 (15.35%)
41 – 50	25	18	43 (16.10%)
51 - 60	13	17	30 (11.23%)
61 – 70	07	09	16 (5.99%)
71 – 80	02	05	07 (2.62%)
81 - 90	00	00	00
Total	150	117	267 (100)

Majority of two-wheeler accidents 125(46.81%) occurred in rainy season followed by winter season 81(30.33%). Most of the 2-wheeler lethal accidents 141(52.80%) occurred between 6 pm to 12 pm as shown in **Table 2.**

Table 2: Distribution of two-wheeler road traffic accidents according to season and timing. (n=267).

Season	Riders	Pillion riders	Total
Summer	30	31	61(22.84%)
Rainy	72	53	125(46.81%)
Winter	48	33	81(30.33%)
Timing			
12 AM – 06 AM	11	07	18(06.74%)
06 AM – 12 PM	23	38	61(22.84%)
12 PM – 06 PM	38	09	47(17.60%)
06 PM – 12 PM	78	63	141(52.80%)

Table 3: Showing external injuries among riders and pillion riders. (n=267).

Parts involved	Abrasion		Contusion		Laceration	
	Riders	Pillion riders	Riders	Pillion riders	Riders	Pillion riders
Head	15(10%)	14(11.9%)	61(40.6%)	53(45.2%)	33(22%)	29(24.7%)
Face	33(22%)	35(29.9%)	18(12%)	13(11.1%)	51(34%)	29(24.7%)
Neck	12(08%)	04(03.4%)	03(02%)	02(01.7%)	04(02.6%)	03(02.5%)
Chest	49(32.6%)	41(35.04%)	51(34%)	26(22.2%)	07(04.6%)	02(01.7%)
Abdomen	21(14%)	28(23.9%)	13(08.6%)	08(06.8%)	06(04%)	05(04.2%)
Upper limb	55(36.6%)	67(57.2%)	09(06%)	08(06.8%)	13(08.6%)	11(09.4%)
Lower limb	49(32.6%)	45(38.4%)	05(03.3%)	07(05.9%)	24(16%)	29(24.7%)

Contusion and laceration over the head and abrasion over upper limb was common external injury sustained in both groups (**Table 3**).

Majority of the deceased had lethal skull bone fracture among both riders and pillion riders (**Table 4**) Most of the cases of riders and pillion rider's brain

was commonly injured internal viscera followed by spleen (**Table 5**).

4. Discussion:

Two-wheeler accidents accounted for 25.97% (267 cases) of those killed in road accidents. Similar findings were seen in a study conducted by Devi *et al*.[3.] Most fatal riders and pillion riders were from the age group of 21–30 years (34.08%), similar to the findings of Devi *et al.* and Ghosh.[4], As this age group leads an active and adventurous lifestyle with more mobility, they frequently expose themselves to traffic hazards. Our study found a male to female ratio of 2.3: 1, which differs from the results of Salgado and Colombage[5], Adeyemo et al[6] (4.43:1), and Devi et al[3] (9.2:1). outdoor activities of females in this competitive world could be a reason for an increase in female fatalities due to traffic accidents. Peak two-wheeler fatal road accidents were in the rainy season, 125 (46.781%), which was similar to the study by Kumar *et al.*[7]

Table 4: Showings fractures among riders and pillion riders. (n=267).

Body parts	Riders	Pillion riders
Skull	59(39.3%)	78(66.6%)
Face	31(20.6%)	23(19.6%)
Neck	01(00.6%)	02(01.7%)
Thorax	48(32.0%)	21(17.9%)
Pelvis	21(14.0%)	06(05.1%)
Upper limb	13(08.6%)	03(02.5%)
Lower limb	33(22.0%)	11(09.4%)

Table 5: Showing injuries to the organs among riders and pillion riders. (n=267).

Viscera	Riders		Pillion riders	
	Contusion	Laceration	Contusion	Laceration
Brain	23(15.3%)	48(32%)	15(12.8%)	61(52.1%)
Lungs	30(20%)	44(29.3%)	13(11.1%)	18(15.3%)
Pleura	05(03.3%)	44(29.3%)	08(06.8%)	20(17%)
Heart	05(03.3%)	04(02.6%)	03(02.5%)	09(07.6%)
Pericardium	04(02.6%)	05(03.3%)	04(03.4%)	12(10.2%)
Great vessels	03(02%)	13(08.6%)	05(04.2%)	17(14.5%)
GI Track	07(04.6%)	03(02%)	04(03.4%)	21(17.9%)
Liver	13(08.6%)	38(25.3%)	08(06.8%)	31(26.4%)
Spleen	09(06%)	43(28.6%)	06(05.1%)	33(28.2%)
Mesentery	06(04%)	23(15.3%)	07(05.9%)	16(13.6%)
Kidney	13(08.6%)	09(06%)	15(12.8%)	07(05.9%)
Urinary bladder	02(01.3%)	11(07.3%)	01(0.8%)	07(05.9%)

This was in contrast to a study by Bairagi *et al.,*[8] who found the majority of the two-wheeler RTAs were in the spring season. Increased alcohol consumption, overcrowding on the streets, and rash driving on damaged and poorly maintained roads in the rainy season may be the causes of leading fatalities this season. Most two-wheeler accidents occurred between 6 p.m. and 12 p.m., accounting for 141 cases (52.80%). This may be due to inefficient lighting, traffic congestion, many people returning home from work in the evening, drinking alcohol in the middle of the night, etc. These results are consistent with Sevit S [9] and Kumar A et al.[7]

Fracture of the skull was most commonly seen in riders 59 (39.3%) and pillion riders 78 (66.6%) of all motorcycle fatal accidents, which was similar to the study results of Devi *et al.* [3] A study conducted by Arun Prakash et al.[10] found that head and neck injuries were more common among two-wheeler riders. Another study conducted by Brinda and Ranjan also showed similar findings.[11]

Wearing helmets might have prevented skull fracture and fatality in riders, a practice rarely practiced by pillion riders, thus predisposing them to more head injuries. Lower limb bones fracture was commonly seen in riders 33(22.0%) followed by skull fracture. Our study showed that, among all internal organs, brain laceration was the most common injury, involving 48 cases (32%) of riders and 61 cases (52.1%) of pillion riders. Again, not following the traffic rules and not wearing protective headgear while riding a 2-wheeler can be an important cause of these fatalities involving laceration of the brain.

5. Conclusion

Around three-fourth of the RTA's were two-wheeler accidents. Among them, more than half were fatal riders and remaining were among pillion riders. Majority of them had skull fractures and brain was the most common internal organ involved during RTA.

Recommendations:

1. Strict enforcement of laws requiring riders and pillion riders to wear protective head gears are mandatory for two-wheeler drivers.
2. Proper setting and enforcement of speed limits on roads.
3. Making compulsion of having day time running lights for two-wheeler by manufacturing company.
4. Managing existing road infrastructure to promote safety, through provision of safer routes for pedestrians and cyclists.
5. Health facilities should be strengthened to decrease the road traffic fatalities.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. The times of India. Two-wheeler crash deaths more than double in a decade.2020. [Cited 25th January 2022]. Available from: https://timesofindia.indiatimes.com/india/two-wheeler-crash-deaths-more-than-double-in-a-decade/articleshow/77923795.cms
2. World Health Organization. Global status report on road safety 2015. World Health Organization; 2015 Dec 17. [Cited 20th January 2022]. Available from: https://books.google.co.in/books?hl=en&lr=&id=wV40DgAAQBAJ&oi=fnd&pg=PP1&dq=WHO+World+Health+Organization,+Global+status+report+on+road+safety,+2015+Switzerland.&ots=DKXxDXfXvg&sig=kRzEAP0-1pEqcjOqn7Rj5HxaU2M&redir_esc=y#v=onepage&q=WHO%20World%20Health%20Organization%2C%20Global%20status%20report%20on%20road%20safety%2C%202015%20Switzerland.&f=false
3. Devi TM, Momonchand A, Fimate L. Pattern of injuries in two-wheeler fatal road traffic accidents. Journal of Medical Society RIMS, Imphal.1998;12:33-6.
4. Ghosh PK. "A critical observation from the pattern of injury vis-à-vis vehicle and the road users in the city of Delhi" a scientific article XIV annual conference (10-1-92 to 12- 01-92) of Indian Association of Forensic Medicine.
5. Salgado MSL, Colombage SM. Analysis of fatalities in road accidents. Forensic Sci Int. 1988;36: 91-6.
6. Adeyemo AO, Arigbabu AO, Adejuyibde O. Thoracic injuries in road traffic accidents: analysis of 148 cases. Injury.1984; 14(1): 30-4.
7. Kumar A, Qureshi GU, Aggarwal A, Pandey DN. Profile of thoracic injuries with special reference to road traffic accidents in Agra. J Indian Acad Forensic Med .1999; 21(4): 104-9.
8. Bairagi KK, Barbhuiyan SI, Hazarika N. Injuries in riders and pillion riders of fatal two-wheeler road traffic accidents in city of Guwahati. Indian J Forensic Med Toxicol.2010;4(2):25-7.
9. Sevitt S. Fatal Road accidents in Birmingham, time to death and their causes. Injury: The British Journal of Accident Surgery. 1973;4(4):281-93.
10. Arun Prakash KS, Sanjeev K, Gambhir Singh O. Prospective Studies on Pattern of Two-Wheeler Injuries in Road Traffic Accidents. Medico-legal Update.2021;21(1):82-6.
11. Patel B, Parashar R. Study of pattern of injuries sustained by two-wheeler drivers in a tertiary care hospital of Bhopal city. IP Int J Forensic Med Toxicol Sci.2020;5(3):95-8.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Autopsy-Based Demographical Profile of Hanging Victims In A Rural Area Of Central India.

Sharjeel Khan[a], Biyabani Naushad Husain[b], Shadma Quazi[c]*, B.H. Tirpude[d]

[a]Assistant Professor, Dept. of Forensic Medicine, NKP Salve Institute of Medical Sciences & RC and LMH, Hingna, Nagpur, Maharashtra, India. [b]Assistant Professor, Dept. of Forensic Medicine, American International Institute of Medical Sciences, Transport Nagar, Udaipur, Rajasthan, India. [c]Assistant Professor Dept. of Pharmacology, NKP Salve Institute of Medical Sciences & RC and LMH, Hingna, Nagpur Maharashtra, India. [d]Director Professor & HOD, Dept. of Forensic Medicine, Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha, Maharashtra, India.

Article Info

Received on: 28.03.2022
Accepted on: 15.06.2022

Key words
Hanging,
Ligature material,
Complete hanging,
Degree of suspension.

Abstract

Background: Hanging has been used as the most common suicidal method for centuries old. Typically, all hanging cases are suicidal. Accidental hanging is uncommon and homicidal cases are rare. **Materials and methods:** The present study was carried out at the autopsy centre of a rural medical college in India from 01/08/2011 to 31/07/2017 in which 101 cases of hanging were autopsied. **Results:** The most commonly adopted method was complete hanging in 77 (76.23%) cases and in 24 (23.76%) cases it was partial hanging. In the majority of victims 41 (40.59%) cases, the nylon rope was used as ligature material, in 24 (23.76%) cases the ligature material was not made available for examination, in 12 (11.88%) cases "Dupatta" was being used, in 8 (7.92%) cases, rope other than nylon rope was used, in 6 (5.94%) cases, the saree was used while the cable wire was used in 1 case (0.99%) and metallic wire in 3 (2.97%) cases. The piece of cloth and "Gamaccha (Turban)" was used as a ligature material in 2 (1.98%) and 3 (2.97%) cases respectively. **Conclusion**: The most common ligature material used for the hanging is nylon rope and the complete hanging method is commonly used for suspension by the victims.

1. Introduction

The term asphyxia is better characterized to be caused by breath interference or lack of breathable oxygen or inability to extract carbon dioxide during breathing, which leads to oxygen deprivation or unconsciousness or death of tissues and organs. The asphyxial deaths constitute a large number of medicolegal cases that are subjected to medicolegal autopsies. Asphyxial death in forensic autopsy procedures is a common occurrence and it is very important in such cases to determine the reason behind death. The state of Maharashtra recorded a significant number of 16,970 (12.7%) suicides in the year 2015. Hanging was the adopted method in 60,952 (45.6%) cases followed by poiso-

How to cite this article: Khan S, Husain BN, Quazi S, B.H. Tirpude BH. Autopsy-Based Demographical Profile of Hanging Victims In A Rural Area of Central India. J For Med Sci Law 2022;31(2):19-22.

***Corresponding author:** Dr Shadma Quazi, Assistant Professor, Department of Pharmacology, NKP Salve Institute of Medical Sciences & RC and LMH, Hingna, Nagpur Maharashtra, India. Email: shar4041@gmail.com

ning in 37,232 (27.9%). [1] As per the ICD classification and related health problems, suicides by hanging are included under code X70 which is intentional self-harm by hanging, strangulation and suffocation.[2] Typical or atypical hanging can be according to the ligature mark features. Based on the degree of suspension, it may be total or partial. When the body is suspended completely and any part of the body does not touch the ground, it is considered a full suspension and if any portion of the body touches the ground then the partial suspension is considered.[3]

For cases of judicial hanging, the trend for neck injury varies from that of suicidal hanging. In hanging accidental autoerotic deaths rarely occur. Irrespective of the noose material, the hanging destroys its victims in three ways: carotid arteries compression, jugular veins compression and airway compression.[4, 5] The carotid artery gets compressed by a pressure of 5 kg; for the jugular veins it is 2 kg and for the airway at least 15 kg of pressure is needed.[6] The ligature mark is a dynamic confirmation of deaths due to hanging. The source of the ligature mark with its direction helps in differentiating the death as being due to hanging or strangulation. An inverted mark as V-shaped is seen in cases of hanging. Occasionally the tongue is protruded due to jaw pressure resulting in a dry and desiccated appearance.[3] In hanging, the ligature mark is commonly located above the thyroid cartilage and compresses the internal structures of the neck. The injury to the various internal structures of the neck depends on the ligature material nature, the weight of the body and the time period of suspension.[3]

Aims and objectives

1. To assess the cases of hanging considering the suspension method adopted for hanging in rural areas.
2. To determine the commonly used ligature material for suspension in rural areas.

2. Materials and methods

It is a retrospective cross-sectional study, conducted on either sex with the deceased being brought for medico-legal autopsy examination with hanging as the suspected cause of death in the inquest panchanama and the history given by the relatives. The autopsy was conducted at a rural medical college in central India from 01/08/2011 to 31/07/2017. A total number of 101 cases was included in the study. All the autopsied cases of death due to hanging were included in the study. All the other violent forms of asphyxial death and the bodies in an advanced stage of decomposition were excluded from the study. The informed consent was obtained from the relatives of the deceased. The related data in the form of history given by the relatives, from the inquest conducted by police, crime scene examination and photographs along with post-mortem examination report were included in the study. The statistical analysis was done using SPSS and the diagrams and tables are prepared using windows 10.

3. Observations and results

It is a cross-sectional study design with 101 hanging cases carried over the duration of six-year. The autopsy cases of hanging are being investigated. The autopsied cases were selected precisely according to the purpose of the analysis, and inclusion and exclusion criteria.

Table no.1: Hanging cases considering the method adopted (Complete or Partial).

Degree of suspension	No. of cases (n=101)	Percentage
Complete	77	76.23
Partial	24	23.76
Total	101	100

Out of the 101 cases, the most common method adopted was complete hanging in 77 (76.23%) cases and in 24 (23.76%) cases the method adopted was partial hanging (Table 1).

Table no.2: Hanging cases considering the nature of the material of ligature used.

Nature of ligature material	No. of cases (n=101)	Percentage
Cable wire	01	0.99
Metallic wire	03	2.97
Dupatta	12	11.88
Gamaccha	03	2.97
Cloth	03	2.97
Nylon rope	41	40.59
Rope	08	7.92
Saree	06	5.94
Not available	24	23.76
Total	101	100

Of the 101 cases, in the 41 (40.59%) cases, the nylon rope was used as ligature material, in 24 (23.76%) cases the ligature material was not made available for examination, in 12 (11.88%) cases “Dupatta” was being used, in 8 (7.92%) cases, rope other than nylon rope was used, in 6 (5.94%) cases, the saree was used while the cable wire was used in 1 case (0.99%) and metallic wire in 3 (2.97%) cases. The piece of cloth

and "Gamaccha (Turban)" was used in 2 (1.98%) and 3 (2.97%) cases respectively as a ligature material(**Table 2**).

4. Discussion

4.1. Hanging cases considering the method adopted (Complete or Partial)

The most common method adopted was complete hanging in 76.23% of cases i.e. the feet or any part of the body doesn't touch the ground, while in 23.76% of cases, adopted the partial hanging method i.e. feet or any part of the body touches the ground. The above parameters indicate that majority of victims adopted a complete hanging method.

The findings of our study correlate with the study by authors Rao D[7], Samanta AK et al [8], Ambade VN et al[9], Sharma BR et al[10], K Jyothi Prasad et al [11]. The findings might be due to the underlying fact as the houses build up in this area are with the structure and pattern in the form of small conical huts having the main wooden rafter inside the house bearing the weight of the whole house, generally situated at the height of about 12 feet from the ground surface without having any suspended ceiling fans. Such a structure is so build-up to keep the house cool and protects oneself from the scorching heat of the sun. As in this tropical area, in the summer season, the maximum temperature rises to 45-48 degrees centigrade. Considering this high point of suspension, cases of complete hanging are more commonly seen than cases of partial hanging.

Our study findings are in contrast to that of Pradhan A et al[12] in Nepal where he had found that about 56.81% of victims adopted the partial hanging method which is in contrast to our percentage of 26.73%. The above-said author from Nepal had discussed the point of complete and partial hangings in relation to the medicolegal aspect of hanging i.e.to differentiating the case whether it is hanging or strangulation. The above point is not considered a relevant aspect in our present observational point and it is a separately discussed topic.

4.2. Hanging cases considering the nature of the material of ligature used

Out of the101 cases, the use of nylon rope as a ligature material was observed in the majority of victims (40.59%) while in 24.75% of cases, the ligature material was not made available for examination. In 11.88% of cases "Dupatta" was being used; in 7.92% rope other than nylon rope was used, in 5.94%, the saree was used while the cable wire was used in 0.99% cases and the metallic wire in 2.97% cases. The piece of cloth was used in 1.98% and "Gamaccha (Turban)" was used in 2.97% of cases as a ligature material.

The findings of our study are consistent with the study done by authors Pal S K et al [13], Singh Pradipkumar K H et al [14], Bhosle S H et al [15] and Sahoo N et al [16]. The fact that the nylon rope is an inexpensive, readily available material for ligature and is being used frequently by farmers (which is a predominant population in the study area) as a means of daily use in various day-to-day activities, for farming, tying the animals in the cattle shed adjacent to the house and for stacking. It is also a household commodity used in rural areas for day-to-day activities.

Our study findings are in contrast with that by Rao Dinesh[7] where the stole was used in 29.92% of cases, Najan BA et al [17] where the chunni was used in 37.70% of cases, Udhayabanu R et al[18] where the synthetic saree was used in 47.74% of cases, Chandegara PK, et al [19] where the "Dupatta" was used in 41.4% of cases, Das TK et al [20] where the soft material was used in 54.74% of cases.

The reason might be the fact that in hanging, the condition of the victim is very stressful and there is the presence of impulsive nature and in such conditions, the victim uses any kind of material easily available at hand like "saree", "dupatta", "chunni", electric wire, cable wire, rope or a piece of cloth, "Gamaccha (Turban)" as a ligature material.

5. Conclusion

It can be inferred that the most common ligature material used for the hanging is nylon rope and the complete hanging method is commonly used for suspension by the victims. The commonly available household material or any material available at the scene of the crime that can be turned into a ligature is frequently used for hanging due to the underlying emotional stress.

The victim is completely determined to end life by hanging. Moreover, the victim adopts the complete method of hanging as the houses are built in the rural area in such a way that the ligature material can only be tied at a particular height due to which the body parts do not touch the ground.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.
Source of funding: None to declare.

References

1. National crime records Bureau, Ministry of home affairs, Government of India, New Delhi. Accidental deaths and suicide in India 2015. [Cited 20th November 2021]. Available from: http://ncrb.gov.in
2. X70: Intentional self-harm by hanging, strangulation and suffocation: ICD (10):2007 version.
3. Modi JP. Deaths from asphyxia. In: Mathiharan K, Patnaik A, editors. Medical jurisprudence and Toxicology. 23rd edition. New Delhi, India: Lexis Nexis Butterworths; 2006:565-90.
4. Riviello R. Manual of Forensic Emergency Medicine: A guide for clinicians. Sudbury, United States: Jones and Bartlet learning; 2010.pp.15-7.
5. Berman AL, Silverman MM, Bongar BM. Comprehensive Textbook of Suicidology. New York: The Guilford Press; 2000. Pp.302-3.
6. Adams, Nick "Near hanging". Emergency Medicine Australasia. 1999; 11: 17-21. Doi:10.1046/j.1442-2026.1999.00314. x.
7. Rao D. An autopsy study of death duet to suicidal hanging- 264 cases. Egypt J Forensic Sci. 2016; 6: 248-254.
8. Samanta AK, Nayak RS. Newer trends in hanging death. JIAFM. 2012; 34(1): 37-9.
9. Ambade VN, Kolpe D, Tumram N, Meshram S, Pawar M, Kukde H. Characteristic Features of Hanging: A Study in Rural District of Central India. J Forensic Sci. 2015; 60(5): 1217-22.
10. Sharma BR, Harish D, Sharma A, Sharma S, Singh H. Injuries to neck structures in deaths due to constriction of neck, with a special reference to hanging. J Forensic Leg Med.2008; 15:298-305.
11. Jyothi Prasad K, Khalid AM, Khader FN, Narayana LB, Arumalla VK. Ligature Mark in Hanging – Gross and Histopathological Examination with Evaluation and Review. J Addict Depend. 2016; 2(2): 1-7.
12. Pradhan A, Mandal BK, Tripathi CB "Hanging: nature of ligature material applied and type of hanging according to point of suspension" Nepal Med College J (2012); 14(2): 103-106.
13. Pal SK, Sharma A, Sehgal A, Kaushik N, Rana A. Hanging suicides in Himachal Pradesh: An analysis of Forensic Cases. Int J Forensic Sci Pathol. 2016; 4 (11): 297-304.
14. Singh PKH, Aelifeter MR, Meera TH. Multifactorial analysis of hanging deaths. J Med Soc. 2013; 27(1): 49-51.
15. Bhosle SH, Batra AK, Kuchewar SV. Violent asphyxia death due to hanging: a prospective study. J Forensic Med. Sci. Law.2014; 23(1): 1-8.
16. Sahoo N, Kumar N, Panda BB, Datta A. Significance of external findings in hanging cases during autopsy. IJBAR.2016; 7(3): 119-22.
17. Najan BA, Chinchole BS, Banerjee KK, Kohli A. Pattern of external and internal findings in deaths owing to Hanging- a study in northeast Delhi. Int J Med Sci Public Health. 2015; 4(11): 1536-9.
18. Udhayabanu R, Toshi S, Baskar R. Study of hanging cases in Pondicherry region. IOSR- JDMS. 2015; 4 (7): 41-4.
19. Chandegara P, Patel J, Zanzrukiya K, Patel U, Parkhe S, Gajera C et al. Socio-Demographic profile of hanging cases at New Civil Hospital, Surat. Int J Med Sci Public Health. 2014; 3(12): 1474-7.
20. Das TK, Pathak NM, Gogoi RK. Hanging cases in AMCH mortuary, Dibrugarh, Assam- Two years' study. J. Evolution Med. Dent. Sci. 2017; 6(51):3882-4.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Mandibular Canine Index : A Tool For Sexual Dimorphism.

Nitin S Barmate[a], Vinod Bhalerao[b]*, Sarah Al Hinawi[c], Prerna Sahare[d]

[a]Professor, Dept. Forensic Medicine, Shri Shankaracharya Institute of Medical Sciences, Bhilai, Chhattisgarh, India. [b]Assistant Professor, Dept. Forensic Medicine, Govt. Medical College, Chindwada (MP), India. [c]Assistant Professor, Dept. Forensic Medicine, HBT Medical College, Juhu, Mumbai, Maharashtra, India. [d]Dental Surgeon, Maharashtra, India.

Article Info

Received on: 29.12.2021
Accepted on: 10.04.2022

Key words
Mesiodistal widths,
Inter-canine distance,
Mandibular Canine Index,
Sexual dimorphism.

Abstract

Background: Gender estimation is an important aspect of personal identification and, has an immense forensic relevance. The mandibular canines have a mean age of eruption of 10.87 years and are lest affected than other teeth by periodontal diseases. Mandibular canines to exhibit the greatest sexual dimorphism among all teeth. **Materials and methods:** Total 91 subjects including 2nd year MBBS students were studied out, of which 49 were male and 42 were female. **Results:** All the male and female students were 18 - 21 yrs. Mesiodistal widths of right and left mandibular and maxillary canines were measured intraorally with the help of digital vernier caliper accurate to 0.1 mm along with Inter-canine distance or width. **Conclusion**: The mesiodistal width of mandibular canines significantly greater in males than females and Standard canine Index for right and left mandible can be used as a tool for sex prediction.

1. Introduction

Gender estimation is an important aspect of personal identification and, has an immense forensic relevance.[1] Teeth are the hardest and chemically most stable tissues in the body which exhibit the least turnover of natural structure. They can be selectively preserved and fossilized, thereby providing the best evidence for evolutionary change. Their resilience in the case of fire and bacterial decomposition makes them important for identification in forensic science.[2]

In the human dentition off all the teeth, the canines are the least frequently extracted teeth because of the decreased incidence of caries and periodontal disease. Furthermore, canines are reported to withstand extreme conditions and have been recovered from human remains even in air disasters and hurricanes.[2] The mandibular canines have a mean age of eruption of 10.87 years and are lest affected than other teeth by periodontal diseases. These are the last teeth to be extracted with respect to age. These findings indicate that mandibular canines can be considered as the 'key teeth' for personal identification also the tooth size standards based on odontometric investigations can be used in age and sex determination.[3] Mandibular canines to exhibit the greatest sexual dimorphism among all teeth.[2] Whenever it is possible to predict the sex, identification is simplified as it leads to consideration of one sex of missing persons.

How to cite this article: Barmate NS, Bhalerao V, Sarah Al Hinawi S, Sahare P. Mandibular Canine Index : A Tool For Sexual Dimorphism. J For Med Sci Law 2022;31(2):23-27.

***Corresponding author:** Dr Vinod Bhalerao, Assistant Professor, Dept. Forensic Medicine, Government. Medical College, Chindwada (MP), India. Email: nitinsforensic@gmail.com

of one sex need to be considered. In this sense identification of sex takes precedence over age.[4] In the present study an attempt has been made to establish the sex of a person by using mesio-distal width of canine teeth and the respective inter-canine distances in the central Indian College going youth.

2. Materials and methods:

The study was initiated after the protocol had been approved by the Institutional Ethics Committee, and written informed consents were obtained from all the subjects. In the present study, total 91 subjects were included. Subjects with healthy mandibular canines and periodontium were included in the study. Subjects with dental or occlusal abnormalities (rotation, crowding, occlusal disharmony, etc.), physiologic or pathologic wear and tear (e.g., attrition, abrasion, abfraction, erosion) and deleterious oral habits (like bruxism) were excluded from the study. The maximum mesiodistal widths of right and left mandibular and maxillary canines were first measured intraorally with the help of digital vernier caliper accurate to 0.1 mm. Inter-canine distance or width it was measured as the horizontal distance between the cusp tips of right-side canine to the cusp tip of left side canine. It was again measured with the help of Vernier caliper accurate to 0.1 mm. Statistical analysis was done by using MS Excel & SPSS 16.0 version. Sexual dimorphism in right and left mandibular canines was calculated using the formula given below by Garn and Lewis. [2]

$$\textbf{Sexual dimorphism} = \frac{Xm}{Xf-1} \times 100$$

Where, Xm = Mean value of male canine width,

Xf = Mean value of female canine width.[2]

3. Results:

Total 91 subjects including 2nd year MBBS students were studied out, of which 49 were male and 42 were female. All the male and female students were 18 - 21 yrs.

Table no. 1: Sex wise distribution of mesio-distal crown canine width:

Side	Sex	Mandibular Canine			Maxillary Canine		
		Range	Mean	+ /- SD	Range	Mean	+ /- SD
Right	Male	5.78- 8.18	6.800	0.5127	5.49-8.56	7.297	0.5824
	Female	5.23-7.51	6.379	0.4635	5.97-8.15	7.153	0.618
Left	Male	5.58- 7.92	6.840	0.590	6.07-8.6	7.371	0.4926
	Female	5.37-7.94	6.353	0.5262	5.82-8.79	7.274	0.635

From the **Table No. 1**, It was observed that the mean value of the mesio-distal crown width of right and left mandibular canines and mesio-distal crown width of right and left maxillary canines in males were more than that of female. This value was statistically significant (p< 0.001).

The statistical analysis of the data for sexual dimorphism with mean mesiodistal width of for right and left mandibular and maxillary canine showed, that there were a statistically significant difference of mean mesiodistal width of mandibular and maxillary canine for males and females (P=0.00008).

Table No. 2: Sex wise distribution of intercanine distance:

	Sex	**Intercanine Distance**		
		Range	Mean	+ /- SD
Mandibular	Male	20.29 – 32.6	25.06	2.235
	Female	22.26-36.4	26.78	3.332
Maxillary	Male	30.93- 43.7	35.49	2.516
	Female	26.99-42.11	33.46	2.775

Table No. 2 shows that intercanine distance of male and female in both mandibular and maxillary teeth.

The right mandibular canine index in males ranged from 0.217 to 0.324 with a mean of 0.273 ± 0.0217, while it was ranged from 0.176 to 0.306 with a mean of 0.240 ±0.0263 in females. This was statistically significant (P< 0.001). The left mandibular canine index value in males ranged from 0.202 to 0.356 with a mean of 0.275 ± 0.0279, and in females it was 0.183 to 0.306 with a mean of 0.239 ±0.0266. This was also statistically significant (p <0.001). The right maxillary canine index in males ranged from 0.146 to 0.243 with a mean of 0.206 ± 0.0194, while it was ranged from 0.155 to 0.247 with a mean of 0.214 ±0.0192 in females. This was statistically significant (P< 0.001). The left maxillary canine index value in males ranged from 0.143 to 0.237 with a mean of 0.208 ± 0.0175, and in females it was 0.173 to 0.245 with a mean of 0.218 ±0.0175. This was also statistically significant (p <0.001). Canine index (**Table 3**) given as follows-

$$\textbf{Canine index} = \frac{\text{Mesio - distal crown width of canine}}{\text{Intercanine Distance}}$$

Table No. 3: Canine index:

Side	Sex	Mandibular Canine			Maxillary Canine		
		Range	Mean	+ - SD	Range	Mean	+ - SD
Right	Male	0.217-0.324	0.273	0.0217	0.146-0.243	0.206	0.0194
	Female	0.176-0.306	0.240	0.0263	0.155-0.247	0.214	0.0192
Left	Male	0.202-0.356	0.275	0.0279	0.143-0.237	0.208	0.0175
	Female	0.183-0.306	0.239	0.0266	0.173- 0.245	0.218	0.0175

Standard Canine Index (**table 4**) is given as follows-

$$\text{Standard Canine Index} = \frac{(\text{Mean Male CI} - \text{SD}) + (\text{Mean Female CI} + \text{SD})}{2}$$

Table no. 4: Standard Canine Index

		Value	
Mandibular	Right	(0.252 + 0.266)/2	0.259
	left	(0.248+0.265)/2	0.257
Maxillary	Right	(0.186+0.233)/2	0.209
	left	(0.190+0.235)/2	0.212

The standard canine index for the right and left mandibular canines were 0.259 and 0.257, respectively and for that of right and left maxillary canines were 0.209 and 0.212, respectively.

Table No. 5: Sex Prediction by Mandibular Canine Index

Mandibular Canine Index (Mn CI)	Sex	Case	%
Right Mn CI	Male	40 /49	81.63
	Female	34 /42	82.95
	Total	74 /91	81.31
Left Mn CI	Male	37 /49	75.51
	Female	33 /42	78.57
	Total	70 /91	76.92

Sex predictability using the standard canine index with right mandibular canine index shows that 81.63 % and 82.95 % for male and female respectively. While with left mandibular canine index shows that 75.51 % and 78.57 % for male and female respectively.

Table No. 6: Sex Prediction by Maxillary Canine Index

Maxillary Canine Index (Mx CI)	Sex	Case	%
Right Mx CI	Male	24 /49	48.97
	Female	15 /42	35.71
	Total	39 /91	42.85
Left Mx CI	Male	22/49	44.89
	Female	16 /42	38.09
	Total	38 /91	41.75

Sex predictability using the standard canine index with right and left maxillary canine index below the acceptable level (below 50%) for both male and female.

4. Discussion:

Teeth help to estimate age, determination of sex and race of a person even in decomposed and burnt bodies. Studies on sexual dimorphism provide information about the evolution of a population and for that matter, an individual too.[5]

Canine is one of the most strongest and stable teeth among all other teeth, due to its shape, structure and the length of the root. Also, its position in the mandible and maxilla, and the presence of a single cusp makes it less prone to damage, or cavity formation. Thus, makes the canine teeth even more forensically relevant and being resistant to decay can be used as a forensic tool for the purpose of identification of individuals.[1]

In present study, prediction of sex accurately using the right mandibular canine index was 81.63 % and 82.95 % for male and female respectively with an overall accuracy of 81.31%. This value was comparable and correlated with the study conducted by Kaushal et al on a North Indian population with an accuracy of 75%.[3]

Using the left mandibular canine index, the accuracy of prediction of sex was 75.51 % and 78.57 % for male and female respectively, with an overall accuracy of 76.92% which correlate with the study conducted on a North Indian population by Kaushal et al. with an accuracy of 75%.[3] Similar sex prediction has been reported by Rao NG et al [6] and Yadav S et al [7] for South Indians (82.2%–85.9%), by Mughal IA et al [8] for Punjabi–Pakistani population (76%) and for Egyptians by Hashim HA et al. [9] But studies conducted by Muller et al. on the French population showed a lower sex predictability value (59.57%).[10]

Mandibular canine index are useful parameters in differentiating the sexes. In the present study both these parameters as measured in males

and females were compared and the difference was found to be statistically significant.[3]

In the present study, mean mesiodistal width of right mandibular canine in males was 6.8 +/- 0.512 mm whereas in females it was found to be 6.379 +/- 0.463 mm. and mean mesiodistal width of left mandibular canine in males was 6.84 +/- 0.59 mm whereas in females it was found to be 6.35 +/- 0.526 mm The test of significance applied to the difference showed that there was a statistically significant difference in the mesiodistal width of males and females signifying that the mesiodistal width of canines can be used for determination of sex in individuals. ($P < 0.05$) as shown in Table 1. This was in accordance with the previous studies by Garn *et al*.[11] , Nair *et al*., [12] , Fernandes TM et al [13] , Santoro M et al[14] and P amecha S et al.[15]

Using these two sexual dimorphic characteristics of mandibular canine such as mesiodistal width and intercanine distance, and their range of accuracy suggests that mandibular canine odontometrics should be used as a supplementary method along with the other methods to increase the accuracy of sex identification in unknown body remains.[16]

5. Summary and conclusion:

Present study was conducted on 91 subjects including 2nd year MBBS students of which 49 were male and 42 were female. All the male and female students were 18 - 21 yrs.

From the present study we can conclude that.

1. The mesiodistal width of mandibular canines was significantly greater in males than that of females.
2. Standard canine Index for right and left mandible can be used as a tool for sex prediction.
3. Prediction of sex accurately by using the right mandibular canine index was 81.63 % and 82.95 % for male and female respectively with an overall accuracy of 81.31%.
4. Prediction of sex accurately by using the left mandibular canine index was 75.51 % and 78.57 % for male and female respectively, with an overall accuracy of 76.92%.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. Kalim Z, Tyagi R; Sex Determination Using Canine Dimorphism: Forensic Relevance. J Forensic Sci Crim Investig. 2018; 11 (1): 01-05.
2. Sai kiran Ch.,Khaitan T, Ramaswamy P, Sudhakar S, Smitha B, Uday G. Role of mandibular canines in establishment of gender. Egypt J Forensic Sci. 2014; 4: 71–4.
3. Kaushal S, Patnaik VVG, Agnihotri G. Mandibular Canines in Sex Determination. J Anat. Soc. India. 2003; 52(2):119-124.
4. Gradwohl. Identification by the skeletal structures. In: Camps FE, editor. Legal Medicine. 3rd edn. London: John Wright and Sons; 1976: 110.
5. Bakkannavar SM, Manjunath S, Nayak VC, Kumar GP. Canine index – A tool for sex determination. Egypt J Forensic Sci.2015; 5: 157–61.
6. Rao NG, Rao NN, Pai ML, Kotian MS. Mandibular canine index– a clue for establishing sex identity. Forensic Sci Int. 1989; 42:249–54.
7. Yadav S, Nagabhushana D, Rao BB, Mamatha GP. Mandibular canine index in establishing sex identity. Indian J Dent Res. 2002; 13(3–4):143–6.
8. Mughal IA, Saqib AS, Manzur F. Mandibular canine index (MCI); its role in determining gender. Prof Med J. 2010; 17(3):459–63.
9. Hashim HA, Murshid ZA. Mesio-distal tooth width – a comparison between Saudi males and females. Egypt Dent J. 1987; 39(1):343–6.
10. Muller M, LupiPegurier L, Quatrehomme G, Bolla M. Odontometrical method useful in determining gender and dental alignment. Forensic Sci Int. 2001; 121:194–7.
11. Garn SM, Lewis AB, Kerewsky RS. Buccolingual size asymmetry and its developmental meaning. Angle Orthod. 1967; 37(3):186-93.
12. Nair P, Rao BB, Annigeri RG. A study of tooth size, symmetry and sexual dimorphism. J Forensic Med Toxicol. 1999; 16(2):10-3.
13. Fernandes TM, Sathler R, Natalício GL, Henriques JF, Pinzan A. Comparison of mesiodistal tooth widths in Caucasian, African and Japanese individuals with Brazilian ancestry and normal occlusion. Dental Press J Orthod. 2013; 18(3):130-5.

14. Santoro M, Ayoub ME, Pardi VA, Cangialosi TJ. Mesiodistal crown dimensions and tooth size discrepancy of the permanent dentition of Dominican Americans. Angle Orthod. 2000; 70(4):303-7.
15. Pamecha S, Dayakara HR. Comparative measurement of mesiodistal width of six anterior maxillary and mandibular teeth in Rajasthan population. J Indian Prosthodont Soc. 2012; 12(2):81-6.
16. Kumawat RM, Dindgire SL, Gadhari M, Khobragade PG, Kadoo PS, Yadav P. Mandibular canine: A tool for sex identification in forensic odontology. J Forensic Dent Sci. 2017; 9(2):109.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Profile Study of Motorcyclists Victims in Road Traffic Accidents at Jaipur Region- An Observational Antemortem Study.

Kumar R[a], Punia RK[b], Verma LC[c]*

[a]Medical Officer, Govt R.D.B.P. Jaipuria Hospital, Jaipur, Rajasthan, India. [b]Senior Professor, Department of Forensic Medicine and Toxicology, SMS Medical College Jaipur, Rajasthan India. [c]Assistant Professor, Department of Forensic Medicine and Toxicology, Govt Medical College Kota, Rajasthan India.

Article Info

Received on: 05.10.2021
Accepted on: 05.03.2022

Key words
Road Traffic Accidents,
Motorcyclist,
Drinking & Drive,
Motorcycle Crashes.

Abstract

Background: Only 28 countries, covering 7% of the world's population, have comprehensive road safety laws on all five key risk factors: drinking and driving, speeding, and failing to use helmets, seat-belts, and child restraints as per the global status report on Road Safety 2013 by World Health Organization. India is undergoing major economic and demographic transition coupled with increasing urbanization and motorization. Injuries on roads, at homes, and in the workplace have increased due to lack of safety-related policies and programs. The health sector bears the maximum brunt in terms of provision of acute care, and short-term and long term rehabilitation service. **Materials and methods:** This study was conducted to analyse the sociodemographic profile of motorcycle crashes among total cases of RTA at tertiary care centre of Jaipur. **Results:** During study period, a total number of 22618 patients were admitted to trauma centre, from which 10564 were road traffic accident cases, from which 25 % were two wheeler crashes. **Conclusion**:_Motor vehicle crashes are the leading cause of death in adolescents and young adults.

1. Introduction

World Health Organization defined accidents as '' an unexpected, unplanned occurrence which may involve injury''.[1] Road traffic accidents are one of leading cause of death and disability.[2] Motor vehicle crashes are the leading cause of death in adolescents and young adults[3] and of the estimated 856000 road deaths occurring annually worldwide[4], 74% are in developing countries. Road Traffic Accident is the most common cause of death in developing countries. In India rapid urbanisation, industrialisation, population explosion and migration of people in past two decades has resulted in enormous growth in the field of road transportation. This has resulted in increasing amount of the road traffic leading to increased risk for occurrence of road traffic accidents. Factors predisposing to Road Traffic Injuries are classified into Agent, Human

How to cite this article: Kumar R, Punia RK, Verma LC. Profile Study of Motorcyclists Victims in Road Traffic Accidents at Jaipur Region- An Observational Antemortem Study. J For Med Sci Law 2022;31(2):28-32.

***Corresponding author:** Dr Lal Chand Verma, Assistant Professor, Department of Forensic Medicine and Toxicology, Govt Medical College Kota, Rajasthan India. (M): +91-7737513943. Emai: drlal007@yahoo.com

and Environmental. Analysis of this Epidemiological Triad is crucial to develop and implement mechanisms for control and prevention of fatal injuries. The major causes of accidents are drunk driving, driving over the speed limit, not using helmets and seat belts, rash and negligent driving including overconfidence, carelessness and thoughtlessness, failure to maintain lanes, brake failures, mishaps due to bad road conditions and curvy roads, etc. Generally, the behaviour of the younger age group involved in rash driving and enhanced acceleration capacities of the vehicles are the other contributing factors. Traffic and non-traffic collisions may result between vehicles, between vehicle and pedestrian, between vehicle and animal, or between a vehicle and a living/ non-living architectural obstacle. Currently two wheelers are major component of road traffic, most people prefer motorised two wheelers for various reasons with travellers opting for a powered two wheelers as a cost efficient alternative to expensive and less frequent public transport systems, their fuel efficiency, convenience in form of operation and maintenance for short distance travel with one or two persons especially at the peak hours as a means of reducing or avoiding the effects of congestion etc. Lack of systematic data generation mechanisms both at the national and state level leads to limitation in designing appropriate intervention strategies to deal with the problem in the country.

Considering the preciousness of human lives, along with financial loss that occurs during treatment, loss of earning, and many times leading to functional disability, this study had been undertaken to observe the socidemographic profile of road accidents Involving motorcycles. An attempt was also made to probe into medico legal aspects of these accidents so as to suggest remedial measures to traffic rules and law enforcing agencies to decrease the toll of these accidents and to minimising the morbidity and mortality statistics related to motorcycle accidents.

Aims and objectives:

1. To determine the proportion of motorcycle crashes among total cases of RTA.
2. To observe demographic profiles of these cases.

2. Material and methods:

It was a Hospital Based Descriptive Observational study and was done from 1st August, 2019 to 31st July, 2020 at SMS Hospital, Jaipur. Patients with history of Road accidents while riding motorcycles from Jaipur region are included.

Inclusion criteria:

1. Patients admitted to trauma centre with history of RTA while riding motorcycles during study period.
2. Consent given by the patient/attendant.

3. Observation and results:

The present study was conducted at Department of Forensic Medicine, SMS Hospital and Medical College, Jaipur during 1st August, 2019 to 31st July, 2020 on cases of motorcycle accidents admitted to Trauma Centre of SMS Hospital, Jaipur.

Table 1: Proportion of motorcycle crashes amongst admitted Road Traffic Accidents cases.

Item	No.	Percentage
Total no. of cases admitted to Trauma Center SMSH	22618	100%
No. of cases of Road Traffic accidents among them	10564	46.7%
No. of cases of Road Traffic accidents of Jaipur region	3264	30.9%
No. of cases of motorised two wheeler crashes of Jaipur region	816	25%
No. of fatalities among motorised two wheeler accidents	243	29.8%

A total of 22618 Medico-legal Cases were admitted at the trauma Centre out of which 46.7% cases amongst them were cases of Road traffic accidents (RTA). Further, out of them, 816 cases of RTA (25%) injured in motorised two wheeler accidents including occupants of motorcycles, mopeds, scooters, Activa and pedestrians. 243 cases (29.8%) cases injured in motorised two wheeler accidents were fatal amongst these but majority of them were either brought dead or fatal within 24 hours. The occupants of two wheelers other than motorcycles and pedestrians, cases with ambiguous history and those who did not consent for the participation in the study were excluded and 100 cases were included in the study on first come and first serve basis. Majority of victims of motorcycle accidents in the present study were between 20-40 years of age (69%) which shows that the active population of the society was suffering most consequent to the menace of casualties on the roads while riding motorcycles (**Table no -1**). Least number of victims was senior citizens followed by the persons between 40-60 years of age. (**Table-2**).

Table 2: Age-wise distribution of cases of motorcycle accidents (n=100).

Age group (in yrs.)	Number of cases	Percentage
0-20	16	16%
21-40	69	69%
41-60	13	13%
>60	02	2%
Total (%)	**100**	**100%**

Table 3: Gender-wise distribution of cases of motorcycle accidents.

Gender	Number of cases	Percentage
Male	89	89%
Female	11	11%
Total (%)	**100**	**100%**

Table 4: Age and Gender-wise distribution of cases of motorcycle accidents.

Age group (in yrs.)	Male (%)	Female (%)	Total (%)
0-20	16 (17.9%)	0	16 (16%)
21-40	62 (69.7%)	07 (63.6%)	69 (69%)
41-60	10 (11.2%)	03 (27.3%)	13 (13%)
>60	01(1.2%)	01 (9.1%)	02 (2%)
Total (%)	**89 (100%)**	**11 (100%)**	**100 (100%)**

X^2 (5,N=100)= 5.1151, p value=0.163557; p>0.5 Not Significant.

Table 5: Occupant status-wise distribution of cases of motorcycle accidents.

Type of Rider	Number of cases	Percentage
Rider	78	78%
Pillion Rider	22	22%
Total (%)	**100**	**100%**

Table 6: Age-wise and occupant status wise distribution of cases of motorcycle accidents.

Age group (in yrs.)	Rider (%)	Pillion Rider (%)	Total (%)
0-20	11 (11.2%)	05 (22.7%)	16 (16%)
21-40	60 (76.9%)	09 (40.9%)	69 69%)
41-60	06 (7.7%)	07 (31.9%)	13 (13%)
>60	01 (1.2%)	01 (4.5%)	02 (2%)
Total (%)	**78 (100%)**	**22 (100%)**	**100 (100%)**

X^2 (5,N=100)= 12.6203, p value=0.005534; p<0.05 Significant.

Table 7: Occupant status and sex-wise distribution of cases of motorcycle accidents.

Gender	Rider (%)	Pillion rider (%)	Total (%)
Male	78 (100%)	11 (50%)	89 (89%)
Female	0	11 (50%)	11 (11%)
Total (%)	**78 (100%)**	**22 (100%)**	**100 (100%)**

X^2 (3,N=100)= 38.5684, p value<0.001 Most Significant.

The observations are quite obvious as the active proportion of society is the most vulnerable to such events of mishaps on the roads owing to many reasons. Mean age of victims of motorcycle accidents in the present study was 29.848±236 years. 89% victims of motorcycle accidents were males and rest 11% were females (Table-3). This is an obvious observation, males being the majorly productive members of the Indian society are more involved with commuting from one place to another especially using two wheelers, motorcycles being the most commonly used two wheeled vehicle in the country. Although more common in rural settings, it is also commonly used in urban and sub-urban settings in recent times; almost wiping off mopeds and scooters from the Indian roads. 69.7% males and 63.6% females were from 20-40 years age group the active and productive population of the society participating in tasks requiring commuting from one place to another and thus more vulnerable to arias accidents (Table-4). The next age group to suffer trauma due to motorcycle accidents in males was 0-20 years in comparison to 40-60 year old females which is well explained on basis of the gender wise activity statue of population of Indian society where young and adolescent boys start participating in family tasks and also start riding motorbikes whereas females of this age group are neither allowed to participate in outdoor family tasks nor encouraged to move out of houses, whereas the female population of 40-60 years is still engaged in societal and cultural chores actively thus more prone to road accidents.

78% victims of motorcycle accidents included in the present study were drivers or riders or fresh riders and rest 22% were pillion riders (Table-5). Majority of victims in the study were first riders as in majority of the cases were riding alone. There were seven cases (8.9%) in which the pillion riders suffered minor injuries not requiring admission for the same.

A higher proportion of riders (76.9%) were victimised with motorcycle accidents in 21-40 years age group in comparison to 40.9% pillion riders of the same age group (Table-6).Whereas there were 31.9% pillion riders and 7.7% riders; and, 22.7% pillion riders and 11.2% riders respectively in 41-60 years and less than 20 years age groups. This reflects that the pillion riders of more than 40 years of age were most affected. The age group was significantly related to the occupant status of the accident victims. All the motorcycle riders i.e. first riders were males. No female victim was injured while driving the motorcycle in the present study which is an obvious observation as females are rarely seen driving

motorbikes in Jaipur and the trend has recently changed with the practice recently being picked up by very few young girls. Occupant status was significantly related to the gender (**Table-7**).

4. Discussion:

22618 Medico legal Cases were admitted at the trauma Centre of SMS Hospital during the study period from 1st August, 2019 to 31st July, 2020. 46.7% cases (10,564) from amongst them were cases of Road traffic accidents (RTA). Further, out of them, 816 cases of RTA (25%) injured in motorised two wheeler accidents including occupants of motorcycles, mopeds, scooters, activa and pedestrians. 243 cases (29.8%) cases of motorised two wheeler accidents were fatal amongst these but majority of them were either brought dead or fatal within 24 hours. The above data reflects that approximately about half of the traumatic casualties requiring admissions to hospitals and emergency care result from road traffic accidents. Although, motorised vehicles have changed the face of the society making transportation easy and thus, saving much time for other productive tasks and making life comfortable, turning the world into a smaller place with enhanced accessibility even to much remote and interior places; yet, this facility becomes menace when mishandled and results in mishaps. With the advancement of technology in the automobile industry, the world has been blessed with high speed automatic vehicles in attractive designs and speed has become the symbol of today's society.

Motorcycles have seen an upsurge in past few years abs replaced almost all other two wheelers. Young adults use them not only as a means of transportation but also as a sports equipment to gain fun from speeding, racing and stunts with an associated risk of traffic accidents. There are many factors that increase the risk of accidents like over-speeding, violation of traffic rules, bad roads, untrained drivers, faulty licensing, poorly maintained vehicles etc. Overall, road accidents are one of most common causes of untimely fatalities and also a preventable cause of mortality. Morbidity and mortality resulting from vehicular accidents, especially motorcycle accidents is increasing day by day and must be monitored regularly to observe the pattern of injuries resulting from the changing trends of vehicles and traffic sense. An alarming rise in fatalities of motorcyclists compelled us to plan this study with this purpose to elaborate upon the pattern of injuries suffered in these cases to recommend ways for preventing accidents as well as to suggest measures to prevent the proportion of mortalities. The present study revealed that 25% cases of road accidents in Jaipur region resulted from motorcycle crashes and 29.8% of them resulted in fatality. This is a significant proportion in the era of COVID-19 pandemic full of lockdowns and restrictions on travel.

The present study reported that the maximum number of victims of motorcycle accidents were in their third and fourth decades of life, the active population of the society. 16% victims were less than twenty years of age and 15% were of more than forty years. The results show that the most affected age group was 20-40 years which is well known to be the most vulnerable age group for unnatural incidents resulting in trauma. 89% of the admissions due to motorcycle accidents were of males. Jain, et al (2009)[5] also observed same results 89 % male were the victims and maximum deaths occurred in age groups of 18-44 years, 77%, Sharma, et al (2007)[6] also found about same results. Ogunlusi and Nathaniel (2011)[7] said that males (M) were 127 while females (F) were 9, with M: F ratio of 14.1:1.0. It is due to that obvious as men are more actively engaged in outdoor works in comparison to women who are more involved with household chores as per sociocultural norms of Indian society. Thus, the most commonly affected population of the study comprises of the most productive sections of the society thus resulting in exponential consequences of victimisation by not just causing physical harm to the victims but also resulting in socioeconomic setback to their families.

In the present study, 78% of the accident victims were riders and rest 22% were pillion riders. Comparison of occupant status to the affected age group, it was observed that, 76.9% riders were of 21-40 years age in comparison to 40.9% pillion riders; whereas, 36.4% pillion riders were more than forty years of age in comparison to 8.9% riders. Children, adolescents and young adult pillion riders contributed twice as much than the riders in the same age groups. Chichom-Mefire, et al (2015)[8] results said that 405 motorcycle crashes were out of total 621 injury victims This distribution is an obvious one considering the age wise activities of both groups, young males mostly riding the vehicle to assist the older people in the family for their outdoor activities

and societal roles. Sukumar (2018)[9] studied a total of 34 cases of pillion rider fatalities they said almost all were involved the injuries.

In our study 78 % were riders it may be due to that Sukumar S[8] conducted the study only on pillion riders. People from extremes of ages and less active age groups are generally dependent on younger family members and friends for their daily chores as regards to transportation which is also true for females, very few drivers proportionate to men of same age group, especially for motorcycles which also reflects in the present study where no female rider was observed. All the riders in the present study were males whereas equal numbers of pillion riders were affected from both genders although they contributed towards 100% female population and 12.3% male population of the study.

5. Conclusion:

Motor vehicle crashes are the leading cause of death in adolescents and young adults. The major causes of accidents are drunk driving, driving over the speed limit, not using safety measures and negligent driving. In this study 25 % case of total road traffic accident were due to motorised two wheeler accident. Out of these about 30 % cases were having fatal injuries. In our study about 70 % victims were in age group of 20-40 years of age. We observed that about 89% victims were from gender male. 78% drivers or riders or fresh riders were victims of our study. No female victim was injured while driving the motorcycle.

6. Suggestions

1. Adoption of the appropriate road safety policy is the main driving force essentially needed for the major reduction in road traffic fatalities.
2. Education of traffic rules and road safety should be implemented in school curriculum to inculcate road safety practices since childhood.
3. RTA must be considered like other notifiable diseases.
4. Fine on those persons not wearing helmet and not following rules.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

Reference:

1. World Health Organization, Regional Office for South-East Asia, New Delhi. Injury prevention and control in South-East Asia Region 2002 [Cited 25th October 2021]. Available from: https://apps.who.int/iris/bitstream/handle/10665/205922/B1470.pdf?sequence=1
2. Kamble NP, Chavan GS, Deokar RB. Autopsy Study of Head Injury Cases in Road Traffic Accidents. J For Med Sci Law. 2020;29(2):34-38
3. Take A. Accident mortality in children, adolescents and young adults. World Health Stat Q. 1986; 39(3): 232-56.
4. Feachem RGA, Kjellstrom T, Murray CJL, Over M, Phillips MA. The Health of Adults in the Developing World, London: Oxford University Press; 1992.
5. Jain A, Menezes RG, Kanchan T, Gagan S, Jain R. Two wheeler accidents on Indian roads- a study from Mangalore, India. J Forensic Leg Med. 2009; 16(3):130-3.
6. Sharma BR, Gupta N, Sharma AK, Sharma S. Pattern of fatal motorized two-wheeler crash injuries in Northern India: Is safety Helmet adequate prevention. Trends Med Res. 2007; 2(1):27-36.
7. Ogunlusi JD, Nathaniel C. Motorcycle Trauma in a St Lucian Hospital. West Indian Med J. 2011; 60(5):557.
8. Chichom-Mefire A, Atashili J, Tsiagadigui JG, Fon-Awah C, Ngowe-Nigerian M. A prospective pilot cohort analysis of crash characteristics and pattern of injuries in riders and pillion passengers involved in motorcycle crashes in an urban area in Cameroon: lessons for prevention. BMC Public Health. 2015; 15:915.
9. Sukumar S. A Retrospective Autopsy Based Study On the Pattern of Head Injuries in Pillion Riders Involved in Fatal Road Traffic Accidents. Int J Med Toxicol Forensic Med.2018; 8(2):71-8.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Age Estimation From Radiographic Evaluation of Various Developmental Stages of Maxillary Third Molars and its Associated Gender Variation.

J Ramkumar[a], R Ganesh[b]*, N Naveen[c]
[a]Senior Assistant Professor, Department of Forensic Medicine and Toxicology, Kallakurichi Government Medical College and Hospital, Kallakurichi, Tamil Nadu, India. [b]Associate Professor, Department of Forensic Medicine and Toxicology, Sri Manakula Vinayagar Medical College and Hospital, Puducherry, India. [c]Senior Assistant Professor, Department of Forensic Medicine and Toxicology, Government Thiruvarur Medical College and Hospital, Thiruvarur, Tamil Nadu, India.

Article Info

Received on: 21.12.2021
Accepted on: 15.06.2022

Key words
Third Molar,
Intra-oral peri-apical radio-graphs,
Age,
Development stages,
Sex.

Abstract

Background: Forensic age assessment in living subjects has become increasingly important over the last few years in both civil and criminal cases, especially in the age group between 14 and 21 years. Two methods of age evaluation are available for juveniles in this age group: the radiologic examination of skeletal features and radiologic examination of the development of third molars. **Aims:** To evaluate the development of third molars in relation to chronological age and to assess the influence of gender on the development of third molar. **Materials and Methods:** Total of 66 outpatients were a part of this prospective study done between November 2013 to May 2015, for a period of 19 months. The development of the third molars in both the right and left quadrants of the maxillary region of the patients between age group of 15 to 25 years were assessed by taking intra-oral peri-apical radio-graphs. **Conclusion:** From this study one can be reasonably confident that the subject has not attained the age 18 years if the root development of third molar is between stage 1 to 4 and the developmental stage 7 indicates that the subject has attained the age 18 years.

1. Introduction

Forensic age assessment in living subjects and dead persons has become increasingly important over the last few years concerning employment, marriage, and differentiating a juvenile from an adult in criminal cases, pregnant females in sexual offence cases, especially for heinous crimes. Since tooth are the hardest structure in the body survives every disaster such as fire accidents, bomb blasts, plane crashes, mass disasters, etc.[1] Estimating age from teeth is reliable as they are naturally preserved long

How to cite this article: Ramkumar J, Ganesh R, Naveen N. Age Estimation From Radiographic Evaluation of Various Developmental Stages of Maxillary Third Molars and its Associated Gender Variation. J For Med Sci Law 2022;31(2):33-37.

***Corresponding author:** Dr. R. Ganesh, Associate Professor, Department of Forensic Medicine and Toxicology, Sri Manakula Vinayagar Medical College and Hospital, Puducherry, India. (M): +91-7094604964. Email: fm.ganeshr@smvmch.ac.in

after all the tissues and even bones have disintegrated. Skeletal indicators, such as diaphysis–epiphysis fusion, hand–wrist examination, or changes in secondary sex characteristics, have their advantages and disadvantages. But especially during these years, they are more or less indecisive.[2]

Estimating age after about 14 years becomes difficult, since all the permanent teeth, except the third molar, would have completed their development leaving the third molars the only option for age estimation. It also offers a unique advantage over other teeth in that its development tends to continue over a longer period. At or after the age of 14, whether clinically visible or not, the status of the third molar helps in age estimation.[3] The study aims to determine the age based on radiological developmental changes in the root of third molars in subjects of age 15 to 25 years. The objectives of this study are to assess the influence of age and gender on the development of the third molar and to assess the difference in the development of 3rd molars between maxilla and mandible. This study was done as previous studies have not compared all the four molar teeth and there was a paucity of literature on similar studies worldwide.

2. Methods and materials:

In this prospective study, 66 Outpatients, between the age group of 15 to 25 years of both sexes with validated age proof were selected from the Department of Oral Medicine and Radiology, M.S.Ramaiah Dental College and Hospital, Bangalore. Outpatients who had carries and fractures of the third molar were excluded from the study. Ethical clearance was obtained from the Institute Ethics committee of M.S.Ramaiah Medical College. Written informed consent was taken from each participant. The cost of the study was borne by the investigator. The tooth development of the third molar was assessed by taking intraoral periapical radiographs of all four third molars by four separate exposures from each of the subjects. The stages of root development were assessed by Leif Kullman et al method. Statistical analysis was done using Descriptive statistics, ANOVA test, post- hoc test using LSD, linear regression analysis, independent t-test. The data was analyzed using SPSS version 18.0.

3. Results:

A total of 264 (132) radiographs from 66 subjects were examined for the root development of third molars. The 66 subjects were divided into three groups. Each group had 22 subjects **(Figure No 1).** Out of 66 cases, 34 cases were males and 32 cases were females. In the age group of 15 - 18 years, 12 cases were males and 10 cases were females. In the age group of 19-22 years, 11 cases were males and 11 cases were females. In the age group of 23 - 25 years, 11 cases were males and 11 cases were females **(Table No 1).**

Figure No 1: Group Distribution of cases

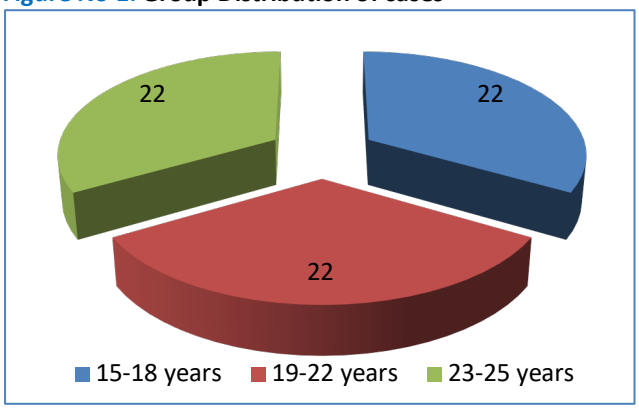


Table No 1: Age and sex distribution of cases

Age groups (in years)	No. of cases	Males (%)	Female (%)
15 - 18 years	22 (33.33%)	12 (18.18%)	10 (15.15%)
19 - 22 years	22 (33.33%)	11 (16.67%)	11 (16.67%)
23 - 25 years	22 (33.33%)	11 (16.67%)	11 (16.67%)
Total	**66 (100%)**	**34 (51.52%)**	**32 (48.8%)**

Leif Kullman et al method of root development **(Figure No 2)** was used to find the developmental stage of the analyzed cases and the age range and mean age of all the 7 stages of third molar development from the left and right maxillary quadrant of the participant cases were given **(Table No 2)**. Mean age for the development of the third molar was found to be similar in all 7 stages when compared between both the left and right maxillary quadrants. There is no significant difference in age found between right and left maxillary areas **(Table No 3).** In the present study, there is no significant difference between the sexes up to stage $\leq$ 5, but there is a significant difference between them once the stage is > 5 i.e. root development of the third molar was earlier in males than females in both the left and right maxillary quadrants. But since the number of cases is less in stages 1 to 4, the comparison between males and females is statistically insignificant **(Table No 4)**. The present study revealed that in both the left and right maxillary quadrants there is no statistically significant difference between stages 1 to 4. There is a significant

difference found between stages 1 to 4 and stages 5, 6, and 7 indicating that if the subject has root development of third molar reaching stage > 5 then one can be reasonably confident that the subject had attained 18 years of age. But if the subject has a developmental stage between 1 to 4, one can be reasonably confident that the subject had not attained the age of 18 **(Table No 5 & 6)**.

Intra-class correlation and p-value between the dental parameter and chronological age were derived statistically and the value was 0.82 for right maxillary ('p' value < 0.001) and 0.84 for left maxillary ('p' value < 0.001). From this, it is evident that the agreement between predicted age by dental parameter and chronological age has a good correlation as confirmed by the 'p' value. A Regression Formula to predict the age for each quadrant separately, based on the Leif Kullman et al staging of third molar teeth present, were calculated. The following regression equations were derived:

Right maxillary

Y (age in years) = 1.131 (right maxillary stage) + 14.82 (constant)

Left maxillary

Y (age in years) = 1.174 (left maxillary stage) + 14.62 (constant).

Figure No 2: Classification of the different stages of root development of lower third molar by Leif Kullman et al method.

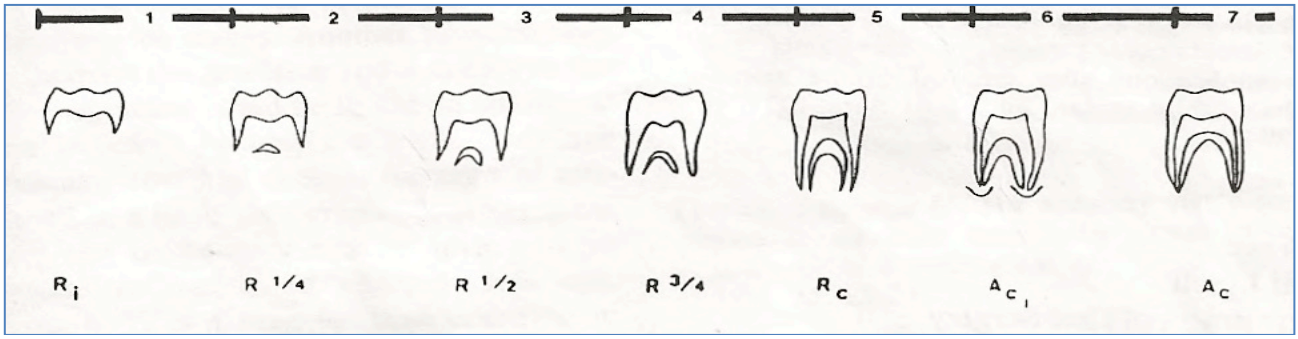


Table No 2: Age Range and Mean Ages of 7 stages in right and left maxillary quadrants

Stages	Right Maxillary			Left Maxillary		
	No of Cases	Age Range	Mean Age	No of Cases	Age Range	Mean Age
1	10	15.08 - 17.92	16.37	9	15.08 – 17.67	16.20
2	2	17.58 - 17.75	17.67	3	16.50 – 17.75	17.28
3	7	16.50 – 18.17	17.20	7	16.83 – 18.17	17.25
4	2	17.83 – 18.25	18.04	2	17.92 – 18.25	18.09
5	10	17.92 – 22.58	20.39	10	17.92 – 22.42	20.26
6	26	17.83 – 24.92	21.91	27	17.83 – 24.92	21.97
7	9	20.83 – 24.83	22.49	8	20.83 – 24.83	22.51

Table No 3: Mean ages with 95% confidence interval of all stages between right and left maxillary quadrants

Stages	Right maxillary			Left maxillary		
	95% confidence interval for mean		Mean ± SD	95% confidence interval for mean		Mean ± SD
	Lower bound	Upper bound		Lower bound	Upper bound	
1	15.61	17.13	16.37±1.06	15.45	16.94	16.20±0.97
2	16.58	18.75	17.67±0.12	15.59	18.96	17.28±0.68
3	16.67	17.74	17.20±0.58	16.77	17.75	17.25±0.52
4	15.37	20.71	18.04±0.30	15.99	20.18	18.09±0.23
5	19.22	21.57	20.39±1.64	19.19	21.33	20.26±1.49
6	21.22	22.59	21.91±1.70	21.31	22.63	21.97±1.66
7	21.57	23.41	22.49±1.20	21.44	23.58	22.51±1.28
Total	**19.51**	**20.84**	**20.17±2.70**	**19.51**	**20.84**	**20.17±2.70**

Table No 4: Gender difference of mean ages in Right and Left Maxillary Quadrant

Stages	Right maxillary		Left maxillary	
	Males	Females	Males	Females

	No. of cases	Mean ± SD	No. of cases	Mean ± SD	No. of cases	Mean ± SD	No. of cases	Mean ± SD
1	4	16.21 ± 1.0	6	16.47 ± 1.19	4	16.21 ± 1.0	5	16.18 ± 1.06
2	2	17.67 ± 0.12	0	-	3	17.27 ± 0.68	0	-
3	2	16.75 ± 0.35	5	17.38 ± 0.57	2	16.91 ± 0.12	5	17.38 ± 0.57
4	1	17.83	1	18.25	0	-	2	18.09 ± 0.23
5	6	20.21 ± 2.03	4	20.67 ± 1.03	6	19.99 ± 1.78	4	20.67 ± 1.03
6	14	21.58 ± 2.0	12	22.29 ± 1.27	14	21.67 ± 1.99	13	22.29 ± 1.22
7	5	22.12 ± 1.11	4	22.96 ± 1.29	5	22.12 ± 1.11	3	23.17 ± 1.50

Table No 5: Comparison of mean age between different stages of right maxillary quadrants

Stages	1	2	3	4	5	6	7
1	-	0.245	0.240	0.136	<0.001	<0.001	<0.001
2	-	-	0.688	0.794	0.017	<0.001	<0.001
3	-	-	-	0.467	<0.001	<0.001	<0.001
4	-	-	-	-	0.006	<0.001	<0.001
5	-	-	-	-	-	0.006	0.002
6	-	-	-	-	-	-	0.295
7	-	-	-	-	-	-	-

Table No 6: Comparison of mean age between different stages of left maxillary quadrants

Stages	1	2	3	4	5	6	7
1	-	0.248	0.092	0.087	<0.001	<0.001	<0.001
2	-	-	0.904	0.526	0.002	<0.001	<0.001
3	-	-	-	0.537	<0.001	<0.001	<0.001
4	-	-	-	-	0.048	<0.001	<0.001
5	-	-	-	-	-	0.001	0.001
6	-	-	-	-	-	-	0.340
7	-	-	-	-	-	-	-

4. Discussion:

The third molar is also known as wisdom tooth if fully erupted, indicates that an individual is above 17 years of age. In some persons due to inadequate jaw space, the third molar never erupts into the oral cavity, particularly the mandibular third molars. From 14 to 20 years, dental age estimation is based upon the stages of development of the third molar.[4]

Out of 66 cases, 34 cases were males and 32 cases were females. In the age group of 15-18 years, 12 cases were males and 10 cases were females. In the age group of 19-22 years, 11 cases were males and 11 cases were females. In the age group of 23-25 years, 11 cases were males and 11 cases were females. A similar study was conducted by Vrinda et al consisting of 85 subjects in the age group of 15 to 25 years. Out of these 41 were boys and 44 were girls.[5] Naik et al study was carried out on 100 digital orthopantamograms of patients in the age group of 7 to 24 years. Out of 100 patients, 53 were males and 47 were females.[6]

Tables 2 and 3 show the mean ages with a standard deviation of all seven stages in both the right and left maxillary quadrants. The present study showed that mineralisation of the third molar's root was found to start at the age of 15.1 years and the root was fully formed at about 21-23 years. Kullman et al study showed that mineralisation of the third molar's root was found to start at the age of 15 years and the root was fully formed at about 20 years.[7] Vrinda et al study showed that the root calcification started at 15.1 years and was completed at 19.3 to 20 years.[5] In a study by Darji et al, if a subject presents with a developmental stage A to D based on Demirjian et al method there is less likelihood that subject is 18 years old. On the other hand, if the subject presents with the developmental stage of H (i.e. complete closure of root apex), there are more chances that the subject has crossed the 18 years of age.[8] In Panchbhai AS study, the comparison of the level of development of the third molar by Nolla staging in-between right and left maxillary quadrants was found to be insignificant except for the upper arch in females.[9]

Kanmani et al, Sisman et al and Attar and Al-Taei's studies showed that the third molar genesis attained by the Demirjian formation stages was earlier in males than in females.[10,2,11] In a study by Mesotten et al, completion of third molar formation occurred earlier in males than females.[12] In a study by Kasper et al, all stages of development for both jaws showed the mean ages for males to be lesser than female mean ages.[13] Barka et al study showed that no significant difference was found between the third molars 18 and 28 and 38 and 48 in males or females.[14]

5. Conclusion:

The present study was adopted for the reason that there is a paucity of literature on a study on root development of third molars based on Leif kullman et al method in India as well as the rest of the world. If the root development of the third molar was found to be between stages 1 to 5, then the subject has not attained the age of 18. If the stage of root development was found to be 7 (i.e. Root apices closed), one can be reasonably confident that the subject has attained the age of 18 years. There is good agreement between the dental age and chronological age. Root development of third molars was earlier in males than females. The present study will be useful to estimate the age in pregnant females by third molar development where other joint x-rays would not be possible concerning the exposure. The present study throws light on determining the age of 18 years in an individual who is medico-legally significant.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. Payne JJ, Buruttil A, Smock W. Role of and techniques in forensic odontology. Forensic Medicine-Clinical and Pathological Aspects. 1st ed. London: Greenwich medical media Ltd; 2003:691.
2. Sisman Y, Uysal T, Yagmur F, Ramoglu SI. Third-molar development in relation to chronologic age in Turkish children and young adults. Angle Orthod. 2007; 77(6):1040–5.
3. Clark DH. The chronology of dental development and age assessment. Practical Forensic Odontology. 1st ed. Oxford: Butterworth-Heinemann Ltd; 1992:39-40, 23, 25.
4. Reddy KSN, Murty OP. Identification. The Essentials of Forensic Medicine and Toxicology. 33rd ed. New Delhi: Jaypee brothers medical publishers (P) Ltd; 2014:69-70.
5. Bhat VJ, Kamath G. Age estimation from the root development of mandibular third molars. Medicolegal update. 2004; 4(4):127-30.
6. Naik SB, Patil SN, Kamble SD, Mowade T, Motghare P. Reliability of Third Molar Development for Age Estimation by Radiographic Examination (Demirjian's Method). J Clin Diagn Res. 2014; 8(5):25-8.
7. Kullman L, Johanson G, Akesson L. Root development of the lower third molar and its relation to chronological age. Swed Dent J. 1992; 16:161-7.
8. Darji JA, Govekar G, Kalele SD, Hariyani H. Age estimation from third molar development a radiological study. J Indian Acad Forensic Med. 2011; 33(2):130–4.
9. Panchbhai AS. Radiographic evaluation of developmental stages of third molar in relation to chronological age as applicability in forensic age estimation. Dentistry. 2012; 1(2):1-7.
10. Kanmani R, Srinivasan SV, Jonathan Daniel M. Mandibular Third Molar Development as an Indicator of Chronological Age for a Pondicherry Population of Southern India. E-Journal of Dentistry. 2012; 2(2):153-8.
11. Attar JJ, AL-Taei JA. Chronological age estimation in adolescent and young adult subjects in relation to mandibular third molar development using digital panoramic image. J Bagh College Dentistry.2012; 24(2): 47-50.
12. Mesotten K, Gunst K, Carbonez A, Willems G. Dental age estimation and third molars: A preliminary study. Forensic Sci Int. 2002; 129(2):110–5.
13. Kasper KA, Austin D, Kvanli AH, Rios TR, Senn DR. Reliability of third molar development for age estimation in a Texas hispanic population: A comparison study. J Forensic Sci. 2009; 54(3):651–7.
14. Barka G, Marathiotis K, Protogerakis M, Zafeiriadis A. Radiographic evaluation of third molar genesis in Greek orthodontic patients. Int J Gen Med. 2013; 6:747–5

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Perception of Students towards Structured Oral Examination (SOE) in comparison with Conventional Oral Examination (COE) in Forensic Medicine & Toxicology.

Pramod Kumar GN[a], Adkoli BV[b], Roopa Urs AN[c], Dhritiman Nath[d],Ananthakrishnan N[e], Satish Kumar[f], Shankar M Bakkannavar[g]*

[a]Professor & Head, FMT, Karwar Institute of Medical Sciences, Karwar, India. [b]Director, Centre for Health Professions Education, Department of Medical Education, Mahatma Gandhi Medical College & Research Institute, Sri Balaji Vidyapeeth, Pondicherry, India. [c]Assistant Professor, Pathology, Chamarajanagar Institute of Medical Sciences, India. [d]Associate Professor, FMT, VSS Institute of Medical Sciences and Research, Burla, Odisha. [e]Professor, Surgery, Mahatma Gandhi Medical College & Research Institute, Sri Balaji Vidyapeeth, Pondicherry, India. [f]Professor & Head, FMT, Mahatma Gandhi Medical College & Research Institute, Sri Balaji Vidyapeeth, Pondicherry, India. [g]Associate Professor, FMT, Kasturba Medical College, Manipal, Manipal Academy of Higher Education, India.

Article Info

Received on: 19.09.2021
Accepted on: 20.04.2022

Key words
Summative assessment, Conventional Oral Examination, Structured viva.

Abstract

Background: Oral examination is a part of formative and summative assessment in medical education. Conventional oral examination in university examinations is criticized for being subjective, and often whimsical. We conducted a study to assess the relative efficacy of Conventional Oral Examination (COE) versus Structured Oral Examination (SOE). **Method:** From the batch of second year MBBS students studying Forensic Medicine in 4th Semester, 60 students were chosen for the study. They were subjected to COE and SOE. Detailed feedback was obtained through specially designed five point Likert Scale to assess their perception. The data was collected and analysed using SPSS software version 2012. P value was calculated using Chi square test. **Results**: Majority of students came out in favour of SOE against COE. The main reasons cited were uniform allotment of time (96.7%), less variability in the difficulty level, at the same time, greater coverage of content. Most participants (93.3%) agreed that SOE was well organized system. **Conclusion:** Structured viva was perceived as more effective tool for formative assessment which can also be extended to summative assessment with adequate planning and logistics.

1. Introduction

Current literature in assessment suggests use of plethora of tools and techniques, for increasing the validity and reliability of assessment.[1]

How to cite this article: Pramod Kumar GN, Adkoli BV, Roopa Urs AN, Nath D, Ananthakrishnan N[e], Satish K, Bakkannavar SM. Perception of Students towards Structured Oral Examination (SOE) in comparison with Conventional Oral Examination (COE) in Forensic Medicine & Toxicology. J For Med Sci Law 2022;31(2):38-44.

***Corresponding author** Dr. Shankar M Bakkannavar Associate Professor, FMT, Kasturba Medical College, Manipal, Manipal Academy of Higher Education, India. Email: shankar.mb@manipal.edu

Oral examination is a part of both formative and summative assessment in medical profession. Oral Examination is a form of assessment wherein; a set of stimulus questions are asked that address critical areas of competencies. Students are expected to respond verbally in their own words, which allow an assessment of the student's depth of comprehension, and ability to apply their learning to different situations. Oral examination can assess various domains that are required to be achieved by the student in medical course.[2,3,4] Conventional oral examination conducted as a part of university examinations is subjected to a number of criticisms. It is affected by examiners' attitude, mood, whims and fancies, and often influenced by nonacademic factors.[5] Some examiners tend to be stringent, while others are lenient, which affects the reliability. Another criticism is the variability of time allotted to students appearing in the beginning and at the end. In spite of all these drawbacks, oral examination is popular because it tests students' ability to defend the decision in a given clinical situation that cannot be tested by written examination.[6]

One of the ways out to improve the quality of oral exam is to modify it as structured oral examination (SOE).[7] Few studies conducted on structured oral examination in small groups, have shown to be reasonably reliable and valid. Both faculty and students have shown positive perception toward this examination tool.[7]

Currently, little information is available on the implementation of SOE in a large group as it is a resource-intensive and time-consuming exercise. The main aim of our study was therefore, to explore the possibility of conducting SOE in the context of a medical college that admits 250 students per batch and to study the perceptions of students to compare this method with the Conventional Oral examination (COE). The study was conducted in the Department of Forensic Medicine & Toxicology, in a Medical College, in South India.

2. Material & Method

Considering the logistics issues in organizing viva examination, we selected a purposive sample of 60 students from among the second year MBBS batch studying Forensic Medicine and Toxicology at Mahatma Gandhi Medical College and Research Institute, Pondicherry between 2016-17. The criteria used for sampling were stratification of high, moderate and low achievers based on the previous test scores and their willingness to participate on voluntary basis. They were divided into three groups of 20 each again, to meet the logistics. Students were informed in advance about the purpose of study and their participation was solicited on voluntary basis. Approval of Institutional Ethics Committee was obtained.

We designed a Five Point Likert Scale (Strongly agree, Agree, Neutral, Disagree & Strongly Disagree) consisting of 14 statements to capture students' perception about various aspects of oral examination. This instrument was piloted with a few volunteers to judge the user-friendliness. Based on the inputs and the responses provided by the volunteers, the instrument was modified and finalized. Then, the instrument was sent to experts for their opinion, who validated it for its content and construct of individual questions and the reliability for internal consistency on the instrument. The Conventional oral examination was conducted by three examiners. After the examination, feedback was obtained using the Likert scale.

The SOE was conducted after one week of conventional viva for the same set of students. Prior orientation was given to students about the procedure of SOE. The questions were prepared by two faculty members, further subjected to peer review and finalized with the approval of head of the department. A consensus was reached among all the assessors on the content, marking, and estimated difficulty level of the questions developed. The key to answers were also prepared and agreed by all examiners. Out of ten marks allotted to viva, the marks distribution was based on difficulty level, so that initial three questions were labeled as easy, two questions were moderate in difficulty, and one question was difficult. Questions were framed from the topics covered in 4th semester and included general consideration of toxicology, agricultural poisons, corrosive poisons, metallic poisons, organic and inorganic irritant poisons, CNS depressants and deliriant poisons.

The questions developed were of graded levels of difficulty for different topics of the examination. Development of questions and answers according to difficulty level took more time and effort. However, this can be minimized with dedicated time for curriculum planning in later years. Each student was asked questions from the list developed, and students had to answer the questions to a single

assessor. Students' feedback was obtained on SOE at the end, through an anonymous Likert scale questionnaire, to indicate their perception. The data collected was analysed using SPSS software version 2012. P value was calculated using Chi square test. The variables studied were listed with individual statistics. Statistical analysis of the Likert scale questionnaire submitted by students for conventional and structured oral examination was done. Agreement was calculated by adding 'strongly agree' and 'agree' to both COE and SOE (**Table 1 & 2**). Likewise, disagreement was calculated by adding 'strongly disagree' and 'disagree'. The neutral response was not included in the analysis.

Table 1: Comparison of agreement and disagreement by students on Conventional Oral Examination.

S.no	Conventional oral examination			
	Statement	Agree	Disagree	P-value
1	Time allotted for each student was uniform & Adequate	30 (50%)	26 (43.3%)	0.4654
2	Questions were asked from a list/set of questions available to examiners	08 (13.3%)	47 (78.3%)	NA*
3	Level of difficulty of questions varies between examiners	52 (86.7%)	0 (0.0%)	NA*
4	Covers most of topics from syllabus	32 (53.3%)	16 (26.7%)	0.002
5	Process is Comfortable with less stress level	32 (53.3%)	06 (10%)	NA*
6	Questions were easy to understand	56 (93.3%)	0 (0.0%)	NA*
7	Questions ranged from easy to difficult level	30 (50%)	08 (13.3%)	NA*
8	Sequence of questions helped to maintain chain of thought while answering	22 (36.7%)	16 (26.7%)	0.238
9	Provides more time to think before answering	38 (63.3%)	09 (15%)	NA*
10	This method will be more helpful in enhancing performance in the final exam	33 (55%)	09 (15%)	NA*
11	This is a well-organized system/method	14 (23.3%)	26 (23%)	0.020
12	Scoring depends on appearance, vocabulary & language of candidate	24 (40%)	26 (43.3%)	0.711

*p-value was not calculated since one of the frequencies is zero

Table 2: Comparison of agreement and disagreement by students on Structured Oral Examination

S.No.	Structured oral Examination			
	Statement	Agree	Disagree	p-value
1	Time allotted for each student was uniform & adequate	58 (96.7%)	02 (3.3%)	0.000
2	Questions were asked from a list/set of questions available to examiners	60 (100%)	0 (0.0%)	NA*
3	Level of difficulty of questions varies between examiners	27 (45%)	15 (25%)	0.021
4	Covers most of topics from syllabus	55 (91.7%)	04 (6.7%)	0.000
5	Process is comfortable with less stress level	44 (73.3%)	04 (6.7%)	0.000
6	Questions were easy to understand	54 (90%)	0 (0.0%)	NA*
7	Questions ranged from easy to difficult level	56 (93.3%)	0 (0.0%)	NA*
8	Sequence of questions helped to Maintain chain of thought while answering	36 (60%)	03 (5%)	0.000
9	Provides more time to think before answering	46 (76.7%)	02 (3.3%)	0.000
10	This method will be more helpful in enhancing performance in the final exam	48 (80%)	0 (0.0%)	NA*
11	This is a well-organized system/method	56 (93.3%)	0 (0.0%)	NA*
12	Scoring depends on appearance, vocabulary & language of candidate	26 (43.3%)	24 (40%)	0.711

*p-value was not calculated since one of the frequencies is zero

Table 3: Comparison of Agreement by students on Conventional and Structured Oral examination

S.no	Statement	Agreement		P-value
		COE	SOE	
1	Time allotted for each student was uniform & adequate	30 (30%)	58 (96.7%)	0.000
2	Questions were asked from a list/set of questions available to examiners	08 (13.3%)	60 (100%)	0.000
3	Level of difficulty of questions varies between examiners	52 (86.7%)	27 (45%)	0.000
4	Covers most of topics from syllabus	32 (53.3%)	55 (91.7%)	0.000
5	Process is comfortable with less stress level	32 (53.3%)	44 (73.3%)	0.000
6	Questions were easy to understand	56 (93.3%)	54 (90%)	0.509
7	Questions ranged from easy to difficult level	30 (50%)	56 (93.3%)	0.000
8	Sequence of questions helped to Maintain chain of thought while answering	22 (36.7%)	36 (60%)	0.010
9	Provides more time to think before answering	38 (63.3%)	46 (76.7%)	0.112
10	This method will be more helpful in enhancing performance in the final exam	33 (55%)	48 (80%)	0.003
11	This is a well-organized system/method	14 (23.3%)	56 (93.3%)	0.000
12	Scoring depends on appearance, vocabulary & language of candidate	24 (40%)	26 (43.3%)	0.711

*p-value <0.005 was considered significant.

3. Results

Majority of students felt that the overall process was better in SOE against conventional viva voce. Most of the respondents (96.7 %) felt that time allotted was uniform and equal in SOE as against 30% in COE (**Table 3**). Nearly half (43% students) felt that time was neither uniform nor adequate to answer in COE. All the 60 students (100%) were satisfied that in SOE the questions were asked from the list available to examiners which was prepared in advance with consensus.

Nearly half (45%) of students agreed that the level of difficulty of questions varied between examiners in SOE. However, this variation was felt by a large number of participants in COE (86.7%).

There was strong agreement supported by a vast majority (93.3%) that SOE was well organized system that covered most of topics from the syllabus. The also thought it was helpful for enhancing performance in final examination

When the students were asked about 'Time allotted for each student was uniform & adequate in COE, 50% agreed and 43.3% disagreed for the statement (**Table 1**). The difference in proportion of agreement and disagreement was not significant (p = 0.4654). Similarly, when the students were asked whether 'Sequence of questions helped to maintain chain of thought while answering', 36.7% of participants agreed and 26.7% disagreed for the statement. The difference in proportion of agreement and disagreement was not significant (p = 0.238)

Likewise, when the students were probed whether 'Scoring depends on appearance, vocabulary & language of candidate', 40% agreed and 43.3% disagreed with the statement. The difference in proportion of agreement and disagreement was not significant (p = 0.711). For all other statements, the difference in proportion of agreement and disagreement was significant (P< 0.005)

When the students were asked whether 'Questions were easy to understand', 93.3% agreed in COE and 90% agreed in SOE for the statement. The difference in proportion of agreement between COE and SOE was not significant (p = 0.509). Similarly, when they were asked about scoring, whether 'Scoring depends on appearance, vocabulary & language of candidate', 40% agreed in COE and 43.3% agreed in SOE for the statement. The difference in proportion of agreement between COE and SOE was not significant (p = 0.711).

Discussion

In the present study, most of the respondents (96.7 %) felt that time allotted was uniform and equal in SOE. They all were satisfied that in SOE the questions were asked from the list available to examiners. 86.7% of students felt that level of difficulty of questions varied between examiners in COE. 93.3% students agreed that the SOE was well organized system that covered most of topics from

the syllabus. Most number of students (93.3%) agreed that the questions asked in COE were easy.

Oral examinations are being used as a mode of assessment of medical students for years. Conventional oral examinations consist of a dialogue or discussion with the examiner who asks questions to which candidate must reply. This method gives the examiner the unique opportunity to explore students' depth of knowledge as well as their ability to express it in a precise manner. They are used for their flexibility and potential for testing higher cognitive skills.[8]

An assessment tool must be valid, reliable, and objective. Most authors agree that structuring and preplanning viva voce leads to a better validity and reliability of viva as an assessment tool for under graduates.[9] Validity is the most important characteristic of good assessment. Feasibility and acceptability are other considerations. Our findings in terms of student perception reveals that SOE is more preferred modality.

The oral exams enable instructors to test the students on all five cognitive domains of Bloom's taxonomy.[10] The examiner can ask the student about his/her knowledge and comprehension (levels 1 and 2), ask question to see if the student can apply the concepts (level 3), use a case scenario to test the student's analytical ability (level 4), judge if the student can combine concepts into a new whole (Level 5), and even determine if the student can evaluate or critically assess various concepts or theories (Level 6). While some of these levels can be assessed through the written exam, the oral exam allows the instructor to assess cognitive domains along with the skill (psychomotor domain) and the attitude (affective domain) combined together.

Most of the Indian medical schools conduct viva by conventional method. Many of them have experimented the SOE in different subjects. But it is not incorporated across all the subjects in medical course. The present study carried out to get the feedback from students as to whether structured viva voce is making any difference from conventional oral examination. In the present study the viva voce was structured and made more objective. Questions were prepared with specific objectives in consensus with other faculty members in the department. The entire faculty agreed upon asking the questions from the list of questions. In COE method, examiners take their own time with whatever questions they feel to ask to a student. In SOE method uniform time was allotted for each candidate. The results showed that there were less biases in the structured viva as compared to the conventional viva. 73.4% participants agree that SOE method is comfortable with less stress level when compared to COE (53.4%). But still there is not much difference in both methods which results in stress. This has also been confirmed by other studies which claim similar results regarding the agreement of participants to SOE.[11 - 14]

In the present study, the student's perspective regarding SOE was very encouraging with students considering SOE more reliable and comfortable method of assessment. Students felt that it covered the complete syllabus on given topics and explored the knowledge of the subject. Similar findings were reported in other Indian studies done in the subjects of physiology.[15]

In our study, a vast majority of students preferred structured viva over conventional viva. This is probably due to decreased biases and increased objectivity of the structured viva. This is in line with other studies which claim that 93% of vivas are biased.[16] Moreover, the majority of the students in the present study claim that structured viva was more student friendly, to the point and better in terms of preset questions and uniform coverage of the syllabus. This opinion reinforces other studies in which students share a similar opinion.[17,18] Many studies show that students prefer a SOE as compared to COE because it is uniform, fair, less stressful, reliable and less biased.[14,19,20]

Strengths of our study: We made a pioneering effort to use SOE in UG assessment in Forensic Medicine which is a step towards the attainment of Competency Based Medical Education launched by the NMC (National Medical Commission). The new MBBS curriculum by NMC, lays stress on formative assessment and internal assessment, but questions are raised regarding how reforms can be extended to summative assessment which falls under the purview of universities.[21] We have shown how SOE can be effectively implemented as formative and part of summative assessment tool in university examination in consensus with other examiners. No doubt, convincing other examiners especially external examiners is a challenging issue. However, with proactive action from the Department and support from Medical Education Units that support Faculty Development, this can be achieved sooner or later.

Limitations of our study

Our study was conducted with 60 students in one medical school hence the generalizability is limited. Due to logistic issues, we could draw only purposive sample of 60 students. The instrument which we developed also needs further study for their validity and reliability. We recommend that further studies are needed with a large sample using multi centric approach, which can substantiate this method for recommending to all medical schools across the country**.** A SWOT analysis of our experience has been depicted in **table 4**.

Table 4. SWOT analysis of structured v/s Conventional viva voce

Strengths • Structured process • Transparent • Acceptable • Feasible for both students and teachers • External examiners assessment would be uniform	**Weakness** • Requires more thinking skills • Requires advance preparation /and training of faculty • No scope for external examiner to ask his own /new questions
Opportunity • Strengthening of competency to foster skill and knowledge • Communication skill development • Bringing about best in evaluation strategies • External examiners can suggest for the improvement in specific areas based on assessment	**Threats** • How to incorporate in the current curriculum • How to change the mindset of conventional experienced faculty • Convincing external examiners for SOE as many may not like it and have no experience

5. Conclusion

Majority of the students were in favour of structured viva as more effective tool for formative assessment in the Department of Forensic Medicine possibly, due to its increased objectivity and less biases. Our study is also an example to show how this can be organized in a large group setting. This can also be extended for summative assessment with adequate planning and logistics.

6. Recommendations

The candidates should be informed about the examination process in advance. Examiner performance can be enhanced by appropriate guidelines and instructions and training of new examiners. Training of examiners may produce more rigorous evaluation of student performance. Large amount of preparatory work required in setting up the protocols and question bank. Hence faculty development and proactive leadership hold the key. We also suggest further standardization of questionnaire before the implementation of SOE for summative assessment.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References

1. Epstein RM. Assessment in medical education. N Eng J Med. 2007; 356:387-96.
2. Rehman G. Appropriateness of using oral examination as an assessment method in medical or dental education. J Educ Ethics Dent. 2011; 1:46-51.
3. Ananthakrishnan N, Sethuraman KR, Kumar S. Medical Education- Principles and Practice. 2nd edn. Pondicherry, India: NTTC JIPMER; 2000.:139-40.
4. Singh T, Anshu. Principles of Assessment in Medical Education. 1st Edn. New Delhi: Jaypee brothers Medical Publishers; 2012: 166-71.
5. Thomas CS, Mellsop G, Callender K, Crawshaw J, Ellis PM, Hall A, et al. The oral examination: A study of academic and non-academic factors. Med Educ. 1993;27: 433–9.
6. Vu NV, Johnson R, Mertz SA. Oral examination: A model for its use within a clinical clerkship. J Med Educ.1981; 56: 665–7.
7. Rangacahri PK. The targeted viva. Adv Physiol Educ 2004; 28:213–4.
8. Wakeford R., Southgate L., Wass V. Improving oral examinations: Selecting, training and monitoring examiners for the MRCGP. BMJ. 1995; 311: 931-5.
9. Evans LR, Ingersoll RW, Smith EJ. The reliability, validity, and taxonomic structure of the oral examination. J Med Educ 1966;41: 651–7.
10. Anderson, L, & Krathwohl, DA. Taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of Educational Objectives. New York: Longman; 2001.

11. Arndt CB, Guly UM, McManus IC. Preclinical anxiety: the stress associated with a viva voce examination. Med Educ.1986; 20(4):274–80.
12. Imran M, Doshi C, Kharadi D. Structured and unstructured viva voce assessment: A double-blind, randomized, comparative evaluation of medical students. Int J Health Sci (Qassim). 2019;13(2):3-9.
13. Dhasmana DC, Bala S, Sharma R, Sharma T, Kohli S, Aggarwal N, Kalra J. Introducing structured viva voce examination in medical undergraduate pharmacology: A pilot study. Indian J Pharmacol. 2016;48(Suppl 1): S52-S56.
14. Shaikh S. Objective Structured Viva Examination Versus Traditional Viva Examination in Evaluation of Medical Students. Anat Physiol. 2015; 5: 175.
15. Shenwai MR, Patil KB. Introduction of Structured Oral Examination as A Novel Assessment tool to First Year Medical Students in Physiology: J Clin Diagn Res.2013; 7(11);2544-7.
16. Rehman R, Syed S, Iqbal A, Rehan RR. Perception and performance of medical students in objective structured practical examination and viva voce. Pakistan Journal of Physiology. 2012;8(2):33-6.
17. Shah HK, Vaz FS, Motghare DD. Structured Oral Examination: From Subjectivity to Objectivity - An experience in Community Medicine**.** Journal of Educational Research & Medical Teacher. 2013;1(1):25-27.
18. Abraham RR, Raghavendra R, Surekha K, Asha K. A trial of the objective structured practical examination in physiology at Melaka Manipal Medical College, India. Adv Physiol Educ. 2009; 33(1):21–3.
19. Ganji KK. Evaluation of Reliability in Structured Viva Voce as a Formative Assessment of Dental Students. J Dent Educ. 2017 ;81(5):590-6.
20. Bagga IS, Singh A, Chawla H, Goel S, Goyal P. Assessment of Objective Structured Viva Examination (OSVE) as a tool for formative assessment of undergraduate medical students in Forensic Medicine Sch. J. App. Med. Sci., Nov 2016; 4(11A):3859-3862.
21. National Medical Commission. Competency Based Undergraduate Curriculum**.** Available from: https://www.nmc.org.in/information-desk/for-colleges/ug-curriculum. Cited 20.04.2021.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Perception Regarding Online Teaching among Undergraduate Students of a Peripheral Medical College of West Bengal: A descriptive cross-sectional study.

Surajit Lahiri[a], Saptarshi Chatterjee[b], Sohanjan Chakraborty[c], Mainak Tarafder[d]*
[a]Assistant professor, Senior Resident[c], Dept. of Community Medicine; [b]Associate professor, [d]Assistant professor, Dept. of FMT; Bankura Sammilani Medical College and Hospital, Bankura, West Bengal, India.

Article Info

Received on: 21.12.2021
Accepted on: 20.03.2022

Key words
Online class,
Pandemic,
Remote teaching,
Virtual learning.

Abstract

Background: COVID 19 pandemic has severely impacted medical education and residency training all over the world. Tele-teaching via online platforms became an apt solution as a result. This study was conducted on MBBS undergraduate students of Bankura Sammilani Medical College to describe their perception regarding e-learning. **Materials and methods:** All the students of 4th and 6th semester MBBS of Bankura Sammilani Medical College were given a pre-designed, pre-tested Google form questionnaire and their responses were collected. **Results:** 73.12% students were satisfied or very satisfied in live lecture class compared to only 28.46% in live practical class. However, for theory classes, majority felt traditional class as superior than online modes with respect to understanding of content (85.77%), less distraction during class (58.10%), interaction with faculty (88.54%), interaction with peers (86.96%), clearing of doubts (83.79%). Virtual mode gained superiority in recording of information (66.40%), flexibility of class timing (64.03%) and flexibility of continuation of class (51.78%). For practical classes, majority thought that traditional modality is better than virtual modes with respect to all the parameters. **Conclusion:** Majority of students considered traditional teaching as a better mode of teaching than virtual mode of class.

1. Introduction

The COVID 19 pandemic has impacted significantly on all the countries in view of loss of life, physical impairment, financial loss and psychological distress.[1] COVID 19 pandemic has affected all aspects of human life including medical education all over the world. With principles of social distancing and lockdown being enforced, all theory and practical classes were suspended. With the advancement of information technology, plethora of medical knowledge is available online. Whilst not ideal, tele-teaching may prove to be an apt solution in the current scenario.[2]

How to cite this article: Lahiri S, Chatterjee S, Chakraborty S, Tarafder M. Perception Regarding Online Teaching among Undergraduate Students of a Peripheral Medical College of West Bengal: A descriptive cross-sectional study. J For Med Sci Law 2022;31(2):45-49.

***Corresponding author** Dr Mainak Tarafder, Assistant professor, Dept. of FMT; Bankura Sammilani Medical College and Hospital, Bankura, West Bengal, India. Email: mainak.cmc@gmail.com

Rather than leaving students to their own devices, online teaching guides student learning and places content within the overall context of their curriculum.[2] A new competency based medical education curriculum is being implemented in all medical colleges in India since August 2019 for first year undergraduates' batch.[3] In this scenario, adapting to virtual teaching modalities pose a challenge to medical educators. Bankura Sammilani Medical College started online teaching for all semesters of MBBS students since early April 2020. We conducted a cross-sectional study on 4th and 6th semester students to gauge their response to online teaching in comparison to the traditional teaching from their one-year experience i.e., 1st April 2020- 31st March 2021.

Objectives:

- To estimate the level of satisfaction of students in online classes.
- To assess the preference of online teaching over traditional teaching.

2. Materials and Methods:

- **Study type and design**: Descriptive, cross-sectional study.
- **Study settings and study period:** The study was conducted in Bankura Sammilani Medical College from August'20 to November'20.
- **Study population:** All the 300 MBBS students of 4th and 6th semester of Bankura Sammilani Medical College were included in this study.
- Ethical approval was obtained from institutional Ethics Committee of Bankura Sammilani Medical College. Informed consent was obtained from all participants in the study.
- **Sample size & sampling technique**- 253 out of 300 students submitted their response. Complete enumeration method was used.
- **Tools, Techniques, Data collection and analysis:** The participants were given a pre-designed and pre-tested Google form questionnaire for this study. Their responses were entered in an excel sheet and checked twice to detect any erroneous entry. Data were organised and presented in the forms of tables and diagrams. Principles of descriptive statistics were used.

3. Results

3.1 Demography of the sample population

There were total 253 students out of which male students were 135 (53.36%) and female students were 118(46.64%). Among them 115(45.45%) students were from 4rth semester and 138(54.55%) students were from 6th semester. Mean age of students were 21.4 years, SD 1.18 years. 76 (30.04%) students belonged from rural area and 177(69.96%) students belonged from urban area. In Higher Secondary level, 96(37.94%) students studied in Bengali medium, 150(59.29%) students studied in English medium, 6(2.37%) students studied in Hindi medium and 1 (0.4%) student studied in Urdu medium. Among the students, number of day scholars were 56(22.13%), whereas 194(76.68%) were hostelite and 3(1.19%) students stayed as paying guest.

3.2 Devices and media used by the students to participate in online class.

Table no.1 shows different gadgets used by the students to participate in online classes. Majority of the students used mobile phones as gadget for online classes.

Table 1: Distribution of number of students according to devices used by them: (n=253)

Devices	Number of students (%)
Mobiles only	218(86.16)
Mobile + Desktop	4(1.58)
Mobile + Desktop +Laptop	1(0.4)
Mobile + Laptop	22(8.7)
Mobile + Laptop + Tablets	4(1.58)
Mobile + Tablets	4(1.58)
Total	253(100)

168 (66.4%) students used Earphone as audio device whereas 82(32.41%) students used speaker of device as audio device. Only 3(1.19%) students use standalone speakers. Zoom App and Google Meet were mainly used to conduct the live classes. Coordination of classes was done through Whatsapp and through Google Classroom. Material upload was done in YouTube, through WhatsApp and through Google classroom. Doubts were clarified in live class over voice in 126(49.8%) students and later by messages/mails in 127(50.2%) students.

3.3 Opinion of students regarding online classes

Table 2: Distribution of number of students according to satisfaction level in virtual live lecture class: (n=253)

Satisfaction level	Number of students (%)
Very Unsatisfied	7(2.77)
Unsatisfied	25(9.88)
Undecided	36(14.23)
Satisfied	147(58.10)
Very Satisfied	38(15.02)
Total	253(100.00)

Table 3: Distribution of number of students according to satisfaction level in virtual live practical class: (n=253)

Satisfaction level	Number of students (%)
Very Unsatisfied	87(34.39)
Unsatisfied	52(20.55)
Undecided	42(16.60)
Satisfied	44(17.39)
Very Satisfied	28(11.07)
Total	**253(100.00)**

Table No. 2 & 3 respectively shows satisfaction level in virtual live lecture class and live practical class. Majority of students (73.12%) were satisfied or very satisfied in live lecture class but that percentage was significantly lower (28.46%) in live practical class. **Table 4** shows that for theory classes, traditional face to face class is superior than online modes with respect to understanding of content (85.77%), less distraction during class (58.10%), interaction with faculty (88.54%), interaction with peers (86.96%), clearing of doubts (83.79%). Virtual mode of class is superior with respect to recording of information (66.40%), Flexibility of class timing (64.03%) & flexibility of continuation of class (51.78%).

Table 5 shows that for Practical classes, traditional modality is superior than virtual modes with respect to understanding of content (93.28%), less distraction during class (72.33%), interaction with faculty (91.70%), interaction with peers (91.70%), clearing of doubts (92.49%), recording of information (61.26%), flexibility of class timing (54.94%) & flexibility of continuation of class (65.61%).

Table 4: Distribution of number of students according to their preferred mode of theory class and different parameters of perception: (n=253).

Parameters	Face to Face No (%)	Virtual No (%)	Total No (%)
Understanding of Content	217(85.77)	36(14.23)	253(100.00)
Less distraction during class	147(58.10)	106(41.90)	253(100.00)
Recording of Information	85(33.60)	168(66.40)	253(100.00)
Flexibility of class timing	91(35.97)	162(64.03)	253(100.00)
Flexibility of continuation of class	122(48.22)	131(51.78)	253(100.00)
Interaction with faculty	224(88.54)	29(11.46)	253(100.00)
Interaction with peers	220(86.96)	33(13.04)	253(100.00)
Clearing of doubts	212(83.79)	41(16.21)	253(100.00)

Table 5: distribution of students according to their preferred mode of practical class and different parameters of perception: (n=253).

Parameters	Face to Face No (%)	Virtual No (%)	Total No (%)
Understanding of Content	236(93.28)	17(6.72)	253(100.00)
Less distraction during class	183(72.33)	70(27.67)	253(100.00)
Recording of Information	155(61.26)	98(38.74)	253(100.00)
Flexibility of class timing	139(54.94)	114(45.06)	253(100.00)
Flexibility of continuation of class	166(65.61)	87(34.39)	253(100.00)
Interaction with faculty	232(91.70)	21(8.30)	253(100.00)
Interaction with peers	232(91.70)	21(8.30)	253(100.00)
Clearing of doubts	234(92.49)	19(7.51)	253(100.00)

4. Discussion:

There were total 253 students out of which male students were 53.36% and female students were 46.64%. Mean age of students were 21.4 years, SD 1.18 years. Similarly, in a study by Uma et al[4] there were 50.3% females and 49.7% males where mean age of the respondents was 21.5years. Daroedono et al [5] and Surana et al[6] reported mean age of their respondents as 21.2 and 21.7 years respectively. Majority (86.16%) of the students in our study used only mobile phone as gadget. Uma et al. found that 90% students preferred mobile for e-learning.

Majority of students (73.12%) were satisfied or very satisfied in live lecture class but that percentage is significantly lower (28.46%) in live practical class in our study. Uma et al. found that 50% students seemed to be satisfied with online teaching, and 20.9% were dissatisfied. Baczek et al[7] observed acceptance of e-learning in 73% respondents who rated e-learning as enjoyable, of these, 15% found it extremely enjoyable, 29% found it very enjoyable & 27% students did not enjoy online learning. In our study traditional face to face lecture class is superior than online modes with respect to understanding of

content (85.77%), less distraction during class (58.10%), interaction with faculty (88.54%), interaction with peers (86.96%), clearing of doubts (83.79%). Baczek M et al[7] showed e-learning was considered less effective than face-to-face learning in terms of increasing skills (P<.001) and social competences (P<.001), students assessed that they were less active during online classes compared with traditional classes (P<.001).

We found virtual mode of lecture class was superior with respect to recording of information (66.40%), flexibility of class timing (64.03%) & flexibility of continuation of class (51.78%). Similarly, Singh KV et al [8] showed majority of the students perceived that time flexibility (58.5%) and location flexibility (62.0%) in online learning as beneficial, also approximately half (49.4%) of the students agreed that there is no need to get ready/dress up for attending online classes.

This study was focused on the students' perspective on the usefulness and applicability of online teaching in medical education. However, a better and more statistically appropriate result could be obtained by doing the study on all undergraduate students of multiple medical colleges. But due to logistical constraints we have focused on two semesters of our medical college.

COVID-19 pandemic created tough challenges for all educational systems[9] and had affected educational system worldwide.[10,11] At the same time, there is a strong opportunity for us to adopt newer online technique that is more suitable for the present generation learners.[12, 13].

5. Conclusions

Teaching and learning are two mutually dependent intertwined processes which has undergone a paradigm shift in recent years. Medical education in India after remaining stagnant for decades finally has started to change with times. With the implementation of new competency-based curriculum (CBME), there are major changes in undergraduate teaching-learning pattern.[14]

Teachers are encouraged to change themselves into Facilitators and traditional one directional teaching has been transformed into learner centric two directional teaching and learning. But this transformation process has faced its biggest challenge in the form of Covid 19 pandemic. Physical classrooms with teacher and students facing each other transformed overnight into virtual classrooms where teacher and students are sitting in their respective drawing rooms and participating in teaching learning activities virtually using various methods. This virtual teaching is new to medical educators in our country and remote learning is also a novel experience for undergraduate medical students of our country. So, there are few initial teething problems.

Most participants in our study liked online teaching methods for their flexibility and use of multimedia but lack of interaction remained disadvantage for virtual teaching learning methods. We hope that more similar studies will be done in near future to uncover different factors affecting virtual learning experience of students and then appropriate steps should be taken by both government and private stakeholders to ensure development of a better online medical education infrastructure in our country.

Acknowledgement: We acknowledge Prof. Dr. Partha Pratim Pradhan, Principal, Bankura Sammilani Medical College, Prof. Dr. Aditya Prasad Sarkar, Head of the Department, Department of Community Medicine, Bankura Sammilani Medical College, Prof. Dr. Prabir Chakraborty Head of the Department, Department of Forensic Medicine & Toxicology, Bankura Sammilani Medical College and all the students of 4th and 6th semester of Bankura Sammilani Medical College for their support in this work.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References

1. Patil SS, Deokar RB, Dere RC, Kukde HG, Kumar NB. Medico-legal and Ethical Issues in Context to COVID-19 Pandemic. J For Med Sci Law. 2021;30(2):57-62.
2. Bongomin F, Erima B, Kwizera R, Odongo-Ahinya EI. Online Learning Resources Enhanced Teaching and Learning of Medical Mycology among Medical Students in Gulu University, Uganda. Educ Res Int.*2020*: 1-5.
3. Deokar RB, Patil SS. Competency based Medical Education curriculum for Undergraduates Forensic Medicine Perspectives. J For Med Sci Law. 2019;28(2):1-2.

4. Uma G, Vartika T, Kumar GN. Perception about online learning among medical students in northern India during lockdown period of COVID - 19: a cross sectional study. International Journal of Contemporary Medical Research. 2020;7(12): L6-L10.
5. Daroedono E, Siagian FE, Alfarabi M, Cing JM, Arodes ES, Sirait RH, et al. The impact of COVID-19 on medical education: our student's perception on the practice of long-distance learning. Int J Community Med Public Health. 2020; 7:2790-6.
6. Surana A, Panika RK, Gupta V, Singh A. Principal components analysis of educational resources usage among undergraduate medical students during the COVID-19 pandemic in Southern Haryana, India. J Sci Soc. 2020; 47:99-104.
7. Bączek M, Zagańczyk-Bączek M, Szpringer M, Jaroszyński A, Wożakowska-Kapłon B. Students' perception of online learning during the COVID-19 pandemic: A survey study of Polish medical students. Medicine *(*Baltimore*)*. 2021;100(7): e24821. doi:10.1097/MD.0000000000024821
8. Singh KV, Aqeel KI, Misra SK. A cross-sectional study of perception among medical students on online learning amid COVID-19 pandemic, at government medical college, Agra, India. Int J Community Med Public Health. 2021;8: 248-52.
9. Theoret C, Ming X. Our Education, Our Concerns: Medical Student Education Impact due to COVID-19. Med Edu. 2020;54(7) :591-2.
10. Chick RC, Clifton GT, Peace KM, et al. Using technology to maintain the education of residents during the COVID-19 pandemic. J Surg Educ. 2020;77(4):729-32.
11. Dhawan S. Online Learning: A Panacea in the Time of COVID-19 Crisis. J Edu Tech Sys. 2020;49: 5–22. doi: 10.1177/0047239520934018.
12. Roberts DH, Newman LR, Schwartzstein RM. Twelve tips for facilitating Millennials' learning. Med teacher. 2012;34(4):274-8.
13. Davies BS, Rafique J, Vincent TR, Fairclough J, Packer MH, Vincent R, Haq I. Mobile Medical Education (MoMEd)-how mobile information resources contribute to learning for undergraduate clinical students-a mixed methods study. BMC medical education. 2012;12(1):1-1.
14. Deokar RB, Patil SS. Workplace based Assessment in Clinical Forensic Medicine. J For Med Sci Law. 2020;29(1):1-3.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Knowledge, Attitude & Perception of 2nd year Medical students about Medicolegal Autopsy.

SV Dhoble[a], SS Dhoble[b]*, BW Ramteke[c], SG Dhawane[d], NK Tumram[e]
[a]Assistant Professor, [c]Medical Officer, [e]Professor, Department of Forensic Medicine, Government Medical College& Hospital; [b]Assistant Professor, Community Medicine, Ramnagar, Chandrapur, Maharashtra, India. [d]Professor, Department of Forensic Medicine, Government Medical College, Nagpur, Maharashtra, India.

Article Info

Received on: 30.06.2022
Accepted on: 10.11.2022

Key words
Students,
Forensic medicine,
Post-test,
Medico legal autopsy.

Abstract

Background: Autopsy is an important procedure & search tool for not only to reach the cause & manner of death but also to find out identify of deceased and to catch criminal by collecting biological evidence at Post mortem examination. **Material & Methods:** The present study is Knowledge, Attitude & Perception (KAP) Study. The study was conducted in Department of Forensic Medicine of tertiary care institution. **Results:** Most of the students (48%-55%) knew that Inquest from investigating officer is must For Medicolegal autopsy. Most of the participants knew that PM examination on deceased body is duty of Registered Medical Practitioner. Students opined that Tissues for Histopathological Analysis are most commonly preserved in 10% Formalin. Majority of students (53%-55%) strongly agreed that Observation & demonstration of medico legal Autopsy in 2nd MBBS. While more of the students (54%-56%) agreed that More exposure to PM examination/ Medicolegal autopsy is required to handle Medicolegal question in future of Indian medical graduate. Students strongly agreed that Medicolegal autopsy plays an important role in administration of justice by providing significant information about death of deceased in Court of Law. **Conclusions:** Concept of students should be thoroughly clear to avoid repetition of same mistakes. Medical students should be encouraged and facilitated to watch more autopsies and their practical training of autopsies should be more effective to serve the purpose.

1. Introduction

Autopsy is an important research instrument to establish cause of death. In India, according to the curriculum of the Medical Council of India, a medical student should witness medico legal autopsies in the second year of Batchelor of Medicine & Bachelor of Surgery (MBBS). The aim of this study is to investigate the general attitude of medical students of 2nd, years MBBS towards medico-legal autopsy.[1]

Post mortem examination is a process which is required to establish the exact cause of death in sudden, suspicious or unnatural cases. It determines the mode, manner and time passed since death.[2]

How to cite this article: Dhoble SV, Dhoble SS, Ramteke BW, Dhawane SG, Tumram NK. Knowledge, Attitude & Perception of 2nd year Medical students about Medicolegal Autopsy. J For Med Sci Law 2022;31(2):50-55.

***Corresponding author** Dr S S Dhoble, Assistant Professor ,Department of Community Medicine, Government Medical College & Hospital, Ramnagar, Chandrapur, Maharashtra, India. Email id: shitalpsm@gmail.com

In India, according to the curriculum of the Medical Council of India, a medical student should witness a minimum number of medico legal autopsies in the second year so that they can observe and interpret various findings.[3] Students are exposed to Autopsy Practice, the aim of which is to acquaint the students with the morphological changes of organs and tissues in diseases, to expose the students to forensic pathology and to equip the students with the knowledge of the importance of autopsy in research andauditing.[4] The value of autopsy has been proven in its elucidation of the cause of death, clinical quality control, medical auditing and in medical education.[5,6] Though medico legal autopsy is mandatory in most of the setup, the relatives of the deceased may have negative attitude towards autopsy.[7] It is worth noting that, before the autopsy in cases of death by natural causes, verbal acquiescence from the family or person responsible is not enough. Thus, after the detail and careful reading of the text explaining how the procedure is performed, it is essential to formalize acquiescence through the signing of an informed consent term.[8]

Autopsy is important tool to find out the cause of death. Many of medical student before gaining medical knowledge they acquire information from surrounding or media as knowledge about post mortem examination. That should be upgraded through correct medical education so that every medical student should teach & upgrade people in society about importance of Autopsy or Post mortem examination.

Aim And Objectives:

Aim: To explore the knowledge, attitude& Perception of 2nd year medical students regarding post mortem examination at the very beginning of their Para clinical course study.

Objectives:

1. To assess the knowledge, attitude & perception regarding medicolegal autopsy in medical students.
2. To analyze the up gradation of knowledge of students in 2nd year regarding medicolegal autopsy.
3. To access the interest in medical students about medicolegal autopsy as part of undergraduate curriculum.
4. To access quality of medical education provided to student so as to improve in medical education teaching techniques.

2. Methods

The present study is Knowledge, Attitude & Perception (KAP) Study. The study was conducted in Department of Forensic Medicine of tertiary care institution. Medical students who had just entered to Second year of MBBS, & who gave consent to participate in project had been included in study. There was total 100 medical students who entered in 2nd year MBBS course, student who were willing to participate in study and after the approval of Institutional Ethics Committee (IEC) study had been started. Multiple choice questions type questionnaire was prepared in accordance with the study objective. Before administering questionnaire to the study participants, Authors explained study procedure to Participants in terms of:

a. They would be questioned twice during the study, first as Pretest before teaching topic relating to Autopsy and second as Posttest would be after completion of same topic.
b. Basic knowledge, attitude & perceptions about Post mortem examination would be noted.
c. If anyone wants to withdraw from study, they could withdraw.
d. The collected data would be used only for study purpose and would be confidential.

Multiple choice questions type questionnaire administered to the study participants and the obtained data tabulated in Microsoft excel. Teaching session including theory and practical classes on Autopsy had been conducted as per University Syllabus. After the teaching sessions, post-test be conducted immediately containing the same questionnaire and the data collected. Data entered using Microsoft Excel 2010 Software. All the response tabulated and Graphical representation made wherever necessary. Data analyzed by using Statistical Package for the Social Sciences (SPSS) Software version 17.0. Statistical tool used as percentage and non-parametric test.

3. Results

Age and sex wise distribution of subject participated amongst medical students as mentioned in **Table 1** observed that most common age group as 20 yrs (43%) nearly equal in gender followed by 19 yrs (31%) of age. Most of them are males (55%) followed by female (45%). **Table 2** shows that Most of student considered that Medicolegal Autopsy (PM examination) is necessary for deaths where cause of death is unknown in Pre (71%) & Posttest (72%). Most

Table 1: Age & sex Wise distribution of Participants (Number Denote percentage as N=100).

S. No.	Age	Sex		Total
		Male	Female	
1	18 yr	0	2	4
2	19 yr	15	16	31
3	20 yr	22	21	43
4	21 yr	12	6	18
5	22 yr	4	0	4
Total		**55**	**45**	**100**

of the students (48%) in pretest knew that Inquest from investigating officer is must For Medicolegal autopsy, which increased in posttest (55%) after teaching of Autopsy Topics. Most of the participants knew that PM examination on deceased body is duty of Registered Medical Practitioner (Indian medical graduate) (91%) in pre posttest (92%). In pretest Students answered that Dead body preserved in at temperature -5^0 C (66%) while in posttest only half (50%) of subjects answered same. Majority of students (98% in Pretest & 94 % in posttest) knew that During Post mortem examination both external & Internal examination is must. About (79%) of participant opined in pretest that Tissues for Toxicological Analysis are most commonly preserved in 10% Formalin while in posttest only (63%) participant opined same. Only half (49%) of participants opined in pretest that Tissues for Histopathological Analysis are most commonly preserved in 10% Formalin while in posttest it increased up to 2/3rd (75%) participants opined same.

Most common student (37%) suggested that PM examination is done by / conducted by A doctor with Doctor of Medicine (MD) in Forensic Medicine only in pretest while in Posttest same answer of the question was given by a greater number of medical students (48%). In both pre & Posttest, the Main reason for Post mortem Examination is answered to find out the cause of death (92%) & about half of the students came to know about Post mortem examination (Autopsy) from TV & Media in majority of the cases (53-52%).

Table 2: **Knowledge, Attitude & Perception of Medical Students about Autopsy (Number Denote percentage as N=100).**

Que. no.	Questions	Most Common Answer by Students-Pre test		Most Common Answer by Students-Post test	
		option	%	option	%
1	Medicolegal **Autopsy**(PM examination) is necessary for	(b) Deaths where cause of death is unknown	**71**	b	72
2	For Medicolegal autopsy, following is **must**	(b) Inquest from investigating officer	**48**	b	55
3	PM examination on deceased body is **duty of**	(a) Registered Medical Practitioner(Indian medical graduate)	**91**	a	90
4	Dead body preserved in at **temperature**	(a) -5^0 c	**66**	a	50
5	During **PM examination**	(c) Both external & internal examination is must	**98**	c	94
6	Tissues for **Toxicological** Analysis are most commonly preserved in	(b) 10% Formalin	**79**	b	63
7	Tissues for **Histopathological** Analysis are most commonly preserved in	(b) 10% Formalin	**49**	b	75
8	PM examination is **done by / conducted** by	(b) A doctor with MD in Forensic Medicine only	**37**	b	48
9	The Main **reason** for Post mortem Examination is	(a) To find out the cause of death	**92**	a	92
10	From where did you **know** about Post mortem examination (Autopsy)	(a) TV & Movies	**53**	a	52

Table 3: Knowledge, Attitude & Perception of Medical Students with Agree , Disagree with Medicolegal Questions (Number Denote percentage as N=100).

Que. No.	Answers- Pretest					Answers- Post test				
	(a) Strongly agree	(b) Agree	(c) Not sure	(d) Dis-agree	(e) Strongly disagree	(a) Strongly agree	(b) Agree	(c) Not sure	(d) Dis-agree	(e) Strongly disagree
11	**53**	41	5	1	0	**55**	40	5	0	0
12	36	**54**	6	3	1	31	**56**	10	3	0

13	**55**	42	2	0	1	**64**	35	1	0	0
14	41	**48**	6	5	0	**46**	41	10	3	0
15	28	**37**	26	5	4	33	**50**	10	5	2
16	12	**41**	33	14	0	11	**47**	27	12	3
17	15	21	**29**	25	10	7	18	**30**	32	13
18	16	34	**37**	11	2	14	**33**	29	22	2
19	40	**55**	3	2	0	40	**53**	2	3	2
20	3	6	6	41	**44**	7	5	5	37	**46**

Questionnaire no. 11 to 20:

11. Observation & demonstration of medico legal Autopsy (PM examination) in 2nd MBBS is necessary for clearing medico legal issues & proper understanding of subject.
12. More exposure to PM examination/ Medicolegal autopsy is required to handle Medicolegal question in future of IMG(Indian medical graduate).
13. Medicolegal autopsy plays an important role in administration of justice by providing significant information about death of deceased in Court of Law
14. Actual Demonstration of Medicolegal autopsy provides an opportunity to the students to discuss with their teachers the Medicolegal issue related to autopsy
15. Advanced equipment during PM examination can reduce disfiguration of body.
16. It emits foul smelling due to PM examination
17. Organs can be donated before autopsy even if body is posted for PM examination.
18. Virtual autopsy should be done as much as possible in present era of technology.
19. Autopsy chapter required to be discussed in details in the under graduate Forensic Medicine course.
20. Study of post mortem examination & observation of Autopsy should be completely removed from the course medical curriculum.

Interpretation of **table 3** showed that Majority of students (53%-55%) strongly agreed that Observation & demonstration of medico legal Autopsy (PM examination) in 2nd MBBS is necessary for clearing medico legal issues & proper understanding of subject. While more of the students (54%-56%) agreed that More exposure to PM examination/ Medicolegal autopsy is required to handle Medicolegal question in future of IMG (Indian medical graduate). In pretest about (55%) students strongly agreed that Medicolegal autopsy plays an important role in administration of justice by providing significant information about death of deceased in Court of Law, which increased in posttest about (64%). Majority of students (48%) agreed in pretest for Actual Demonstration of Medicolegal autopsy provides an opportunity to the students to discuss with their teachers the Medicolegal issue related to autopsy which changes to Strongly agreed (46%) in posttest.

Only one third (37 %) of the students in Pretest advised that Advanced equipment during PM examination can reduce disfiguration of body while half of the students (50%) IN Posttest. 41 % participant in pretest agreed that it emits foul smelling due to PM examination while in Posttest 47% participant agreed same. Majority of students (29%) Not sure in pretest about Organs can be donated before autopsy even if body is posted for PM examination, while most of students disagreed (32%) in posttest. More of students not sure (33%) that Virtual autopsy should be done as much as possible in present era of technology in pretest, while majority of students agreed (37%) for virtual autopsy. More than half of the students (55%) agreed in pretest that autopsy chapter required to be discussed in details in the under graduate Forensic Medicine course, while in posttest also more students (53%) agreed for same. About half of the students strongly disagreed that Study of post mortem examination & observation of Autopsy should be completely removed from the course medical curriculum in pretest (44%) & in Posttest (46%).

4. Discussion

Autopsies allow students to grasp pathology in clinical contexts. There are many factors that affects learning and they are beyond the control of educators, such as prior life experience, cultural or religious beliefs, and psychological predispositions.[1] In this study Majority of subjects were students of age 19- 20 yrs (74%) this is because the common group of students admitted in MBBS course belong to age group 17-21 yr. Most of them are males (55%). This finding coincides with studies of Ravi Rautji el al[3] where participants belong to 17-20 yrs (81.3%). In study of Ekanem VJ et al[4] most common age group is 21-25 yr (56.7%) and most of them were males

(55.8%). In study of Nuwadatta Subedi[7] also most common (72.31%) were male participants. Our findings also compare favorably with the findings of Brieger WR[9] in 1980 and Ekanem VJ et al[4] in 2006.

In present study Most of students considered that Medicolegal Autopsy (PM examination) is necessary for deaths where cause of death is unknown, which coincides with study of Shamshuddin R. Kakkeri et al[1] & Ahmad M. et al[2] where most of the participants (78%), (76.52%) required autopsy to know cause of death respectively. In our study Most of the students (48%-55%) knew that Inquest from investigating officer is must For Medicolegal autopsy which is contradictory findings with study of Shamshuddin et al[1] where only few (1.7 %) subjects opined that inquest is must Before conducting medico-legal autopsy.

In our study Most of the participants knew that PM examination on deceased body is duty of Registered Medical Practitioner (Indian medical graduate) (91-92%) and many Students answered that dead body preserved in at temperature -5^0 C (50%-66%). This suggests fruitful academic teaching and better intelligence of medical students because of new era of post graduate entrance exam-oriented students almost everywhere in medical colleges. Our study showed Majority of students (96%) knew that During Post mortem examination both external & internal examination is must which is similar findings in Shamshuddin[1] study where both internal & external examination is required in Medicolegal autopsy (83.4%).

In this study Participants opined that Tissues for Toxicological Analysis are most commonly preserved in 10% Formalin in pretest (79%) which reduced in posttest (63%) this is also similar findings in Shamshuddin[1] study where participants (93%) replied that Tissues for Toxicological Analysis are most commonly preserved in 10% Formalin. Similarly in our study Students opined that Tissues for Histopathological Analysis are most commonly preserved in 10% Formalin Only (49%) in pretest which increased (75%) in posttest. This may be due to correct teaching exposure to students who confused in pretest but corrected in posttest. While in study of Ahmed M[2] many participants (60.87%) answered that Formalin is preservative for collection of the Viscera samples. This study reflected that Most of the students suggested that PM examination is done by / conducted by a doctor with MD in Forensic Medicine only while in study of Ravi Rautji[3] many participants (21%) suggested that there should be More involvement of autopsy surgeon during autopsy.

The Main reason for Post mortem Examination is answered To find out the cause of death (92%) which is same consideration in study of Shamshuddin et al[1] where (78%) participants replied that Medico-legal postmortem examination is mandatory in all unnatural and sudden unexpected and suspicious death cases & same findings noted in study of Ahmad M et al[2] (76.52%) & in study of Nuwadatta Subedi et al[7] (98.46%) & in present study about half of the students came to know about Post mortem examination (Autopsy) from Television (TV) & Media in majority of the cases (53-52%), this is contradictory findings with study of Ahmad M[2] where student knew about autopsy from Medical Curriculum books (35.65%). In our study Majority of students (53%-55%) strongly agreed that Observation & demonstration of medico legal Autopsy / Post Mortem (PM) examination in 2nd MBBS is necessary for clearing medico legal issues & proper understanding of subject. Similarly in study of Shamshuddin et al[1] students (87.8%) answered that Students should watch more postmortem Examination.

In present study many of the students (54%-56%) agreed that more exposure to PM examination/ Medicolegal autopsy is required to handle Medicolegal question in future of Indian Medical Graduate (IMG). Many of our Students strongly agreed that medicolegal autopsy plays an important role in administration of justice by providing significant information about death of deceased in Court of Law. There should be compulsory training sessions for dealing with medicolegal issues especially medicolegal autopsy.[10] In study of Ekanem VJ et al[4] most of participants, i.e., about 2/3rd students recommended that medical student should watch medicolegal autopsy (74%) and student should actively participated in performing Autopsy (76%). In this study Majority of students (48%) agreed for Actual Demonstration of Medicolegal autopsy provides an opportunity to the students to discuss with their teachers the Medicolegal issue related to autopsy. In our study the students advised that advanced equipment during PM examination can reduce disfiguration of body while half of the students (50%) In Posttest which was also same findings in study of Ravi Raoutji[3] that participants

suggested Replacement of primitive instruments with modern ones in the autopsy room (74%). About half of students agreed that it emits foul smelling due to PM examination. Majority of students disagreed (32%) in posttest about Organs can be donated before autopsy even if body is posted for PM examination.

In present study students agreed (37%) in posttest that Virtual autopsy should be done as much as possible in present era of technology. Similarly in study of Shamshuddin et al[1] students (92.1%) preferred virtual autopsy while in study of Ahmad M[2] Most of students (58.26%) Knew that virtual autopsy is new form of Post mortem examination. More than half of the students agreed that autopsy chapter required to be discussed in details in the under graduate Forensic Medicine course. This finding coincides with study of Ahmad M[2] almost all participants (100%) told that autopsy chapter required to be discussed in details in the under graduate Forensic Medicine course. About half of the students strongly disagreed that Study of post mortem examination & observation of Autopsy should be completely removed from the course medical curriculum which is similar findings in study of Shamshuddin et al[1] that (80%) participants said No to Post Mortem examination should be scrapped from medical education and in study of Ahmad M[2] many participants (93%) told that autopsy should not be scrapped from medical education.

Limitations

More of participants are students from Government Medical College, and cannot be taken as consideration for whole population systemic sample method of all students in Maharashtra Medical Colleges which also have Private medical college & autonomous universities. Many of student prepared well before online classes because of Pandemic Covid-19 so there may be chance of error in answers given in Pre & Posttest by the participants.

5. Conclusions

Medical students came prepared for classes in medical education. Concept should be thoroughly clear to avoid repetition of same mistakes. Actual demonstration of autopsy procedure with its importance in medicolegal scenario is to be taken practically than online classes because of Pandemic Covid-19. Medical students should be encouraged and facilitated to watch more autopsies and their practical training of autopsies should be more effective to serve the purpose.

List of Abbreviations:-

MBBS : - Batchelor of Medicine & Bachelor of Surgery
MD : - Doctor of Medicine
KAP : - Knowledge, Attitude & Perception
IEC : - Institutional Ethics Committee
SPSS : - Statistical Package for the Social Sciences
TV : - Television
PM : - Post mortem
IMG : - Indian Medical Graduate

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. Kakkeri SR, Ahmed KM, Ahmad SR, Khan R. Knowledge and attitude of medical students toward medico- Legal autopsy. IP International Journal of Forensic Medicine and Toxicological Sciences. 2018;3(1):8-11.
2. Ahmad M, Rahman MF, Rahman FN, Rahman MA. Knowledge and Attitude of 3rd Year Medical Students regarding Post Mortem Examination. JAFMC Bangladesh. 2016; 12(2): 9-14.
3. Rautji R, Kumar A, Behera C. Attitudes of Medical Students towards Medico-legal/Clinical Autopsy. J Indian Acad. Forensic Med.2013; 35(4): 358-61.
4. Ekanem VJ, Akhigbe KO. Attitudes of Nigerian Medical Students Towards Autopsy. Turk J Med Sci.2006;36: 51-6.
5. Teo CE. The autopsy. Singapore Med J. 1997; 38:71-5.
6. Diegbe IT, Idaewor PE, Igbokwe UO. Autopsy audit in a teaching hospital in Nigeria Ð the Benin experience. West Afr J Med.1998; 17:213-6.
7. Subedi N, Paudel IS, Kandel D, Chudal A. Knowledge and perception of public towards medical legal autopsy in Nepal. Journal of Lumbini Medical College. 2018;6(1):6-10.
8. Luiz Otávio Savassi Rocha. Autopsy and medical education. Rev Med Minas Gerai. 2014; 24(1): 103-110.
9. Brieger WR. Attitudes of Nigerian medical students towards rural practice. Journal of med Edu. 1980; 54: 427-29.
10. Deokar R B, Patil S S, Bhise S S, Medicolegal Cases in Hospitals. J For Med Sci Law. 2018;27(2):1-2.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Speaker identification of the Electronically Disguised Voices

Palak Aneja[a], Sumit Kumar Choudhary[b], Surbhi Mathur[c]

[a]Research Scholar; [b]Senior Assistant Professor, School of Forensic Science, Risk Management & National Security, Rashtriya Raksha University Gandhinagar, Gujarat, India. [c]Senior Assistant. Professor, School of Forensic Science, National Forensic Science University, Gandhinagar, Gujarat, India.

Article Info

Received on: 13.09.2021
Accepted on: 09.02.2022

Key words
Acoustic,
Disguise,
Forensic,
Speaker,
Identification.

Abstract

Background: Voice is said to be unique for every individual and can be used for the identification. Significant intra variation in Speech samples can be seen with the changes in the physical and mental conditions. Analysis of disguised voice samples is challenging to the Forensic Speaker Identification Expert. Speech processing softwares which are freely available and can be used to change voice samples. These softwares add some background variations along with the alter in the frequency distribution in the voice. **Methodology:** This paper focuses on the examination of the voice samples which are processed by a freely available android application which changes the female voice samples to that of male. The examination was done on the OT- Expert 6.0. The Examination of the voices was done by the Aural-Acoustics method. **Results:** For the examination of the voice samples on acoustics parameters such as fundamental frequency(F0) and Formant Frequencies (F1, F2, F3, F4) for 5 vowels (/ʌ/, /ɔ/, /i/, /I/, /u/) compared with their control recordings showed prominent and noteworthy differences. Aural examination parameters such as relative pauses, background variations, and linguistic features such as delivery of speech, specific pronunciations for words remained similar. **Conclusion:** Some specific formant frequencies for 5 vowels (/ʌ /, /ɔ /, /i /, /I /, /u/) combined with auditory parameters especially the degradation of background of the audio for suspecting a case of electronically disguised voice and then compared it with a possible list of suspects for speaker identification. Therefore, based on some specific aural-acoustics features electronically disguised voices can be identified amongst the suspected voice sample.

1. Introduction

Speaker recognition is the technique used for the identification of the speaker using speaker-specific information from the speech signals. Speaker identification is the process of determining from which of the registered speakers a given utterance comes;

How to cite this article: Aneja P, Choudhary SK, Mathur S. Speaker identification of the Electronically Disguised Voices. J For Med Sci Law 2022;31(2):56-60.

Corresponding author: Palak Aneja, Research Scholar, School of Forensic Science, Risk Management & National Security, Rashtriya Raksha University, Gandhinagar, Gujarat, India. Email id: palakaneja78083@gmail.com (M): +91-9999832247.

speaker verification is the process of accepting or rejecting the identity claimed by a speaker[1] Some applications include secure access control by voice, customizing services, or information to individuals by voice, indexing or labelling speakers in recorded conversations or dialogues, surveillances.[2]

In voice disputed cases encountered in Forensic Science both the scenarios speaker identification and verification are very significant. Identification is correlated with the physiological and behavioural characteristics of an individual's speech production system.[3] To hide their identity criminals, use various disguise methods like keeping a handkerchief over the phone's mic or producing nasal sound, doing mimicry to cheat with the system etc.[1] All these methods open new challenges to the forensic speaker identification expert. The last decade's development in the software technology has provided more options in disguising the identity. There are multiple android and windows operating applications that change the given voice to that of alien, robot, other gender, child etc. Forensic Speaker identification in India and some other countries majorly depends on the Formant Frequency, Pitch, and Auditory methods for analysis.[4]

This research has reported a voice conversion method based on analysis and transformation of the characteristics that define a speaker's voice.[5] This manuscript gave an overview of real-world applications by extensively studying existing systems of voice conversion, and discussed remaining challenges in the voice conversion system.[6] In one of the study Voice feminization therapies were exploited for male to female transgender women by increasing the fundamental frequency and increasing the formant frequency, the result suggested that voice was convincing as not male.[7] Research conducted to investigate the contribution of formant frequencies for gender identification found that female speaker was perceived as a female even at a speaking fundamental frequency in the typical male range, whereas for male speaker's gender perception was less accurate at speaking fundamental frequencies at 165 Hz and higher. Even if there was considerable overlap between genders, significant differences in formant frequencies of male and female were seen.[8]

2. Experimental Procedures

To conduct this study, voice samples of 50 females from age 20- 35 years were collected. All the recordings were collected in a controlled environment at the Acoustics Laboratory at the School of Forensic Science & Risk Management, using Motu Audio System. Hindi Transcript was given to all the speakers. Each speaker was asked to recite the given script for five times. To make them familiarize with the script, it was given 30 minutes before the recording to each speaker. For creating the electronically disguised sample every fourth recording of each speaker was converted into the male voices, using a free android application. The selected android application was highly rated and have multiple changing parameters.

Changing the voice samples into the Child, old-age, alien, Robot, etc. For this study, the recoded female voice samples were converted to Male voices. After processing each recording, Speaker Identification was done using the Semi-Automatic method. Selected parameters for auditory analysis were quality of speech, delivery of the speech, nature of pause, background variation, and speech rate. In Spectrographic analysis Pitch and Formant frequencies (F1, F2, F3, F4) were studied. Five vowels studied are **/ʌ/, /ɔ/, /i/, /ɪ/, /u/**. Wilcoxon Signed Rank Test was used as a statistical procedure to determine whether the mean difference between two sets of observations is significant ($p<0.05$) or not.

3. Results

On Auditory Analysis, parameters such as **Voice quality, Delivery of Speech, Nature of Pauses, Background Variation, and Speech Rate** in the controlled audio was found to be good, clear, natural pauses, no background noise, and speech rate was also observed to be normal. The audios were recorded in the control situation, to study the effect of electronic disguising software on these parameters. In the electronically disguised voice, the **Voice Quality** was degraded in 42%, 50% had normal quality of speech and in the remaining 8% of the audios the quality of voice was good. **Delivery of Speech** was degraded in all the audios but in 20% of the audios, the delivery was degraded to an extent that it was difficult to understand the content of the audios. While examining **Nature of Pauses,** in 50 % of the audios the duration of pauses was increased, in 40% the duration of pauses was decreased, and only in 10% audio the pauses remained the same. **Background Variation** was added through reverberations were added in the audios. **Speech Rate** showed degradation and high variation from

their original voices. After the auditory analysis of the audios, both control and disguised audios were run through the Acu- Expert 6.0 for **Spectrographic analysis**. The fundamental frequency of the audio and formant frequencies (F1, F2, F3, F4) for the five vowels **/ʌ/, /ɔ/, /i/, /ɪ/, /u/** were marked. The values were then compared among themselves using Wilcoxon Signed Rank Test. The results of Wilcoxon Signed Rank Test were tabulated and shown below.

Figure 1: Distribution of Voice Quality in electronically disguised voice.

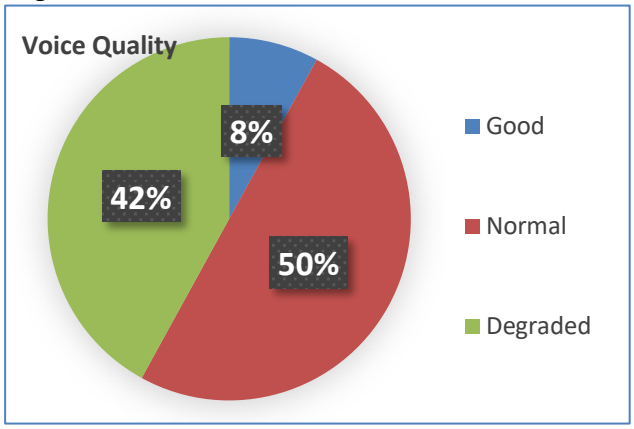


Figure 2: Distribution of Nature of Pauses in electronically disguised voice.

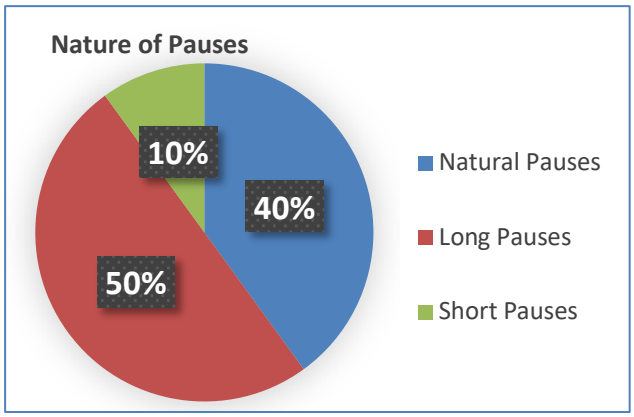


Figure 3: Distribution of Delivery of Speech in electronically disguised voice.

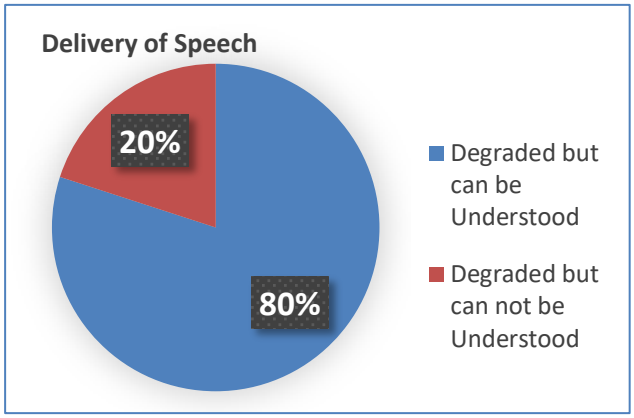


Figure 4: Distribution of Background Variation in electronically disguised voice.

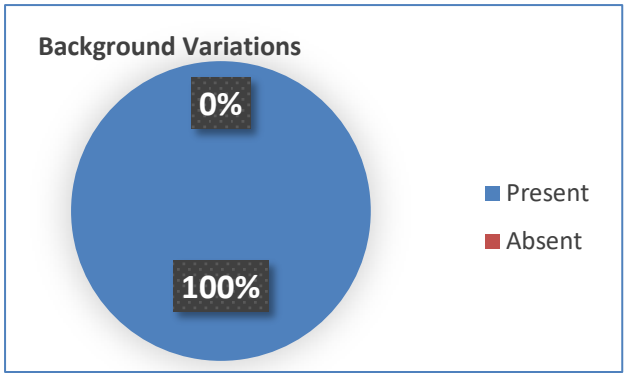


Table 1: Statistical Results of the fundamental frequency of Female Samples Compared with Disguised Male Sample- *Fundamental Frequency (F0).*

	EF0 - CF0
Z	-6.155
Asymp. Sig. (2-tailed)	.000

Table 1 above indicates that the fundamental frequency was highly significant ($p<0.005$) therefore, there is significant positive difference in the fundamental frequency of the control and electronically disguised voice.

Table 2: Statistical Results of Formant Frequency of Female samples Compared with Morphed Male for vowel /ʌ / - Formant Difference for vowel / ʌ /

	EF1 - CF1	EF2 - CF2	EF3 - CF3	EF4 - CF4
Z	-1.368	-3.546	-1.577	-5.148
Asymp. Sig. (2-tailed)	.171	.000	.115	.000

Table 2 above indicates that the fundamental frequencies (F2 & F4) was highly significant ($p<0.005$) therefore, there is significant negative difference in the formant frequencies (F2 & F4) of the control and electronically disguised voice. Also, formant frequencies (F1 & F3) were non-significant ($p>0.005$).

Table 3: Statistical Results of Formant Frequency of Female samples compared with Disguised Male for vowel /ɔ/ - Formant Difference for vowel / ɔ/

	EF1 - CF1	EF2 - CF2	EF3 - CF3	EF4 - CF4
Z	-6.073	-3.183	-2.074	-4.372
Asymp. Sig. (2-tailed)	.000	.001	.038	.000

Table 3 above indicates that the fundamental frequencies (F1, F2 & F4) was highly significant ($p<0.005$) therefore, there is significant positive difference in the formant frequencies (F1, F2 & F4) of the control and electronically disguised voice. Also,

formant frequency (F3) was non-significant (p>0.005).

Table 4: Statistical Results of Formant Frequency of Female samples compared with Disguised Male sample for vowel /i/ - *Formant Difference for vowel /i/*

	EF1 - CF1	EF2 - CF2	EF3 - CF3	EF4 - CF4
Z	-6.093	-2.999	-4.372	-.527
Asymp. Sig. (2-tailed)	.000	.003	.000	.598

Table 4 above indicates that the fundamental frequencies (F1, F2 & F3) was highly significant (p<0.005) therefore, there is significant positive difference in the formant frequencies (F1 & F3) and negative difference in formant frequency (F2) of the control and electronically disguised voice. Also, formant frequency (F4) was non-significant (p>0.005).

Table 5: Statistical Results of Formant Frequency of Female samples compared with Disguised Male sample for vowel /I/ - *Formant Difference for vowel /I/*

	EF1 - CF1	EF2 - CF2	EF3 - CF3	EF4 - CF4
Z	-6.093	-3.278	-4.382	-3.183
Asymp. Sig. (2-tailed)	.000	.001	.000	.001

Table 5 above indicates that the fundamental frequencies (F1, F2, F3 & F4) was highly significant (p<0.005) therefore, there is significant positive difference in the formant frequencies (F1, F3 & F4) and negative difference in formant frequency (F2) of the control and electronically disguised voice.

Table 6: Statistical Results of Formant Frequency of Female samples compared Disguised Male sample for vowel /u/ -*Formant Difference for vowel /u/*

	MF1 - CF1	MF2 - CF2	MF3 - CF3	MF4 - CF4
Z	-6.083	-.343	-3.069	-3.790
Asymp. Sig. (2-tailed)	.000	.731	.002	.000

Table 6 above indicates that the fundamental frequencies (F1, F3 & F4) was highly significant (p<0.005) therefore, there is significant positive difference in the formant frequencies (F1, F3 & F4) of the control and electronically disguised voice. Also, Formant Frequency (F2) is non-significant with negative difference in formant frequency (F2) of the control and electronically disguised voice.

4. Discussion

After processing the audio in software, the output audio was altered with different properties to that of control recording. In auditory analysis of the control and electronically disguised voices the parameter which showed maximum variation was the background variation. Background of the audio is referred to as the non-voiced regions of the audio signal. On listening to the electronically disguised male voices there were significant changes in the background of the audio. The Voice of the female samples was converted in such a manner that the voice was heavy, reverberating and recorded in a closed empty area. In some of the audio's articulation of words was not very clear, researchers had to listen twice or thrice to understand the words.

This could be because the formant frequencies showed significant changes. The values of formant frequency F1, F2, F3, F4 for 5 selected vowels were decreased for all vowels in disguised voice sample to that of values of control recording. On analyzing the average pitch of the control and morphed voice it can be noted that the average pitch of the electronically disguised male was in the range of 105- 175 Hz whereas the average pitch of the male voice lies in the 85 to 155 Hz.[9] The parameters selected for the analysis are limited, and includes only those which are commonly used and accepted in the identification of the speaker in the criminal investigation.[4] There can be many more changes in the signal of the audio which could be analyzed by the speech signal processing experts. Forensic Speaker Identification expert together with signal processing experts can explore this challenge and seek solution in the examination of the electronically disguised voice, so that the changed signal can either be linked to the original signal or it can reprocess and converted to the original audio.

5. Conclusion

The study clearly highlighted that auditory analysis of all the aural parameters of the electronically disguised voice samples with respect to their control voice had shown degradation and remarkable deviations in the voice conditions. But identification of disguised voice only on the basis of auditory parameters of speech can be tricky and challenging for the expert. This is because disguising softwares are altering the vocal parameters on the basis of predefined algorithms.

From spectrographic parameters of electronically disguised voices along with their original voices, it can be concluded that parameters such as pitch of the voices shows comprehensive variations, thus cannot be reliable parameter for

identification. However, respective formant frequencies for the given vowel are the suitable parameter for speaker identification especially in samples disguised into male.

Certainly, with limitations, some specific formant frequencies indicative of the morphing can be combined with auditory parameters for suspecting a case of morphing and can be compared with possible list of suspects for speaker identification based on spectrographic analysis.

Contributor ship of Author: All authors equally contributed.

Ethical Clearance: Yes.

Conflict of interest: None to declare.

Source of funding: None to declare.

Acknowledgments

Authors would like to acknowledge Acoustics Laboratory, School of Forensic Science and Risk Management. A special thanks Dr. Gaurav Singh Kushwaha, Assistant professor, School of Physical Education and Sports; Dr. Parvesh Sharma, Assistant Professor, School of Forensic Science and Risk Management; Mr. Sudhanshu Shekhar Tiwari, Assistant Professor, School of Forensic Science and Risk Management Rashtriya Raksha University for their continuous support during the study. Also, we are very much thankful to all those who have contributed their time and effort for providing samples for our research work without whose co-operation and trust this project might not have been possible.

List of Abbreviations:

F0 -Fundamental Frequency
F1- Formant Frequency 1
F2- Formant Frequency 2
F3- Formant Frequency 3
F4- Formant Frequency 4
CF0- Control Fundamental Frequency
CF1- Control Formant Frequency 1
CF2- Control Formant Frequency 2
CF3- Control Formant Frequency 3
CF4- Control Formant Frequency 4
EF0- Electronically Disguised Fundamental Frequency
EF1- Electronically Disguised Formant Frequency 1
EF2- Electronically Disguised Formant Frequency 2
EF3- Electronically Disguised Formant Frequency 3
EF4- Electronically Disguised Formant Frequency 4

References

1. Rose P. Forensic Speaker Identification. 1st ed. London: CRC Press; 2002. p.381.
2. Furui S. Chapter 7 - Speaker Recognition in Smart Environments. In: Aghajan H, Delgado RLC, Augusto JC, editors. Human-Centric Interfaces for Ambient Intelligence. USA: Elsevier, Academic Press; 2010. p. 163–84.
3. Kent RD, Kent RA, Read C. The Acoustic Analysis of Speech. Albany, New York, USA: Thomson Learning; 2002. p. 324.
4. Eriksson A. Aural/Acoustic vs. Automatic Methods in Forensic phonetic case work. In Neustein A, Patil HA, editors. Forensic Speaker recognition: Law Enforcement and counter terrorism. New York (USA): Springer; 2012. p. 41-69.
5. Rentzos D, Vaseghi S, Turajlic E, Yan Q, Ho CH. Transformation of speaker characteristics for voice conversion. In 2003. p. 706–11.
6. Mohammadi SH, Kain A. An overview of voice conversion systems. Speech Commun. 2017; 88:65–82.
7. Gallena SJK, Stickels B, Stickels E. Gender Perception after Raising Vowel Fundamental and Formant Frequencies: Considerations for Oral Resonance Research. J Voice. 2018; 32(5):592–601.
8. Gelfer MP, Bennett QE. Speaking Fundamental Frequency and Vowel Formant Frequencies: Effects on Perception of Gender. J Voice. 2013; 27(5):556–66.
9. Titze IR. Principles of voice production.1st ed. Englewood Cliffs, N.J: Prentice Hall; 1994; p. 354.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Case Series

Gastric Aspiration in Infants As A Cause Of Death: Case Series

Ishita Manral[a], Dobi Sravan Kumar[b]*, Rahul Manral[c], Raavishekar N Hiremath[d], Anand Mugaldimath[e]

[a]Forensic Medicine Specialist, Kolkata, West Bengal, India. [b]Forensic Medicine Specialist, New Delhi, India. [c]Physiologist, Pune, Maharashtra, India. [d]Public health Specialist, Bangalore. [e]Professor, Dept of Forensic Medicine, SNMC Medical college, Bagalkot, Karnataka, India.

Article Info

Received on: 06.10.2021
Accepted on: 23.10.2022

Key words
Death,
Sudden,
Aspiration,
Stomach.

Abstract

The rationale for this case series is the four cases seen by authors where gastric contents were seen in terminal bronchioles on autopsy. The fact that gastric aspiration is considered to be a post-mortem phenomenon (agonal regurgitation) and is also enlisted in ICD11 brings more dilemmas in forensic practitioners concerning the cause of death when this finding is seen in suspected cases. This article describes four case reports of aspiration deaths in infants, along with literature review, definitions, diagnosis, epidemiology, pathophysiology, and whether aspiration can be given as a cause of death in suspected cases.

1. Introduction

Sudden death due to its unexpected nature and death within one hour to twenty-four hours of the onset of terminal events is often met with suspicion both by the family and police. Gastro-intestinal cause of death accounts for less than ten percent of the cause of death. Gastric aspiration is defined as the inhalation of gastric contents into the airway or lower respiratory tract. It leads to a spectrum of features from acute lung injury to pulmonary edema to airway obstruction to chronic airway disease. Regurgitation on the other hand is the presence of stomach contents into the oropharynx or esophagus but not the lungs.[1,2]

PB04 deals with Unintentional threat to breathing by inhalation or ingestion of gastric contents.[3] The true incidence of gastric aspiration is not possible as most of the vents are unwitnessed. The incidence of gastric aspiration is one event in 89 patients.[4] We stick to the term gastric aspiration as it is mentioned in ICD11. Depending on the number of contents, a temporal relation of the regurgitation, host response, and predisposing conditions of the individual the aspiration elicit a varied response in an individual. It may vary from chemical injury to lung to bacterial infection to acute respiratory distress syndrome which may be fatal.[5] Gastric aspiration seen in upper airways is considered a post-mortem phenomenon or agonal. However, if the contents are seen in the terminal bronchioles, it may be antemortem.

2. Methodology

Four case reports were presented as case series and a literature review was done on the topic of pulmonary aspiration. We used search engines like PubMed, Google Scholar. Our keywords were pulmonary aspiration, infants, agonal aspiration, stomach contents.

How to cite this article: Manral I, Kumar DS, Manral R, Hiremath RN, Mugaldimath A. Gastric Aspiration in Infants As A Cause Of Death: Case Series. J For Med Sci Law 2022;31(2):61-64.

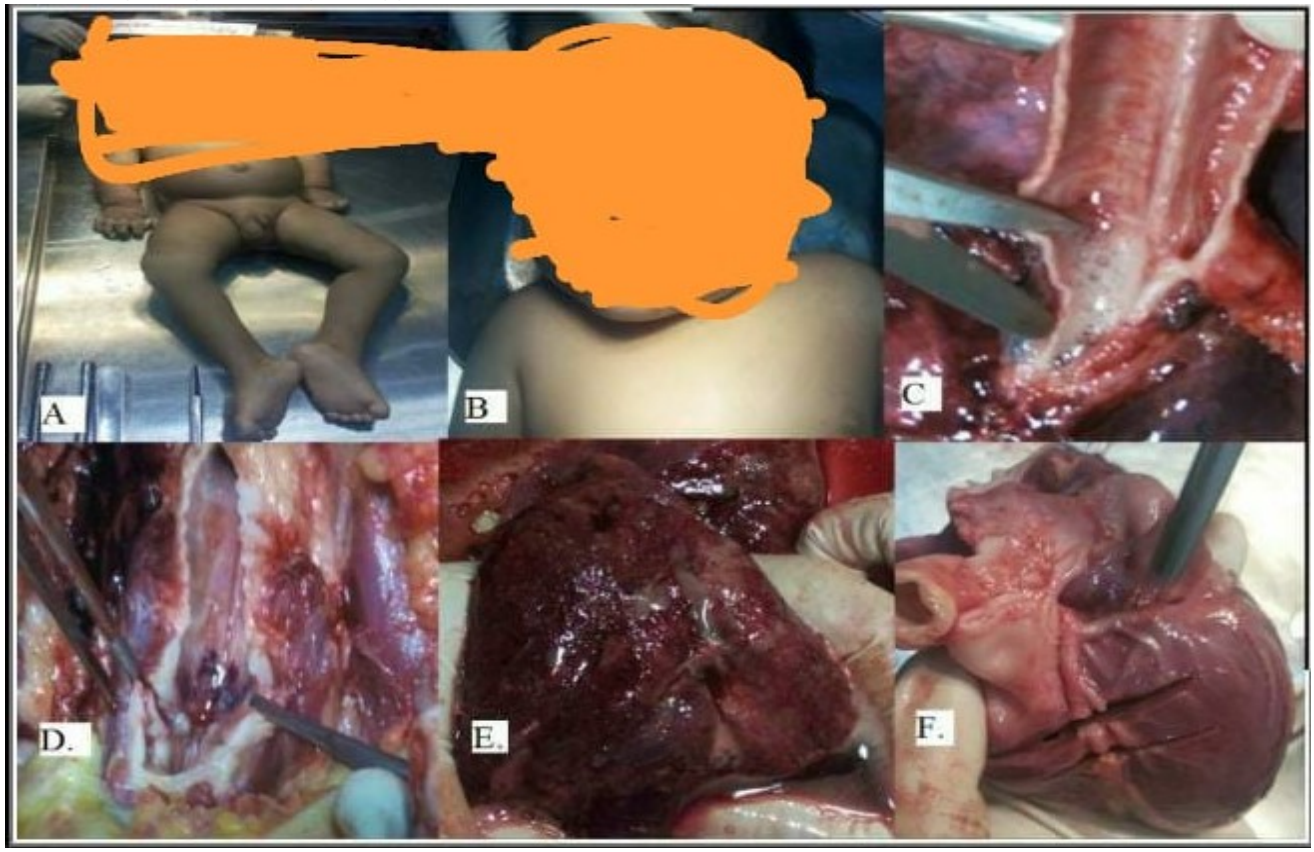
*Corresponding author: Dr Dobi Sravan Kumar, Forensic Medicine Specialist, New Delhi, India. Email id: dsravn@gmail.com (M): +91-9622235554.

3. Case-series

The rationale of the study was the four cases that were observed by the authors in Western Maharashtra. **Case 1**: 03 months old girl, with an alleged history of being found unresponsive while sleeping. The deceased had taken feed four hours before being found unresponsive. On gross examination, the build was average with no congenital abnormalities. The stomach was filled with 300-400 ml of curdled milk. The same curdled milk was also seen in bronchioles on the cut section in both the lungs. The weight of the lungs was normal. No other systemic abnormalities were seen. **Case 2**: 20 months old male toddler with an alleged history of being found unresponsive while sleeping. Alleged history of upper respiratory tract infection for three days. The deceased had taken feed six-seven hours before being found unresponsive. The stomach was filled with 200 ml of curdled milk. The curdled milk was also seen in bronchioles on the cut section in both the lungs. The weight of the lungs was normal. No other systemic abnormalities were seen.

Case 3: A month-old baby with an alleged history of being found unresponsive while sleeping. The child was a known case of cleft palate and was under workup for fever of two days duration. The deceased had taken feed an hour before being found unresponsive. **Case 4**: 19 months Toddler male with an alleged history of being found unresponsive while sleeping (**Fig. 1**). The deceased had taken feed four hours before being found unresponsive. The study was undertaken to review the literature differentiating between the agonal aspiration of food and pulmonary aspiration leading to death.

Figure 1: Pictorial collage showing the Unresponsive child (A, B), Showing Milky contents in cut section of trachea (C, D) and Lungs congested on gross appearance (E).



4. Discussion

Gastric aspiration is defined as the inhalation of gastric contents into the airway or respiratory tract of an individual.[1] Difference between aspiration and regurgitation is that in the latter the gastric contents are found in the oropharynx or oesophagus.[2] Literature on this topic is limited and confusion between the terms gastric aspiration and pulmonary aspiration exists. We stick to gastric aspiration considering similar terms are used in ICD11 to certify a cause of death. The predisposing risk factors to aspiration are Altered levels of consciousness,

toddlers and elderly and nursing home residents, people with gastrointestinal (GI) and oesophageal abnormalities and patients with neurologic trauma and neuromuscular diseases are at increased risk.[5,6]

Additionally, abnormal anatomy, such as a cleft palate or delayed growth, from premature birth or a condition such as Down syndrome, brain damage or other problems, such as from cerebral palsy or infection, or Problems with the cranial nerves that control the muscles of swallowing and Neuromuscular diseases, such as spinal muscular atrophy with Medical procedures, such as a nasogastric tube or a tracheostomy and Gastroesophageal reflux disease (GERD) can also cause aspiration.[7]

Usually, in infants and toddlers, the larynx is one-third the size of an adult. The soft palate naturally obstructs the airway. The tongue is larger in the oropharynx than in the adult. Epiglottis is relatively long and narrow. Additionally, the large occiput of the infant against the neck makes it flex and increases the chances of airway obstruction.[8,9] Extra-thoracic airway calibre decreases during inhalation whereas intrathoracic airway diameter tends to increase. Airway resistance is determined by the diameter of the airway. it is a laminar flow. The airway is branched. During any infection of the upper respiratory tract increased chance of collapse of the upper airway occurs.[8,9] Aspiration syndromes are classified as aspiration pneumonitis, aspiration pneumonia, and airways obstruction. Aspiration pneumonia leads to chemical injury in the lungs, aspiration pneumonia leads to bacterial infection and airways obstruction causes mechanical obstruction which if not suctioned on time may lead to death. [10]

On aspiration of gastric contents, acid contents of the stomach cause damage to the airway epithelium. Large volume aspiration may cause airway obstruction. Small volume recurrent aspiration may induce chemical injury which will be seen as an inflammatory injury like the loss of alveolo-capillary permeability causing oedema (Figure 1). It may also lead to secondary bacterial infections causing pneumonia-like features in the lung.10 Unwitnessed gastric aspiration is one of the most difficult entities to diagnose. There are no gold standards for the diagnosis of aspiration-induced lung injury. Often it is a disease of exclusion, where other aetiologies of hypoxia such as pulmonary oedema, pulmonary embolism, or community or hospital-acquired bacterial pneumonia have been ruled out. Gastric aspiration seen in the upper airways is considered a post-mortem phenomenon or agonal. However, if the contents are seen in the terminal bronchioles, it may be antemortem. Facts like shifting the body or packing the body may cause displacement of food but not up to the terminal bronchioles.

Aspiration of gastric contents incites inflammation in the airways. The large volume can cause airway obstruction. It is mostly unwitnessed and induces acute respiratory distress leading to a fatal outcome. A small amount of regurgitant induces chemical injury in the airway causing features of dyspnoea, tachycardia, and hypoxia and causing aspiration pneumonitis. Superadded bacterial infection may be manifested by fever, cough, and radiological diagnosis of pneumonia. In long term, it may induce fibrosis in the lungs and lead to chronic airway disease. Mechanical obstruction can cause airway obstruction which depending upon the level of obstruction may have varied manifestations. if not, timely intervened it may lead to fatal outcomes that probably occurred in our cases. It may have acute dyspnoea, cyanosis and apnoea.[10] Aspirated fluids like saline, barium, ingested fluid (including water), and gastric contents with a pH exceeding 2.5 are non-toxic. Aspiration of large volumes of fluids produces abrupt suffocation by mechanical obstruction. The acidity of the contents makes it sterile and chances of infection immediately post aspiration are minimal.[11] Mendelson's syndrome is a chemical injury to the lungs in obstetric patients after spinal anaesthesia.[12] Aspiration syndrome includes aspiration pneumonitis, aspiration pneumonia, and mechanical obstruction. [10]

In recent advances on the topic, Pepsin, C-Reactive Protein, Serum procalcitonin, anti-human aloha lactalbumin have been found to be important in gastric aspiration. Bronchopulmonary dysplasia has been associated with detectable pepsin. The anti-human alpha-lactalbumin antibody is used to screen milk in aspirated material. Serial monitoring of serum procalcitonin levels is important in differentiating between bacterial pneumonia and aspiration pneumonia.[13,14,15] Unwitnessed death account for a maximum of these deaths thus posing a challenge for doctors and police to show the cause and manner of death. Due to its unexpected nature and it's being an unwitnessed event, it includes allegations on the

family or doctor. Cases of death in operation theatre due to mechanical obstruction of the airway by food or gastric aspiration are commonly seen. After a road traffic accident, aspiration of blood may cause death.[16]

5. Conclusion

Literature on the diagnosis of gastric aspiration as the cause of death is limited. It is considered as both a post-mortem phenomenon and a cause of death. It is an important causal factor in death in children and renewed focus should be given to research.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None.

Source of funding: Nil.

References

1. Marik PE. Aspiration pneumonitis and aspiration pneumonia. N Engl J Med. 2001; 344(9): 665-71.
2. Zaloga GP. Aspiration-related illnesses: definitions and diagnosis. JPEN J Parenter Enteral Nutr. 2002; 26(6 Suppl): S2–7.
3. International Statistical Classification of Diseases and Related Health Problems (11th ed, ICD-11; World Health Organization, 2019)
4. Metheny NA, Clouse RE, Chang YH, et al. Tracheobronchial aspiration of gastric contents in critically ill tube-fed patients: frequency, outcomes, and risk factors. Crit Care Med. 2006; 34(4): 1007–1015.
5. Hu X, Lee JS, Pianosi PT, Ryu JH. Aspiration-related pulmonary syndromes. Chest. 2015; 1 47(3): 815–823.
6. Raghavendran K., Nemzek J., Napolitano LM, Knight PR. Aspiration-induced lung injury. Crit Care Med.2011; *39*(4): 818–26.
7. Yeung CY, Tam AS. Gastric aspirate findings in neonatal pneumonia. Arch Dis Child. 1972; 47(255): 735-40.
8. Tahir N, Ramsden WH, Stringer MD. Tracheobronchial anatomy and the distribution of inhaled foreign bodies in children. Eur J Pediatr. 2009; 168(3):289.
9. Adewale L. Anatomy and assessment of the paediatric airway. Paediatr Anaesth. 2009; 19: 1-8.
10. Webb A, Angus D, Finfer S, Gattioni L, Singer M. Oxford textbook of critical care. 2nd edition. Oxford University Press; 2016.
11. Colebatch HJ and Halmagyi DF. Reflex airway reaction to fluid aspiration. J Appl Physiol.1964; 17:787.
12. Dines DE, Baker WG, Scantland WA. Aspiration pneumonitis—Mendelson's syndrome. JAMA. 1961; 176(3): 229-31.
13. Stovold R, Forrest IA, Corris PA, Murphy DM et al. Pepsin, a biomarker of gastric aspiration in lung allografts: a putative association with rejection. Am J Respir Crit Care Med. 2007; 175(12): 1298-303.
14. Jaoude PA, Knight PR, Ohtake P, El-Solh AA. Biomarkers in the diagnosis of aspiration syndromes. Expert Rev Mol Diagn. 2010; 10(3):309-19.
15. Mokra D, Kosutova P. Biomarkers in acute lung injury. Respir Physiol Neurobiol. 2015; 209:52-8.
16. Ivan T, Milena G, Svetlozar S, Georgi I, Borislava T. Lung aspiration of blood and gastric contents in road traffic accident-a case report. Scientific works of the Union of Scientists in Bulgaria-Plovdiv, series G. Medicine, Pharmacy and Dental medicine. 2017; 21: 36-38.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Review Article

Advances of Medical termination of pregnancy Amendments act in India.

Sachin S. Patil[a*], Ravindra B Deokar[b]

[a] Associate Professor, Department of Forensic Medicine & Toxicology, LTMMC & LTMG Hospital, Sion, Mumbai, Maharashtra, India-400022.

[b] Professor (Additional), Department of Forensic Medicine & Toxicology, Seth G S Medical College & KEM Hospital, Mumbai, Maharashtra, India-400012.

Article Info

Received on: 24.10.2022
Accepted on: 30.12.2022

Key words
Abortion laws, Amendment, Supreme court judgement, Autonomy.

Abstract

Abortion or miscarriage in legal sense refers to expulsion of foetus during any time of pregnancy before completion of full term. The word "Abortion" is consequential from the Latin term aboriri, which denotes "failure to be born." Abortion may be spontaneous, therapeutic or induced termination of pregnancy prior to viability of foetus or capable of having separate existence outside the mother's womb. The Medical Termination of Pregnancy Act (MTP Act) 1971, can be considered as revolutionary legislature in eradication of gender discrimination, as it caused reduction in the number of perilous unlawful abortions. The MTP Amendment Act was the law which has brought India to the progressive group of nations that consider women's rights to have autonomy regarding to pregnancies. Even though there are shortcomings for safeguarding the unrestricted rights of females over their own bodies, this amendment act is surely a step in correct track. Supreme Court's judgement to include women—regardless of their marital status—under the MTP act, which permits termination of pregnancy up to 24 weeks endorse India's pledge to provide safe and legal abortion as constitutional right of every female. The apex court's recent decision proves that abortion laws in India have come a long way and are moving towards an even more progressive direction.

1. Introduction

Abortion or miscarriage in legal sense refers to expulsion of foetus during any time of pregnancy before completion of full term.[1] The word "Abortion" is consequential from the Latin term aboriri, which denotes "failure to be born." Abortion may be spontaneous, therapeutic or induced termination of pregnancy prior to viability of foetus or capable of having separate existence outside the mother's womb.[2]

Abortion has been utilised globally since ancient times for multiple reasons ranging from health to approachability. In India, the basic rights of women to have safe abortion was provided from time to time with enactment of MTP act, rules and regulations with its amendments at varying intervals. As per these acts, whoever conducts unsafe or illegal abortion is liable for punishment.

How to cite this article: Patil SS, Deokar RB. Advances of Medical termination of pregnancy Amendments act in India. J For Med Sci Law 2022;31(2):65-70.

***Corresponding author:** Dr Sachin S Patil, Associate Professor, Department of Forensic Medicine & Toxicology, Lokmanya Tilak Municipal Medical College & LTMGH, Sion, Mumbai, Maharashtra, India. Pin-400022. Email: sachinpatilmdfm@gmail.com (M): +91- 9136667077.

There are many instances where the pregnant females are pressurized to terminate the pregnancy while few females are also pressurized to control their fertility. In developing countries like India, most of the times females don't have the choice of not getting married or even if married, they don't have choice of indulging in sexual interactions resulting into pregnancy. The females also in most cases don't have freedom to continue the pregnancy. For many females, termination of pregnancy may be the only choice which may be illegal or unsafe.[2]

The resolution of The World Medical Association on therapeutic abortion, is also known as Declaration of Oslo was passed in 1970. A criminal abortion refers to unlawful destruction and ejection of the foetus during the pregnancy indicating no therapeutic indication for the termination of pregnancy. Widows or unmarried females were the ones who were mainly indulged in criminal abortion. Criminal abortion is seldom reported to police by someone and comes into picture on death of women at the time of termination of pregnancy.[3]

2. Abortions laws since ancient era:

Since ancient times, laws related to abortion were in existence. As per the Vedas, the abortion was permitted only till 5th month of intrauterine age as after that it was considered as viable child. Kautilya's arthshastra also mentions punishment for the slave woman having abortion. It is one of the oldest and most extensively used methods of control of population. Abortions were performed in every corner of the world. Induced termination of pregnancy were prevalent in all the civilizations and are regulated by various laws. These laws, rules, regulations or policies based on the country's historical aspects as well as its political, commercial, communal, divine, and cultural establishments. Under British rule, there is no record of banning of abortion in India. After the independence in 1947, the medical code of ethics of 1956 suggests respects for human life and opposition to abortion.[2]

Till the 1960s, Section 312 of IPC was applicable making abortion illegal in India and a female was liable for punishment for three years of imprisonment and/or a fine.[4] Before MTP act, about five million abortions were done in India annually but out of which illegal abortions were more than three million [5] but less than one percent convictions were done. About one seventh of total abortions were conducted by unqualified or inexperienced persons comprising of quacks or paramedical persons. To avoid punishment by the law agencies, these females were forced to get the abortion done by crude methods in unhygienic conditions which was responsible for high morbidity and mortality.[6] Many doctors exploit these females by wresting huge sums for conducting abortions. The inflexibility of the legal provisions for procuring abortions also lead to suicide by pregnant mothers, desertion and brutality to children as well as infanticide.[7]

During Mid-1960s, the government set up the Shantilal Shah Committee to decide that law relating to abortions to be prepared or not. Report laid by the Shantilal Shah Committee lead to introduction of a medical termination bill in Lok Sabha and Rajya Sabha which was passed by Parliament in August 1971.[8] Medical Termination of Pregnancy (MTP) Act, 1971 act authorize termination of pregnancy to be performed in two stages: First pregnancies having gestational age extending up to 12 weeks, the opinion of single doctor was adequate. Secondly for pregnancies between gestational age of 12 to 20 weeks old, there was need of opinion of two doctors to ascertain whether the continuity of pregnancy would endanger the life of the pregnant female physically or mentally or if there is considerable threat to the child born with physical or mental abnormalities or developing the abnormalities subsequently.[9]

2.1 The Medical Termination of Pregnancy Amendment Act, 2002

Later, to facilitate the better implementation of the MTP Act 1971 and to increase access for women especially in the private health sector, the act was amended in 2002. [10] This amendment comprises replacement of section 4 indicating the place where termination of pregnancy to be carried out. MTP has to be performed solitarily at government hospitals or places permitted by the government or committee constituted by the government. There was also amendment of section 5 which mentions that MTP to be done only be RMP. Violation of this act liable for imprisonment from two years to seven years. Same punishment also applicable to the owner of the place where the MTP is carried out.[11]

2.2 The Medical Termination of Pregnancy (Amendment) Rules, 2003

The MTP laws were amended again in 2003 by the government, rationalising the physical standards of abortion clinics and founding several standards for performing the operation of first and second trimester abortions. While operation tables and equipment for abdominal or gynaecological surgery, as well as anaesthesia, resuscitation, and sterilisation equipment, are the minimum requirements for centres providing second trimester abortions, a gynaecology or a labour table requiring an operation table, revitalization and sterilisation equipment but not anaesthetic equipment is the minimum requirement for centres providing first trimester abortions. These guidelines also permit a registered medical practitioner to provide medical abortion services up to seven weeks after an unsuccessful or incomplete therapeutic abortion if the physician has access to medical abortion.[12]

2.3 The Medical Termination of Pregnancy (Amendment) Bill, 2014

This amendment bill brings modification of section 3 of the MTP Act of 1971. The MTP Act of 1971 mentions that "severe fetal defects may be found in the choice to terminate the period of abortion of the fetus," and that "the period of pregnancy shall not apply in the decision to terminate the period of abortion of the fetus." The terms "registered health care professionals" were added to this definition of "registered pregnancy termination," substituting "registered medical practitioners."[13]

2.4 The Medical Termination of Pregnancy (Amendment) Act, 2021

As per this amendment, for termination of pregnancy till 20 weeks of intrauterine life, opinion of one Registered Medical Practitioner (RMP) is adequate. Opinion of two RMPs is required for termination of pregnancy of 20-24 weeks of gestation. In case of significant foetal abnormalities, opinion of the State-level medical board is important for a pregnancy to be terminated after 24 weeks. For special categories of women comprising of rape survivors, victims of incest as well as other susceptible females like differently abled, minors and others, upper limit of termination of pregnancy was enhanced from 20 weeks to 24 weeks. The information about “name and other particulars of a woman whose pregnancy has been terminated shall not be disclosed to anyone”, except to a person authorised in any law that is now in force.[14]

3. Discussion

The Medical Termination of Pregnancy Act (MTP Act) 1971, can be considered as revolutionary legislature in eradication of gender discrimination, as it caused reduction in the number of perilous unlawful abortions. The MTP Amendment Act was the law which has brought India to the progressive group of nations that consider women’s rights to have autonomy regarding to pregnancies. Even though there are shortcomings for safeguarding the unrestricted rights of females over their own bodies, this amendment act is surely a step in correct track.[15] Making the availability of safe abortion is one of the basic rights to all women needing the termination of pregnancy. An unmarried **25-year-old woman** pursued to Delhi High Court’s for getting approval for termination of a pregnancy of **almost 24 weeks**, as her partner had denied to get married to her. However, Delhi HC turned down her request for termination of pregnancy. The said female appealed in Supreme Court.[16] On 29 September 2022, Supreme Court gave judgement for termination of pregnancy in 24th week which will be applicable also for unmarried females.[17] This Supreme Court judgement highlighted that termination of pregnancy is reproductive right of every female which is secured constitutionally. Decision of Delhi high court was based on Rule 3B of medical termination of pregnancy rules 2003 with amendment in 2021 having no mention of the unmarried females.[16]

The Supreme Court also clarified that the decision to retain pregnancy or to terminate pregnancy is autonomy of the female as well as to choose about her future where distinction amid married and unmarried can be entertained.[17] As per Rule 3B, even the marital status of the female shifts during pregnancy to other status comprising of divorce or widowhood, abortions between 20 and 24 weeks of pregnancy are permitted. The Supreme Court stated that this Rule should also cover unmarried female who have become widow or divorced during pregnancy. The resolution of the MTP act was to make provision for females with termination of unwanted pregnancies having adverse effect on their physical health and mental health. As per an amendment to the MTP Act in the year 2021, husband has been replaced with word partner which clearly indicates that law is in favour of inclusion of unmarried females. Declining the right of an unmarried female to undergo the right to a safe abortion to be considered as violation of her personal autonomy and freedom. Article 21 of the constitution

states that right to have reproduction is constituent of her personal liberty.

In current scenario, 'uncharacteristic forms' of familial relationships are in existence comprising of live-in partnerships. Live-in relationships had been previously given sanction by the Supreme Court. These points paved the way for Supreme Court to make provision for MTP for unmarried females. Nevertheless, the implication of this judgment extends remote than its application to unmarried females needing abortions. This judgement was florilegium involving variety of issues encircling the laws of abortion in India. This judgement indicated that state should not only provide dignity to the decisions of females but also provide information, better abortion facilities and elimination of discrimination by the hands of healthcare professionals.

This court's decision unwraps the access to numerous novel constitutional avenues in relation to abortion in India.[16] There should be reproductive autonomy for every female to have abortion without having permission from any other person.[18]

Prohibition of abortion as mode of safeguarding foetus would inevitably become unbearable, as women's rights are being considered as absolute and ultimate.[16] The key reason of MTP is failure of contraception. This fact envisions the huge unmet need of contraception and counselling. The religious variances in the society hinders the females in undergoing abortion and has to be handled efficiently.[19]

MTP in USA

The legitimacy of abortion in various states of the United States differ to greater extent as well as procedural ban differ to larger extent. Few states ban the abortion completely throughout the pregnancy, few others ban up to particular gestational age while does not prohibit abortion throughout the gestational age. Till 2022, The states of America could not prohibit abortion preserving the female's right to undergo abortion as followed in Supreme Court rulings in Roe v. Wade (1973) and Planned Parenthood v. Casey (1992), respectively. However, on June 24 2022. Supreme Court overturned the rulings of Roe and Casey by Dobbs v. Jackson Women's Health Organization permitting the states to enforce any ban on abortion, and does not otherwise conflict with federal law.[20]

In this era comprising of Dobbs vs Jackson, which makes difference between the marital statuses of women who are raped, Indian Supreme Court judgement on abortion under the MTP Act is a landmark judgement for the rights of Indian women.

Intermingling with provisions of other acts

a. PCPNDT Act, 1994

PCPNDT act came into existence in 1994 subsequent to successful movement against sex selective abortions. There is contrast between two acts where right to undergo abortion is inclusion of female autonomy and freedom to manage their bodies, at same time, PCPNDT act restrict the females from aborting the female foetuses.[21]

b. POCSO Act, 2012

Doctors are usually stuck between overlapping provisions of the MTP Act, 1971 and the POCSO Act, 2012 in cases of pregnant minor females caused by sex offences such as rape. The MTP Act's confidentiality clause necessitates doctors to safeguard the identity of the patients but the POCSO Act, 2012 requires that any person who witness the sexual act or have information about the act on minors should report to police and on failing to do so, liable for punishment. As per the study by CEHAT in Mumbai, families of the minor involving sexual offences abstain from consulting the medical practitioners and recourse to unlawful methods of abortion, thereby endangering the lives of minor girls.[22]

c. The IPC, 1860

After the enactment of the MTP Act 1971, the section 312 to 316 of the Indian Penal Code relating to abortion become submissive to this Act due to clause in section 3, which allows abortion to be done by a registered practitioner under certain conditions.[23]

4. Progressive features of MTP Act 2021

- Abortions beyond 20 weeks allowed: It allows abortion to be done on the advice of one doctor up to 20 weeks, and two doctors in the case of certain categories of women between 20 and 24 weeks.
- Inclusive: Enhances the upper gestation limit from 20 to 24 weeks for special categories of women including survivors of rape-thus preventing the socio-economic and psychological impact of unwanted pregnancies.
- Lowers burden on courts: Removes the limit of 24 weeks for termination of pregnancy in case of substantial foetal abnormalities, diagnosed by the newly established Medical Board–

thus easing the burden on courts of writ petition for seeking abortion beyond the permitted period.

- Maintains confidentiality: Names of the woman whose pregnancy has been terminated will be kept confidential– thus ensuring dignity and confidentiality of women.
- De-stigmatizes relations outside marriage: Relaxes termination of pregnancy due to contraceptive-failure condition for "any woman or her partner''– thus de-stigmatizes pregnancies outside marriage.
- However, there are few drawbacks with its provisions:
- No right to abortion at will: Termination of pregnancies to be done only in certain conditions.
- No remedy for rape victims: Beyond 24 weeks, the termination of pregnancies can be done only substantial foetal anomalies while rape victims cannot approach the Medical Board. Therefore, only remedy for rape survivor is through a Writ Petition.
- Fixation of further upper limit for abortions of rape survivor females: As there is substantial delay while going through the multiple procedures in police stations and courts.
- Expectation of the presence of two gynaecologists in rural areas to ascertain the necessity for abortion is unreasonable.
- Inconsistency in the judicial decisions: Unreasonable decisions by the court pertaining to the abortion can have devastating impact on the physical and mental wellbeing of the rape survivors. One such example was in 2019 in Rajasthan where the lower court denied the abortion of pregnant female due to rape citing the reason of right to life of child. But High court permitted abortion in the pregnant female who has exceeded the limit giving reason that right of abortion of rape survivor will surpass the right of life of the child who has yet to be born.[14]

5. Way Forward

- India's legal structure on abortion is by large progressive, particularly in contrast to the countries including developing countries like United States of America where there are huge restrictions on abortion, in past as well as present.
- But still there is scope for improvement in policy making and inclusion of all stakeholders on females and their reproductive rights. Also, the apex court's decision is solitary first step forward in the struggle of females for their reproductive autonomy.
- India can shadow the instances of the United Kingdom where termination of the pregnancy can be done anytime. Even, there is no specification from the World Health Organization about when pregnancy termination to be done. In addition, India should extensively involve healthcare workers like ASHA, ANM in reproductive health services.

6. Conclusion

Abortion laws in India has come a long way from the era of British rule which comprises punishment for abortion in form of imprisonment, fine or both. In the independent India, first law in relation to abortion was passed in 1971 as medical termination of Pregnancy act. It was only in 1971 that a separate law for reproductive rights—in the form of the Medical Termination of Pregnancy (MTP) Act was drafted and passed by the Indian Parliament. However, considering few shortcomings, amendments were done in the year 2003 and 2021 to make provision for medical termination of pregnancies for up to 24 weeks for special categories of women such as rape survivors, minors, women with mental disabilities, women with foetuses' abnormalities, etc. However, this act categorically excludes single women in consensual relationships, depriving them of their bodily autonomy.

Supreme Court's judgement to include women—regardless of their marital status—under the MTP act, which permits termination of pregnancy up to 24 weeks endorse India's pledge to provide safe and legal abortion as constitutional right of every female. The apex court's recent decision proves that abortion laws in India have come a long way and are moving towards an even more progressive direction.

Contributor ship of Author: All authors have equally contributed.
Conflict of interest: None.
Source of funding: Nil.

References

1. Reddy KSN. Essential of Forensic Medicine and Toxicology. 33rd edition, New Delhi, Jaypee Publishers, 2014.
2. Anand T, Chauhan A, Sharma M, Jha RS. Abortion laws in India: a critical analysis. Int J Mech Eng. 2022; 7(6): 61-7.
3. Bardale RV. Principles of Forensic Medicine and Toxicology. 3rd edition. New Delhi, Jaypee Publishers, 2021.
4. Section 312 I.P.C. [Cited 22 September 2022] Available from:https://www.indiacode.nic.in/show-data?actid=AC_CEN_5_23_00037_186045_1523266765688&orderno=350#:~:text=Whoever%20voluntarily%20causes%20a%20woman,the%20woman%20be%20quick%20with
5. Menon NM. Population policy, law enforcement and the liberalization of abortion: a socio-legal inquiry into the implementation of the abortion law in India. J Indian Law Inst. 1974; 16(4):626-48.
6. Gaur, K.D. "Abortion and the Law in India." 1991. [Cited 20 September 2022] Available from: dspace.cusat.ac.in
7. Section 317 I.P.C. [Cited 21 September 2022] Available from: https://indiankanoon.org/doc/9383/
8. Report of the Shah Committee to study the question of legalization of abortion. New Delhi Ministry of Health and Family Planning, Government of India. 1966.
9. The Medical Termination of Pregnancy Act [Act No. 34, 1971]. New Delhi. Ministry of Health and Family Planning, Government of India. 1971.
10. Deokar RB, Patil SS. Workplace-based Issues & Challenges in Formulating the Medical Boards under the MTP Act 2021. J For Med Sci Law 2022;31(1):1-2
11. The Medical Termination of Pregnancy Amendment Act, 2002 (Act No. 64 of 2002) dated 18th December 2002. New Delhi. Ministry of Health and Family Welfare, Government of India. [Cited 20 September 2022] Available from: https://main.mohfw.gov.in/acts-rules-and-standards-health-sector/acts/mtp-act-amendment-2002#:~:text=(1)%20This%20Act%20may%20be,in%20the%20Official%20Gazette%2C%20appoint.&text=(i)%20In%20clause%20(a,ill%20person%20shall%20be%20substituted.
12. The Medical Termination of Pregnancy Rules, 2003 Ministry of Health and Family Welfare, Government of India. (Department of Family Welfare) Notification New Delhi, 13th June, 2003. [Cited 19 September 2022] Available from: http://www.mohfw.nic.in/MTP%20Rules.htm
13. The Medical Termination of Pregnancy (Amendment) bill, 2014 [29th October, 2014) New Delhi. Ministry of Health and Family Welfare, Government of India. [Cited 19 September 2022] Available from: https://main.mohfw.gov.in/sites/default/files/74582186651414643779.pdf
14. The Medical Termination of Pregnancy (Amendment) ACT, 2021 NO. 8 OF 2021 [25th March, 2021) New Delhi. Ministry of Health and Family Welfare, Government of India. [Cited 20 September 2022] Available from: http://www.nrhmhp.gov.in/sites/default/files/files/MTP%20(Amendment)%20Act%2C2021.pdf
15. Arora V, Verma IC. The Medical Termination of Pregnancy (Amendment) Act, 2021: A step towards liberation. Indian J Med Ethics.2022; 7(1):1-7.
16. Pillai G. Oxford Human Rights Hub. Gauri Pillai on the Indian Abortion Decision. 01st October 2022 [Cited 20 October 2022] Available from: https://ohrh.law.ox.ac.uk/gauri-pillai-on-the-indian-abortion-decision/
17. Khullar A. India Matters. Amended abortion rights in India. 10th October 2022 [Cited 22 October 2022]. Available from: https://www.orfonline.org/expert-speak/amended-abortion-rights-in-india/
18. Mehta T, Mohanty S. Reuters. India's top court legalises abortion regardless of marital status. 29th September 2022 [Cited 11 October 2022]. Available from: https://www.nasdaq.com/articles/indias-top-court-legalises-abortion-regardless-of-marital-status
19. Katke RD, Prabhudesai AA. Socio-epidemiological factors of medical termination of pregnancy: an overview in a tertiary care institute. Int J Res Med Sci. 2016; 4:1061-4.
20. Anderson E. Newsroom. Abortion in the United States. 01st July 2022 [Cited 20 October 2022] Available from: https://www.kff.org/womens-health-policy/press-release/abortion-in-the-united-states/
21. The Pre-Natal Diagnostic Techniques (Regulation and Prevention of Misuse) Amendment Act, 2002. (17th January 2003) New Delhi. Ministry Of Health and Family Welfare, Government of India. [Cited 20 October 2022] Available from: https://www.indiacode.nic.in/bitstream/123456789/8399/1/pre-conception-pre-natal-diagnostic-techniques-act-1994.pdf
22. The Protection of Children from Sexual Offences Act 2012. (19th June 2012) New Delhi. Ministry of Law and Justice, Government of India. [Cited 20 October 2022] Available from: https://wcd.nic.in/sites/default/files/POCSO%20Act%2C%202012.pdf
23. Indian Penal Code 1860. (6th October 1860). [Cited 20 October 2022]. Available from: https://indiankanoon.org/doc/1569253/

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Review Article

Hate Speech Against Disabled Persons in India: An Analysis of Legal Provisions and Judicial Interpretations

Suvidutt M S[a], Aditya Tomer[b]

[a]PhD Research Scholar (Law), [b]Additional Director, Amity Law School, Amity University Campus, Noida, UP, India. Pin-201313.

Article Info

Received on: 24.01.2022
Accepted on: 23.08.2022

Key words
Disability, Disabled Persons, Discrimination, Hate Speech, Supreme Court.

Abstract

Background: Disabled persons are subjected to harassment and hostility. Disability hate speech, often neglected, is rampant in society and it leaves terrible psycho-emotional scars on persons with disability. The objective of this paper is to analyse the Rights of Persons with Disabilities Act, 2016 and provisions of various other statutes protecting disabled persons. It examines judgments of the Hon'ble Supreme Court and other High Courts related to protecting the rights of disabled persons. It also aims to understand the concept of hate speech as it is not legally defined in Indian law. Lastly, to identify the shortcomings in the existing legal framework. **Methods:** Analysing and reviewing of research papers, articles, judgments, statistical studies, and news reports that are related to hate speech, abuse and violence against disabled persons in India. **Results:** Although exclusive law and legislations are there to protect the rights and interests of disabled persons, people with disability are not preferring litigation to get justice for less conviction rates and the delay involved. **Conclusion:** Stringent penal provisions create deterrence. Spreading awareness by governmental agencies and NGOs as well is proposed. Appropriate policy decisions are taken so that disabled persons are more integrated into society. Therefore, a sustained campaign for the protection of the rights of the disabled is essential.

1. Introduction

According to the Census of 2011, around 2.21% of the total population of India is disabled, which means around 2.68 crore persons are disabled.[1] Discrimination against disabled persons is rampant in the country. From denying opportunities to services, from hate speech to violence, the disabled have to undergo hardship daily. Disabled persons are subjected to harassment and a range of hostile stereotypes than their nondisabled counterparts.

How to cite this article: Suvidutt M S, Tomer A. Hate Speech Against Disabled Persons in India: An Analysis of Legal Provisions and Judicial Interpretations. J For Med Sci Law 2022;31(2):71-76.

*Corresponding author: Suvidutt MS, PhD Research Scholar (Law), Amity Law School, Amity University Campus, Noida, UP, India. Pin-201313. Email id: suvidutt@yahoo.com (M): +91-9999778751.

The extremities of stereotyping result in hate speech and hate crime. Any criminal offence which is perceived by the victim or any other person, to be motivated by hostility or prejudice, based on a person's disability or perceived disability is called a disability hate crime.[2] There is no legal definition of hostility so we use the everyday understanding of the word which includes ill-will, spite, contempt, prejudice, unfriendliness, antagonism, resentment and dislike.[2] The Organisation for Security and Co-operation in Europe (OSCE) is the world's largest security-oriented intergovernmental organisation with observer status at the United Nations. They have reported the widespread types of hate crimes that are motivated based on the bias across. According to their report, the majority of hate crimes are based on race, ethnicity, religion and sexual orientation. However, it is disability hate crimes with 6% of the crimes reported that is more prominent.[3]

Generally, disability hate speech refers to speech directed towards a person's physical or mental problems. It is a type of speech that is targeted against disabled persons for being disabled or handicapped. It is an ordinary hardship and experience for countless people with disability, leaving terrible psycho-emotional scars. Disability hate speech can take the form of unwelcome comments (written or spoken) or conduct such as verbal abuse, being shouted at, name-calling, offensive graffiti, or online posts. The lack of attention to and recognition of such crimes is alarming and is even though hate speech has the potential to cause mental distress, physical harm, insecurity, intruding an individual's privacy and dignity, and contribute to an offensive, humiliating, hostile, intimidating, and degrading environment.[4] Despite all these, it is calamitous that trivial attention has been given by the socio-legal system to address this contemporary issue.

2. Comprehending Terminologies

The United Nations General Assembly adopted its Convention on the Rights of Persons with Disabilities (CRPD) in the year 2006. To give effect to the CRPD, the Indian Parliament enacted The Rights of Persons with Disabilities Act, 2016. Section 2 (s) of the said Act defines 'person with disability' (PwD) as a person with long term physical, mental, intellectual or sensory impairment which, in interaction with barriers, hinders his full and effective participation in society equally with others. Another term 'person with benchmark disability' is also stated in the 2016 Act. The said Act by stating 'person with benchmark disability' mean that particular protections and concessions in labour and employment when a disabled person is having 40% or more of a defined handicap.[5] Further, Section 2 (zc) of the said 2016 Act states about 'specified disability' and it attempts to define the term in the broadest possible way. Specified Disability means disabilities as specified in the Schedule of the said Act including six categories, namely, 'physical disability', 'intellectual disability', 'mental behaviour', 'disability caused due to chronological conditions or blood disorder', 'multiple disabilities' and any other category as may be notified by the Central Government.[5]

Coming to hate speech, Kent Greenawalt views it as an appealing term inclining towards fighting words doctrine, hostile environment harassment, and group libel.[6] The same stand is taken by Timothy C Shiell.[7] According to United Nations Strategy and Plan of Action on Hate Speech, hate speech is any kind of communication in speech, writing or behaviour, that attacks or uses pejorative discriminatory language concerning a person or a group based on who they are, in other words, based on their religion, ethnicity, nationality, race, colour, descent, gender or other identity factors.[8] Any other identity includes disability. Unfortunately, the term 'hate speech' has never been defined under Indian law. Commonly, hate speech is any form of expression through which speakers intend to vilify, humiliate, or incite hatred against a group or a class of persons based on race, religion, skin colour sexual identity, gender identity, ethnicity, disability, or national origin. In short, hate speech may be defined as the expression of derogatory vocabularies and personal prejudices that aim to dehumanise the target and provoke discrimination.

As the term 'hate speech' hasn't been defined, the Hon'ble Supreme Court in the case of *Pravasi Bhalai Sangathan vs. Union of India* directed the Law Commission of India to carry out a study on hate speech, define it and make recommendations to the Parliament to curb the menace associated to it.[9] Complying that, in the year 2017, the Law Commission of India submitted a report titled 'Hate Speech' wherein it proposed The Criminal Law (Amendment) Bill, 2017 to amend the Indian Penal Code, 1860 (IPC), and the Code of Criminal Procedure, 1973 (CrPC). The Law Commission of India proposed

the insertion of Section 153 C and Section 505A in the IPC.[10]

3. The Legal Framework

3.1 Statutory Provisions Protecting Disabled Persons

The Constitution of India through its Preamble, inter-alia seeks to secure to all its citizens – Justice, social, economic and political; Liberty of thought, expression, belief, faith and worship; Equality of status and opportunity. Part-III of the Constitution provides for a set of six Fundamental Rights to all the citizens. These include – Right to Equality; Right to Freedom; Right against Exploitation; Right to Freedom of Religion; Cultural and Educational Rights and Right to Constitutional Remedies (11). Even though no specific mention is there in the Constitution, the said rights are also available to the Persons with Disabilities (PwDs). The Indian Constitution guarantees citizens, including the disabled, the right to justice, freedom of speech and expression, freedom of worship, and equal status and opportunity. Article 19 (2) of the Indian Constitution restricts the fundamental freedom of speech and expression. Besides, the state and government are prohibited from discriminating against any citizen of India, including handicapped individuals, based on caste, race, religion, or disability, according to Article 15 (1) and 15 (2) of the Constitution.[11]

Further, the Directive Principles of State Policy incorporated in Part – IV of the Constitution are principles intended to be the imperative basis of State policy. These are really like instructions issued to future legislatures and executives for their guidance. As a part of it, Article 41 of the Constitution of India provides that the State shall, within the limits of its economic capacity and development, make effective provision for securing the right to work, to education and public assistance in cases of unemployment, old age, sickness and disablement and in other cases of undeserved want. Additionally, Article 46 lays down an obligation on the State to promote with special care the educational and economic interests of the weaker sections of the people and protect them from social injustice and all forms of exploitation.[11] To fulfil its commitments under the CRPD, the Indian Parliament enacted the Rights of Persons with Disabilities Act in 2016. Unlike The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act of 1995 (PWD Act of 1995 hereafter), which it superseded, the 2016 Act defines disability as a dynamic and changing idea rather than a fixed concept. As a result, rather than the charitable or societal model of disability, the 2016 Act incorporates provisions based on rights.

Terms like 'barriers' (Section 2 (c)), 'discrimination' (Section 2 (h)), 'reasonable accommodation' (Section 2 (y)), and 'Special Employment Exchange' (Section 2 (zb) are defined in the 2016 Act. The right to equality and non-discrimination (Section 4), rights against exploitation and abuse (Section 7), access to justice (Section 12), and other rights and entitlements are addressed in Chapter II of the 2016 Act. Apart from that, women and children with impairments are specifically addressed in Section 5 of the said 2016 Act.[5] The Mental Health Act, 1987 is another Act that consolidates and amend the law relating to the treatment and care of mentally ill persons, to make better provision concerning their property and affairs and for matters connected therewith or incidental thereto. One of the objects of this Act is that the mentally ill persons are to be treated like any other sick persons and the environment around them should be made as normal as possible. Further, this Act regulates admission to psychiatric hospitals or psychiatric nursing homes of mentally ill persons who do not have sufficient understanding to seek treatment voluntarily and to protect the rights of such persons while being detained.[12]

The National Trust for the Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities Act, 1999 established the National Trust for the Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities to meet the following objective: (i) To enable and empower persons with disability to live as independently and as fully as possible within and as close to the community to which they belong; (ii) To strengthen facilities to provide support to persons with disability to live within their own families; (iii) To extend support to registered organizations to provide need based services during period of crisis in the family of persons with disability; (iv) To deal with problems of persons with disability who do not have family support; (v) To promote measures for the care and protection of persons with disability in the event of death of their parent or guardian; (vi) To evolve procedures for the appointment of guardians and trustees for persons with disability requiring such protection; (vii) To facilitate the realization of equal opportunities,

protection of rights and full participation of persons with disability, and (viii) To do any other act which is incidental to the aforesaid objects.[13]

3.2 Laws Regulating Hate Speech

Article 19 of the Indian constitution guarantees every citizen the right to freedom of speech and expression, subject to the limits of morality and decency, public safety, defamation, incitement to commit a crime and other few grounds. Article 19 (2) enables the government to impose speech limitations "in the interests of" certain groups, but it also stipulates that the restrictions must be "reasonable".[11] In criminal law, IPC and CrPC have several provisions that punish and lays down the procedure to prosecute the culprits or perpetrators of hate speech. Section (s) 153A, 153B, 295A, 298, 505 of IPC are few among them that deal with the punishments for inciting offences related to hate speech (14). Whereas, Section (s) 95, 96, 144, 151, 178 and 196 of CrPC deal with the procedure to handle when hate speech offences are committed. Unfortunately, neither IPC nor CrPC has any specific provision that deals with PwDs.[15]

There are provisions in the Indecent Representation of Women (Prohibition) Act, 1986 that prohibits hate speech on women.[16] The Religious Institutions (Prevention of Misuse) Act, 1988 has few provisions for religious hate speech.[17] Protection of Civil Rights Act, 1955 and the Schedules Caste and Scheduled Tribes (Prevention of Atrocities) Act, 1989 have provisions penalising hate speech against marginalised communities but not PwDs specifically. It is the Rights of Persons with Disabilities Act, 2016 that is the only statutory salvage for disabled persons in India.

4. Landmark Judicial Verdicts

There are numerous cases wherein the courts have upheld the rights of disabled persons. One of the notable cases is of *U.P. Vishesh Shikshak Association v State of U.P.* wherein the Allahabad High Court acknowledged the government's legal obligation to "give all essential support and assistance to physically challenged pupils." The High Court further held that "the right to education and right to livelihood being the fundamental rights enshrined under Articles 21 and 21-A of the Constitution, the State Government has to make all efforts to provide necessary assistance to all disabled persons".[18] In the case of *National Association for the Deaf v Union of India,* the petitioner National Association for the Deaf filed a PIL in the Delhi High Court over the lack of sign language interpreters in government services. The petition said that there were insufficient sign language interpreters available in various public venues and requested orders against the Ministry of Social Justice and Empowerment and other agencies to provide sign language interpreter access and improved training. While the court acknowledged the paucity of sign language interpreters, it agreed with the Petitioner Association that the hearing impaired were unable to access medical, transportation, and banking services, as well as seek police assistance, owing to the lack of interpreters. The Court cited the CRPD in determining the need of ensuring the availability of interpreters and went on to hold that all of the aforementioned rights are established in Article 21 of the Indian Constitution.[19]

Further, the case of *Suchita Srivastava v Chandigarh Administration* is concerned about the reproductive rights of a mentally retarded lady living in a government-run welfare institution in Chandigarh who fell pregnant after being raped by an in-house employee and sought to keep the baby and take the pregnancy to term. The Chandigarh Administration petitioned the High Court for permission to terminate her pregnancy under the Medical Termination of Pregnancy Act, 1971 (MTP Act), claiming that she was incapable of continuing the pregnancy and would be unable to care for a kid. Even though the mother had stated her desire to bear her child, the High Court ordered the pregnancy to be terminated. However, the Supreme Court held that it was unable to allow her pregnancy to be terminated as the MTP Act establishes a procedure that respects the personal autonomy of mentally impaired people when it comes to reproductive choices such as continuing or terminating a pregnancy.[20] The right to legal competence of women with mental impairment to make independent decisions about their pregnancy was firmly recognised by the Supreme Court.

The Hon'ble Supreme Court in the case of *Union of India v National Federation of the Blind* upheld the judgment of the Delhi High Court providing reservation to the blind and low vision persons in the process of recruitment to Government posts as required by the statute.[21] Further, in the case of *Deaf Employees Welfare Association v Union of India,* the Hon'ble Supreme Court passed an order to provide speech and hearing-impaired people with the

same transportation benefits as blind and orthopedically challenged government employees. The court emphatically stated that even the belief that a hearing or speech impaired person suffers less than a blind person marginalizes them; as a result, they must be provided with the same advantages as blind individuals. [22] Similarly, in the case of *Shyam Narayan Chouksey v Union of India,* the Supreme Court held that handicapped persons are given the exception of standing on each occasion when the National Anthem is performed or sung. [23]

The Hon'ble Supreme Court in the case of *Pravasi Bhalai Sangathan v Union of India* referred to the Canadian Supreme Court decision in *Saskatchewan (Human Rights Commission) v Whatcott*. The judges examined the approach applied by Canadian Supreme Court in interpreting "hatred" as is used in legislative provisions prohibiting hate speech. The test devised by the Canadian judges was as follows: The first test was for the Courts to apply the hate speech prohibition objectively and in so doing, ask whether a reasonable person, aware of the context and circumstances, would view the expression as exposing the protected group to hatred. The second test was to restrict the interpretation of the legislative term "hatred" to those extreme manifestations of the emotion described by the words "detestation" and "vilification". This would filter out and protect speech that might be repugnant and offensive, but did not incite the level of abhorrence, delegitimization, and rejection that risks causing discrimination or injury. The third test was for Courts to focus their analysis on the effect of the expression at issue, namely, whether it was likely to expose the targeted person or group to hatred by others. The mere repugnancy of the ideas expressed would be insufficient to constitute the crime-attracting penalty.[9]

5. Suggestions and Conclusion

After they had undergone discrimination, most of the disabled persons don't pursue litigation to get justice for it takes longer to get it or due to the expensive legal affairs involved. Surprisingly, IPC penalises any act that promotes enmity between different groups on grounds of religion, race, place of birth, residence, language, etc. and doing acts prejudicial to maintenance of harmony, but doesn't even mention any offence against disabled persons. The harshness of the penal provisions in The Rights of Persons with Disabilities Act, 2016 for any offence committed against disabled persons shall be made more severe to create deterrence in the whole society. A speedy trial can raise optimism among disabled persons. Establishing a special court for hearing the grievance of only disabled persons would encourage disabled persons to pursue litigation. The prosecution machinery also shall efficiently handle such cases so that the wrongdoers of disability hate speech is convicted.

Government, as well as NGOs, need to take steps in increasing societal understanding of disability and persons with disabilities through public awareness campaigns. They should spread the message and share the tales of successful individuals with disabilities so that people with disabilities can be more integrated into society. Therefore, a sustained campaign for the protection of human rights for the disabled is the need of the hour.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None.

Source of funding: Nil.

References

1. Government of India. Persons with disabilities (divyangjan) in India – a statistical profile: 2021. [Internet]. New Delhi: National Statistical Office; 2021 Mar 31 [cited 2022 Jan 22]. Available from: http://www.nhfdc.nic.in/upload/nhfdc/Persons_Disabilities_31mar21.pdf.
2. The Crown Prosecution Service. Hate Crime. [Internet]. London: The Crown Prosecution Service; 2022 [cited 2022 Jan 22]. Available from: https://www.cps.gov.uk/crime-info/hate-crime.
3. Titley G, Keen E, Foldi L. Starting points for combating hate speech online [Internet]. Strasbourg: Council of Europe; 2014. [cited 2022 Jan 22]. Available from: https://rm.coe.int/1680665ba7.
4. Sherry M, Oslen T, Vedeler JS, editors. Disability hate speech: social, cultural and political contexts. New York: Routledge; 2020. [cited 2022 Jan 22]. Available from: https://books.google.co.in/books?hl=en&lr=&id=3kG9DwAAQBAJ&oi=fnd&pg=PT66&dq=disability+hate+speech&ots=U1PWb0hmom&sig=Lk50YetdhF60-JoCRiScGYUWBnU&redir_esc=y#v=onepage&q=disability%20hate%20speech&f=false.
5. The Rights of Persons with Disabilities Act 2016. [cited 2022 Jan 22] Available from: https://legislative.gov.in/sites/default/files/A2016-49_1.pdf.

6. Greenawalt K. Fighting Words: Individuals, Communities and Liberties of Speech. Princeton, NJ: Princeton University Press; 1995. chs. 4 and 5.
7. Shiell TC. Campus, 'Hate Speech on Trial'. 2nd Edn. Lawrence, KS: University of Kansas Press; 2009. p. 162.
8. United Nations. United Nations Strategy and Plan of Action on Hate Speech. New York: United Nations Publications; 2019 May. 5 p. [cited 2022 Jan 22]. Available from: https://www.un.org/en/genocideprevention/documents/UN%20Strategy%20and%20Plan%20of%20Action%20on%20Hate%20Speech%2018%20June%20SYNOPSIS.pdf
9. Pravasi Bhalai Sangathan v Union of India. (2014) 11 SCC 477.
10. Law Commission of India. Hate Speech. New Delhi: Government of India; 2017 Mar. 53 p. Report No.267. [cited 2022 Jan 22]. Available from:https://lawcommissionofindia.nic.in/reports/Report267.pdf.
11. Constitution of India. [cited 2022 Jan 22] Available from: https://legislative.gov.in/sites/default/files/COI.pdf.
12. The Mental Health Act 1987. [cited 2022 Jan 22] Available from: https://legislative.gov.in/sites/default/files/A1987-14.pdf
13. The National Trust for Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities Act 1999. [cited 2022 Jan 22] Available from: https://legislative.gov.in/sites/default/files/A1999-44_0.pdf
14. The Indian Penal Code 1860. [cited 2022 Jan 22] Available from: https://legislative.gov.in/sites/default/files/A1860-45.pdf
15. The Code of Criminal Procedure 1973. [cited 2022 Jan 22] Available from: https://legislative.gov.in/sites/default/files/A1974-02.pdf
16. The Indecent Representation of Women (Prohibition) Act 1986. [cited 2022 Jan 22] Available from: https://legislative.gov.in/sites/default/files/A1986-60_0.pdf
17. The Religious Institutions (Prevention of Misuse) Act 1988. [cited 2022 Jan 22] Available from: https://legislative.gov.in/sites/default/files/A1988-41_0.pdf
18. U.P. Vishesh Shikshak Association v State of U.P. Misc Bench No. 5622/ 2010, Allahabad High Court.
19. National Association for Deaf v Union of India. 2011 SCC OnLine Del 4954.
20. Suchita Srivastava v Chandigarh Administration. (2009) 9 SCC 1.
21. Union of India v National Federation of the Blind. (2013) 2 SCC 772.
22. Deaf Employees Welfare Association v Union of India. (2014) 2 SCC 173.
23. Shyam Narayan Chouksey v Union of India. (2017) 1 SCC 421.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Review Article

Criminal Justice Process for the Forensic Medicine in Murder Crimes

Ahmad Hussein Alsharqawi [a*], Ezzat El Emary[b], Anan Younes[b]

[a]Faculty of Law, Applied Science Private University Al Arab St 21, Amman, Jordan. [b]Assistant Professor, Faculty of Law, Al Falah University, Dubai, United Arab Emirates.

Article Info

Received on: 01.12.2021
Accepted on: 14.03.2022

Key words
Criminal Investigation, Justice, Law, Jordanian Code of Criminal Procedure.

Abstract

The goal of this review article is to better understand the function of forensic medicine in Jordan's criminal justice system. The study demonstrated what forensic medicine entails and how it relates to Jordanian legislation and court procedures, as well as the judge's discretionary right to take forensic reports, particularly in the case of murders; the study came to a satisfactory conclusion.

1. Introduction

As Forensic medicine plays a key role in identifying the crime and its repercussions. There is an influence on research methods and fact-conditioning in this manner. Injuries, deaths, and sexual crimes are all examples of this. Forensic medicine has a practical and technical role to play when the investigation fails to reveal the reasons and perpetrators of odd crimes. These places are searched and investigated in an effort to find the evidence that supports it. The accused is either convicted or acquitted of the charges against him[1].

We discover the forensic doctor doing medical exams on the wounded and expressing the nature and description of the injury, together with an indication of its cause and the date of its occurrence, in the public responsibilities he plays throughout the investigative phase. In addition, the sort of equipment or object that was used to make it, the risk of a permanent handicap, the evaluation of its stability, and its connection to the attack are all factors that might be considered.

It is the duty of the medical examiner, who has been deputized to assist at the scene of the crime, to perform these exams with integrity and honesty and issue a medical report verifying the examination[2]. Aside from conducting a postmortem examination of the deceased's body in criminal investigations and cases involving the suspicion of foul play or other causes of death, it is necessary to express technical opinions regarding accidents and errors, as well as test blood, sperm, and hair samples to learn about diseases[3].

Most likely, the most important purpose of analyzing the corpse is medical identification, which will let investigators figure out who the deceased is, even if that person is already known, and calculate an estimated period of death from the throwaway changes. Furthermore, find out the

How to cite this article: Alsharqawi AH, Emary E, Younes A. Criminal Justice Process for the Forensic medicine in Murder Crimes. J For Med Sci Law 2022;31(2):77-79.

*Corresponding author: Ahmad Alsharqawi, Lecturer at Applied Science Private University Faculty of Law, Al Arab st. 21-Amman-Jordan. (M): 00962796070234. Email- Ahmad_alsharqawi29@hotmail.com

reason for death, as well as the condition of the deceased corpse and whether or not someone moved it after death so that he can perform an autopsy if the deceased's condition is the consequence of criminal activity, regardless of whether the crime was committed intentionally or not. In addition to the situation where a dead body is discovered in water, if a deceased person is found after being burned or poisoned, an autopsy is considered a necessary diagnostic matter in the course of a forensic medical investigation. It also helps to know what type of crime has occurred, such as a suicide or a natural death caused by a disease.[4]

2. Discussion

When a criminal offense is committed, representatives of the judicial police, the public prosecutor, and experts are dispatched to the site to ascertain the crime's specifics, causes, and circumstances. However, members of the judicial police, public prosecutor, and judge may encounter scientific or technological challenges that cannot be addressed owing to their understanding of specialized judicial and legal skills within the confines of their authority and specializations. As a result, the Jordanian legislature approved the Jordanian Code of Criminal Procedure No. 9 of 1961 and its subsequent changes. However, the court and public prosecutor may seek the assistance of forensic medicine to clarify what is ambiguous and difficult for the court or public prosecutor to determine, pursuant to Article 20 of the same law, which states that if a person dies as a result of murder or an unknown cause that raises suspicion, the public prosecutor may seek the assistance of one or more doctors to organize a report of the causes of death and the condition of the deceased body.[5]

Forensic medicine is a branch of medicine concerned with elucidating issues of interest to the judiciary, such as examining the corpse to ascertain the variables that occur after death and the causes that contributed to its occurrence, as well as determining the manner and date of death, the tool used to cause it, and the time period between the time of death and the date of body disclosure.[6] Forensic medicine is of great importance concerning criminal cases, especially murders, whether at the primary investigation stage or the trial stage, and it depends on the forensic medical evidence sometimes the accused's conviction or acquittal. Opinions differed in order to determine the legal nature of the experience. Means of forensic proof and based on two elements: proof of the occurrence of the crime and the attribution of this crime to its perpetrator.[7] Another aspect went so far as to say that it is a way to assess the evidence the judge uses to reach the veracity, and he cannot use it if he is not satisfied with him, and we support this opinion.

Forensic medicine searches in murder crimes for the death and its cause and searches for the type of material means used to kill through the apparent examination of the bodies to prove their injuries and the cause of death, or the forensic medical examinations of the body if the cause of death is not known by apparent detection.[8] The forensic doctor examines the corpse and the victim's clothes, type and colour, describes its content, notes any lacerations or spots of blood or sperm on it, and then studies the signs of the corpse's changes (cooling, blood deposition, stiffness, analysis). As for the internal examination of the corpse, the anatomical characteristic is considered one of the most important and accurate works of the results it entails, and the dissection is according to the following principles (neck, abdomen, head and chest). The forensic doctor records his observations about that corpse. Then he searches for determining the time of death. For example, if the condition of the corpse is hot and there is no sedimentation and hardening of the body, then the time of death is estimated from one to two hours. But if the corpse has lost its temperature and the stiffness of the body is noticed, then the death occurred from 3-8 hours.[9]

After that, the forensic doctor prepares his experience report, and the expert report is the essence of the expert process, as through it the forensic doctor presents the results of his research that constitute the necessary technical and scientific elements that benefit the judge or investigator in clarifying the truth and allow him to make his judgments in the light of it. The expert opinion includes a statement of proof of evidence and a detail of its elements.[10] A proposal from a medical and scientific point of view of the value it can have in proof[11], and an application of the principle of judicial conviction, the judge shall have the discretionary power to assess its value as is the case with the rest of the evidence that the court appreciates after it is discussed by the litigants and in an oral application and confrontation In the trial, the court may or may not be convinced of the forensic doctor's report as it deems appropriate, according to the conscience

principle stipulated in Article 174 of the Jordanian Criminal Procedures Law as long as it is the only evidence.

In the implementation of this, the Jordanian Court of Cassation ruled in its Decision No. 46/1978: that although the trial court's conviction of evidence is not subject to the control of the Court of Cassation, this court has the right to monitor it in terms of whether or not the evidence is legal because this issue is related to legal applications and not from realistic matters and to the judge That his conviction is in the evidence contained in the case without being bound by a certain way or a certain type of evidence, and this is what the Jordanian legislator confirmed in the text of Article 86/2 of the Code of Civil Procedure that the expert's opinion does not restrict the court. The judge is free to take evidence when he reassures his conscience and can be excluded evidence if he is not satisfied.

3. Conclusion

The criminal investigation is a struggle between the investigator and the criminal, the first aims to reach the truth, and the second tries to obscure it to escape punishment. In its general sense, the investigation takes all legitimate measures and means that lead to uncovering the truth. The road and guides how to walk and search for evidence.

Forensic medicine is a term that consists of two parts: medicine and law. As for medicine, it is the science that is concerned with everything related to the human body, whether alive or dead, and Sharia means the law that separates disputes between individuals. Forensic medicine is not limited to writing medical reports or autopsy; it is a living science in its own right, the importance of keeping pace with recent and accelerating developments and advanced theories in analysis and diagnosis.

The opinion of the forensic doctor does not restrict the court, and the judge is completely free to take evidence when he is satisfied with his conscience. However, evidence can be excluded if he is not satisfied so that it has become necessary to design a special curriculum for criminal sciences for law students in Jordanian universities in a manner consistent with the legal mentality.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None.

Source of funding: Nil.

References

1. Batrawy AL. Forensic Medicine and Toxicology. 1st Edition. Amman: Tariq Bookshop; 2004.
2. Shahror HA. Forensic Medicine Principles and Facts. 1st Edition. Beirut: Alhalabi Legal Publisher; 2000.
3. Eckert WD. Introduction to the Forensic Sciences. 2nd Edition. London: CRC Press; 1997.
4. Abuissa, HA. Law of Criminal Procedures. 1st Edition. Amman: Wael Publishing House; 2013.
5. Mashali AH. Al Wajeez in Forensic Medicine. 1st Edition. Alexandria: Dar alwafaa; 2009.
6. Alma'aytah MO. Forensic Evidence and Criminal Investigation. 1st Edition. Amman: Dar althaqafa; 2000.
7. Abuissa H, Juwaihan M. The Extent of the Need for Teaching Forensic Science for Law Students in Jordanian Universities. Indian J Forensic Med Toxicol.2021; 15(1): 1097-1100.
8. Berman M, Kim A. Bridging the Gap between Science and Law: The Example of Tobacco Regulatory Science. J Law Med Ethics. 2015; 43(1): 95–8.
9. Elrefaie A, Alsharqawi A. The Criminal Liability of the Forensic Doctor as a Judicial Expert According to Jordanian Law. Indian J Forensic Med Toxicol. 2021; 15(4): 254–8.
10. Al-Hendi NI. Distortion of Meaning in Forensic Medicine Reports. J For Med Sci Law. 2021; 30(2): 67-70.
11. Leena K, Kumar K, Ahmad N. Role of Forensic Botany in Crime Scene Investigation -A literature review. J For Med Sci Law. 2021; 30(2): 52-6.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Short Communication

Clinical Forensic Psychology: It's Emergence, Significance and Application in India.

Amrita Ajitprasad[a] , Ravindra Baliram Deokar[b]*
[a]Forensic Psychologist, Mumbai, Maharshtra, India. [b]Professor (Additional), Forensic Medicine, King Edward Memorial Hospital & Seth G S Medical College, Mumbai, Maharashtra, India. Pin-400012.

Article Info

Received on: 28.01.2022
Accepted on: 02.12.2022

Key words
Clinical psychology,
Forensic Psychology,
Crime,
Mental illness,
Forensic Neuroscience.

Abstract

Psychology is a study of human behaviour branching out to several specializations namely, social psychology, counselling psychology, industrial psychology, criminal psychology, child psychology etc. Clinical psychology is a specialization of psychology involved in the study and identification of diagnoses, assessment and intervention in individuals suffering from mental disorders. There has been a tremendous rise in deaths, crimes due to mental health illnesses, yet the taboo remains unchanged. People are wary of talking about their mental health concerns or consulting an expert fearing prejudice and labelling. This fear of not being able to socially integrate after a mental health illness, the fear of losing support, and the stereotyping the family members experience, prevents a person from talking about their mental health issues. Characteristic features of certain mental disorders comprise of violent behaviour, manipulative behaviour, impulsive-explosive behaviour, excessive aggression which may be a threat to themselves and the society, at large. There have been research studies linking crimes to mental health illnesses and later studies refuting the claims. Various awareness programmes conducted in the society. Mandatory positions of psychologists at schools, corporates – private and public sectors, small scale-large scale industries and colleges have been a relief, but not enough to eliminate the fear of stigma which is still prevalent. This paper focuses on the importance of clinical psychology and psychological applications in forensic set ups with emergence and significance of Clinical Forensic Psychology.

1. Introduction

Lightner Witmer, an American Psychologist, introduced the term 'Clinical Psychology' in his paper in 1907. The origin of 'Clinical Psychology' can be dated back to 1896 when Witmer first opened a psychological clinic to help children with learning disabilities.

How to cite this article: Amrita A, Deokar RB. Clinical Forensic Psychology: It's Emergence, Significance and Application in India. J For Med Sci Law 2022;31(2):80-83.

***Corresponding author:** Dr Ravindra B Deokar, Professor (Additional), Department of Forensic Medicine, KEM Hospital & Seth G S Medical College, Mumbai, Maharashtra, India. Email: ravindradeokar@kem.edu (M)+91-9423016325.

There were eminent researchers, psychologists and psychiatrists further developing this branch of science continuously to meet the needs of changing society and provide appropriate psychological assistance.

1. Western and eastern influences of Clinical Psychology

Clinical psychology is the study of psychopathology and one of the earliest influences was the work of Sigmund Freud. Freud believed that fixations at an earlier age caused problems in the later stages of life. Carl Rogers, another American psychologist said it was the incongruence between what we want to be and what we are, that led to a pathology. Viktor Frankl, an existential psychologist, maintained that pathology was a result of one's inability to find a meaning or purpose in life. There were various explanations to causes of mental illnesses usually based on the era they belonged to.[1]

Eastern influences of Philosophy were prevalent in ancient India. Indian philosophy and its ideas were the foundation for development of psychology as a subject in India. The ideas were based on reflection, experience, and empirical analysis. In India, traditional healers dealt with large number of mentally ill patients. They followed certain rituals, advocating strict dietary habits, moral and ethical rules, and physical exercises. The etiology of mental illnesses among the Indian people was believed to be due to sins or wrong deeds in the past or current life, faulty diet, changes in physical state of the body, curse of the ghosts, spirits, etc., magic or sorcery, social and psychological factors.[2]

Psychology in India remained detached from its own rich history of knowledge latent in early philosophical texts and was largely dominated by Euro-American theories, models, tests and researches. However, the western influences of psychology were largely incorporated by eminent scholars in the field and developed theories and treatments well suited to the Indian population. Renowned psychologists and psychiatrists of India, being immediate students of the pioneers in the field of psychology, have remarkably laid the groundwork in the emergence of psychology in India. Brojendra Nath Seal, Dr. Narendra Nath Sen Gupta, Girindra Shekhar Bose were few the early pioneers in drafting first syllabus for experimental psychology, to establish the first department of psychology, to found the Indian Psychoanalytic Society, to and to start a publication, the first journal- the Indian Journal of Psychology. It was only post-independence, that psychology grew outside the university system. The Psychological Research Wing of DRDO was set up in 1949. Gradually, the University Grants Commission (UGC) provided funds to various universities to start psychology departments, resulting in the Indian adaptations of intelligence assessments in Indian languages. There was also a surge in the number of research studies in the areas of epidemiology of mental illness, phenomenology of depressive behaviour, yoga and wellbeing, mental retardation by the 1970s. the psychologists in the mid-1970s realized the need to move away from the replication of western ideas and consider the cultural implications of various theories.[1]

2. Diagnosis and Testing of Psychopathology

Clinical Psychology was more developed during the World War I when the practitioners demonstrated the usefulness of psychological assessments. The contributions of several physiologists, neurologists, psychologists, and psychiatrists have led to the development and formulations of various methods to identify and assess an individual of any presence of mental illnesses. Dated back to early 1900s, Alfred Binet, a student of Stanford university developed tests to screen children of intellectual difficulties. Later Group tests, Army Alpha and Army Beta were developed to recruit soldiers. Psychological tests were developed continuously to meet the demands and needs of the society. Thereafter assessments testing various domains were developed. Clinical neuropsychological batteries assess and identifies any deficits in the brain functioning in the realms of cognitive, motor, sensory and emotional functioning.

3. Mental illness and crime

According to World Health Organization, 'mental health is a state of well-being in which everyone realizes their own potential, can cope with the normal stresses of life, can work productively and fruitfully, and can contribute to the society. Various prominent scholars in this field of clinical psychology have discussed the causing factors to mental disorders which hampers their social and occupational functioning as an individual.

Research studies have implied a link between violence and mental disorder. It is the common belief in the society that person with mental illness is more prone aggressive or violent acts. And further many times the criminal justice system treats the person

with mental illness as criminal and used to get arrested, charged, and jailed.[3] On other side, many researchers' data suggest that the person with mental illness is more likely to be a victim of violent criminal activity than the perpetrator.[4]

Many researchers refuted these claims and have stated that the characteristics symptoms, such as hostility and delusions, of certain mental disorders in combination with substance abuse are likely to linked to high probability of violence. Over the years, considering the statistics of crime in India,

According to the Risk Assessment study (1990s), sponsored by the Research Network on mental Health and the Law of the MacArthur Foundation and the National Institute of Mental Health, after studying around 1000 patients (both male and female) suffering from acute mental disorders (except mental retardation), researchers have classified the risk factors for violence into four categories namely, Personal/dispositional factors: age, gender, control of anger impulsiveness, personality etc, Developmental/historical factors: history of child abuse, work history, history of violence, hospitalization, history for mental disorder, Contextual factors: environmental stress, social support, weapons accessibility, lack of support from family or friends etc., Clinical factors: signs and symptoms, such as, delusions and hallucinations, substance abuse etc.[5]

4. Significance of psychology applications in forensic setting

A large body of data in an article by Ghiasi et al., 'Psychiatry and mental illness,' suggests that the people suffering from mental illnesses are more likely to be a victim of violent crimes than a perpetrator.[6] And this ambiguity arises as a result of incorrect labelling of all perpetrators as individuals with mental illness. The article discusses how the society's view of behaviour and conduct problems as symptoms of a psychological disorder leads to false public perception. Hence it is vital that the clinicians apply diagnoses only when characteristic traits are present, to prevent perpetrators from using the cover of psychiatric diagnoses to evade any punishment.

In today's scenario, the test of sanity of the victim, witness and suspect is equally essential in carrying out the judicial procedures for a fair trial. No individual should be falsely implicated and those with conflict with the law should not be left uncorrected. Mental health is on a continuum, the derailment of which is unpredictable. An individual since birth undergoes significant changes in life. They may or may not be well equipped to deal with the stressors of life. Moreover, our environment in which an individual dwells, the people around them, the interaction they create impact significantly an individual's development. Individuals' common sense, beliefs, ideologies, philosophies, decisions are largely dependent on the environment, the culture, and the society they belong to. Society, very quickly, will not hesitate to label someone rigid, a rebel, or disobedient if they fail to fit in the societal expectations. These underlying feelings of frustrations, emotions, unfulfilled aspirations, and desires are sometimes manifested in different forms later in life, depending upon their ways of responding and reacting.

Psychological tests like the projective tests and personality methods are used to either rule out the diagnoses or identify the signs of psychopathology, if any. There has been a comprehensible debate till date in criminality being linked to mental illness, whether crimes are committed by people born with a guilty mind or is it due to a mental illness. However, due to very few research studies in assessing the brains of psychopaths, sociopaths, gruesome offenders or understanding any organic differences, there is not any concrete cause or etiology of such behaviour.

An emerging super-specialization of clinical psychology or applied psychology is 'Forensic Psychology'. **Forensic psychology** deals with the development and application of scientific knowledge and principles to aid in solving legal problems in criminal, civil, contractual, or other judicial proceedings.[7] Clinical Forensic Psychologist may conduct clinical assessment and evaluation of person's state of mind for legal purposes. This will be helpful in criminal proceedings, parole hearings, family or civil court proceedings.[8]

5. Summary

The psychological forensic lie-detection methods that have been popularly used are polygraph, narco-analysis tests, suspect detection etc., with varying degrees of reliability.[9] These methods are not used as sole evidence and not admissible at the court. They are used, instead, as corroborative evidence during the investigation processes. There is a combination of clinical psychological methods and forensic psychological

methods, that in conjunction, provide a pool of information facilitating in the investigative processes and aids in the formulation of rehabilitative and preventive interventions.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None.

Source of funding: Nil.

References:

1. Barlow DH. The Oxford Handbook of Clinical Psychology. New York: Oxford University Press; 2011.
2. Paranjpe AC. From tradition through colonialism to globalization: Reflections on the history of psychology in India. In A. C. Brock (Ed.), Internationalizing the history of psychology. New York: New York University Press; 2006: 56-74.
3. Gottfried ED, Christopher SC. Mental Disorders Among Criminal Offenders: A Review of the Literature. J Correct Health Care. 2017 ;23(3):336-46.
4. Watson A, Hanrahan P, Luchins D, Lurigio A. Mental health courts and the complex issue of mentally ill offenders. Psychiatr Serv. 2001 Apr;52(4):477-81.
5. The MacArthur Violence Risk Assessment Study, School of Law, University of Virginia. (Cited 12nd December 2022). Available from: https://www.law.virginia.edu/faculty/macarthur-violence-risk-assessment-study
6. Ghiasi N, Azhar Y, Singh J. Psychiatric Illness and Criminality. [Updated 2022 May 22]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan.
7. Brown J, Campbell E. The Cambridge Handbook of Forensic Psychology. United States of America, New York: Cambridge University Press; 2010: 1–4.
8. Fulero SM.; Wrightsman LS. Forensic psychology. 3rd ed. Belmont, CA: Wadsworth; 2009.
9. Ravat PS, Deokar RB, Ravat SH. Future and Scope of Forensic Neurosciences in Criminal Investigation System towards Justice. J For Med Sci Law 2022;31(1):77-82.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Short Communication

Executive summary of the XXIV State Annual conference of Medicolegal Association of Maharashtra (MLAM): Forensicon 2021.

Rajesh C. Dere[a], Hemant G. Kukde[b], Ravindra B. Deokar[c], Sachin S. Patil[d*], Narendra B. Kumar[e]
[a] Professor & Head, [b] Professor (Additional), [d]Associate Professor, [e]Assistant Professor; Department of Forensic Medicine & Toxicology, LTMMC & LTMG Hospital, Sion, Mumbai, Maharashtra, India-400022.
[c]Professor (Additional), Department of Forensic Medicine & Toxicology, Seth G S Medical College & KEM Hospital, Mumbai, Maharashtra, India-400012.

Article Info

Received on: 14.01.2022
Accepted on: 02.06.2022

Key words
Forensic Conference,
Medicolegal issues,
Hospital Management,
Forensic Sample analysis,
Crime investigation.

Abstract

The XXIV annual state conference of the Medicolegal Association of Maharashtra: Forensicon 2021 organized by the department of Forensic and Toxicology, Lokmanya Tilak Municipal Medical College and Hospital, Mumbai. Previous conference "Forensicon 2020" was held at TNMC & BYL Nair Ch. Hospital, Mumbai in the month of April 2021 as COVID pandemic prevented the continuity of the conference in the year 2020. Responsibility of organizing XXIV annual State conference was allotted to Department of Forensic Medicine and Toxicology, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai on 22nd November 2021. The organizing committee have magnificently conducted the annual state conference in the very short duration of 24 days on 17th and 18th December 2021 at main auditorium, Lokmanya Tilak Municipal Medical College and hospital, Mumbai. Dr Rajesh Dere, professor and head, Forensic Medicine Dept, LTMMC & hospital and Dean BKC Jumbo COVID 19 facility, Mumbai through his valiant efforts as team leader overcoming all the obstacles brought this conference to epitome of success.

1. Introduction

The XXIV annual state conference of the Medicolegal Association of Maharashtra: Forensicon 2021 organized by the department of Forensic and Toxicology, Lokmanya Tilak Municipal Medical College and Hospital, Mumbai. Previous conference "Forensicon 2020" was held at TNMC & BYL Nair Ch. Hospital, Mumbai in the month of April 2021 as on virtual hybrid platform.

The organizing committee (**Photograph 01**) have magnificently conducted the annual state conference in the very short duration of 24 days on 17th and 18th December 2021 at main auditorium, Lokmanya Tilak Municipal Medical College and hospital, Mumbai. Dr Rajesh Dere, professor and head, Forensic Medicine Dept, LTMMC & hospital and Dean BKC Jumbo COVID 19 facility, Mumbai through his valiant efforts as team leader overcoming all the obstacles brought this conference to epitome of success. The Organizing team was presided by Dr KD Chavan, Registrar, MUHS, Nashik and guided by Dr Mohan Joshi, Dean, LTMMC

How to cite this article: Dere RC, Kukde HG, Deokar RB, Patil SS, Kumar NB. Executive summary of the XXIV State Annual conference of Medicolegal Association of Maharashtra (MLAM): Forensicon 2021. J For Med Sci Law 2022;31(1):84-88.

***Corresponding author:** Dr Sachin S Patil, Associate Professor, Department of Forensic Medicine & Toxicology, Lokmanya Tilak Municipal Medical College & LTMGH, Sion, Mumbai, Maharashtra, India. Pin-400022. Email: sachinpatilmdfm@gmail.com (M): +91- 9136667077.

and GH, Mumbai. The conference was conducted under the chief patronage of Mr I.S. Chahal, Hon. Municipal Commissioner, MCGM along with patronage of Mr Suresh Kakani, Hon Additional Municipal commissioner, (WS & health) MCGM, Mumbai.

Photograph 01: Organizing committee Forensicon 2021.
Left to right: Sitting:- Dr NB Kumar, Dr HG Kukde, Dr RC Dere, Dr RB Deokar, Dr SS Patil, Dr K Shirsat. Left to right: Standing:- Dr RR Wagh, Dr RA Kanekar, Dr S Shende, Dr A Lokare, Dr A Vora, Dr P Bale, Dr N Bhutada, Dr P Pavan Kumar, Dr R Lokare

Theme of the conference was "Forensic Medicine- Breaking new grounds." The conference was aimed at upgrading the knowledge of the delegates and abreast them with recent advances in the field of Forensic Medicine.

2. Proceedings of the conference

This state chapter of Medicolegal Association of Maharashtra witnessed more than 300 delegates for whole two days. The delegates comprise the faculty of Forensic Medicine, Postgraduate students, Medical Officers, Police personnel, Lawyers, Forensic Scientist and Medical practitioner from different parts of India who actively participated in all the sessions.

First day of the conference i.e., 17th December 2021 started with Guest lecture on "Crime scene visit – a holistic approach." by Dr. Dinesh Rao, Professor & Head, TOMCH, Bangalore. The lecture was chaired and coordinated by Dr SC Mohite and Dr RR Savardekar.

Inauguration of Forensicon 2021, annual state conference was being held in the auspicious presence of Dr Dilip Mhaisekar, Director, Directorate Medical Education and Research, Govt. of Maharashtra and Ex VC, MUHS, Nashik. The session was also graced by Dr Avinash Supe, Director, PD Hinduja hospital, Mumbai, Dr Ramesh Bharmal, Director ME and MH, MCGM and Dr VV Apte, Ex Prof and Head, FMT, TNMC & BYL Nair hospital, Mumbai. The occasion was also embellished by the presence of Dr Mohan Joshi, Dean LTMMC & GH, Mumbai, Dr Shailesh Mohite, President, MLAM & Dean HBTMC & RNCH, Mumbai, Dr Nilima Bhamare, President elect, AMC and Dr RR Savardekar, Ex Prof & Head, FMT dept, LTMMC, Mumbai. This session was commenced with the inaugural speech of the dignitaries on the dais (**Photograph 02**) and lamp lightning ceremony (**Photograph 03**). Dignitaries for this conference then officially released souvenir for the Forensicon 2021 conference (**Photograph 04**) followed by the release of Journal of Forensic Medicine science and law, official publication of Medicolegal Association of Maharashtra (**Photograph 05**) . By the initiative of the organizing committee, membership card for the life members were made and officially released by the dignitaries. In addition, faculty of Forensic Medicine who have contributed significantly to the subject and the society were felicitated on this auspicious occasion. Dr Rajesh Dere was felicitated for his significant contribution in COVID relief work and COVID Vaccination at BKC Jumbo COVID hospital, Mumbai. Next felicitation was for Dr Kalidas Chavan for his eminent work as registrar, MUHS for streamlining the functioning of MUHS. There was also felicitation for Dr Ajit Pathak for his noteworthy work as Controller of examinations, MUHS, Nashik. Dr Sandeep Kadu was also felicitated for his remarkable work in the field of Medical education and bagging the best MUHS teacher award. Finally, Dr Ravindra Deokar was felicitated for his astonishing work for the journal of Forensic medicine and toxicology, triggering the revival of the journal and uplifting the journal to the international level by getting indexed in Scopus.[2]

Photograph no 02: Inauguration speech by Dr Dilip Mhaisekar.
Left to right sitting: Dr MA Joshi, Dr RN Bharmal, Dr AN Supe, Dr SC Mohite, Dr VV Apte, Dr RR Savardekar, Dr N Bhamare.

Photograph 03: Lamp lightning ceremony.
Left to right: : Dr RN Bharmal, Dr MA Joshi, Dr D Mhaisekar, Dr AN Supe, Dr SC Mohite, Dr RC Dere, Dr RR Savardekar.

Photograph 04: Release of Souvenir Forensicon 2021.
Left to right : Dr RC Dere, Dr MA Joshi, Dr RN Bharmal, Dr AN Supe, Dr D Mhaisekar, Dr SC Mohite, Dr RR Savardekar, Dr N Bhamare.

This was followed by informatic Lecture on topic "Formulating Research Question in Forensic Medicine." by Dr. Avinash Supe, Director, Clinical Governance & Head, P. D. Hinduja Hospital, Mumbai. The chairpersons for the session were Dr KU Zine and Dr SS Kadu.[3] Third lecture for the first day was by Adv. Sudeep Pasbola, Member & Ex Vice chairman, Bar council of Maharashtra & Goa on topic" Doctor in witness Box- a legal purview". The chairpersons for the lecture were Dr HM Pathak and Dr Ajay Patil.

Next lecture for the day was from the international speaker Dr Yanko Kolev, Head of department, Forensic Medicine, District Hospital, Gabrovo, Bulgaria. Topic for the lecture was "virtuopsy- autopsy without scalpel" with chairpersons being Dr MB Shrigiriwar and Dr GS Chavan. Last lecture for the first day was on topic "Medicolegal aspects of Vaccination deaths." by Dr. B. G. Chikhalkar, Professor & Head (FMT), GMC Mumbai. This lecture was chaired by Dr RV Kachare and Dr BV Jain. Similarly, Scientific Paper presentations for faculty and postgraduate students was also scheduled in the afternoon session in adjoining seminar halls. Scientific Paper presentations for faculty was chaired by Dr Rajesh Sukhdeve and Dr Rajendra Bangal. While paper presentations for PG students was chaired by Dr Ajay Shendarkar and Dr Sadanand Bhise.

Photograph 05: Release of Journal of Forensic Medicine, science and law.
Left to right: Dr RC Dere, Dr MA Joshi, Dr RN Bharmal, Dr AN Supe, Dr D Mhaisekar, Dr SC Mohite, Dr RR Savardekar, Dr N Bhamare, Dr RB Deokar, Dr SS Patil.

Photograph 06: Panel Discussion
Left to right: API Wagh, API Madhukar, Dr S Surase, Dr S Utture, Dr K Kulkarni, Dr SM Patil, Dr P Keshkar, Dr S.Iyer, Dr S Pikale, Dr V Thakur, Dr KU Zine and Dr RC Dere.

Last session for the first day of Forensicon 2021 was panel discussion with topic "Hospital Management- Various Medicolegal issues". Prominent panelist for the panel discussion were Dr Shivkumar Utture, President, MMC and Member, NMC. Dr SM Patil, Police Surgeon, Mumbai, Dr KU Zine, Prof & Head, GMC, Aurangabad, Dr Krishna Kulkarni, Ex Director, FSL, Mumbai, Dr Padmaja Keshkar, EHO, MCGM, Dr Vidya Thakur, Chief MS, peripheral hospitals, MCGM, Mumbai, Dr Sanjay Surase, MS, JJ group of hospitals, Mumbai, Dr Sangita Pikale, Consultant, AMC, Dr Suganthi Iyer, Dy. Director, PD Hinduja hospital, Mumbai, API Madhukar & API Sachin Wagh. Panel discussion was moderated

by Dr RC Dere. (**Photograph 06**). There was in-depth discussion on multiple issues of medicolegal importance pertaining to Forensic Medicine faculty, Medical officers, Police, FSL personnel and lawyers.

General body meeting of Medicolegal Association of Maharashtra was conducted from 05.30 pm on 17th December 2021. The Inauguration of the MLAM membership Identity card was done by the executive committee of Medicolegal Association of Maharashtra (**Photograph no 07**). Various issues related to faculty of Medicolegal association of Maharashtra were discussed and elections were held for Executive committee of Medicolegal Association of Maharashtra.

Photograph 07: Release of MLAM Member ID card.
Left to right: Dr RC Dere, Dr MV Sonawane, Dr SS Kadu, Dr AB Shinde, Dr SM Patil, Dr SC Mohite, Dr KD Chavan, Dr MN Pawar, Dr RB Deokar, Dr SS Patil.

Photograph 08: Convocation ceremony.
Left to right: Dr MB Shrigiriwar, Dr KU Zine, Dr R Kute, Dr SC Mohite, Dr MA Joshi, Dr SV Ghumatkar, Dr RS Bangal.

Second day of Forensicon 2021 on 18th December 2021 commenced with lecture on topic "Redefining medicolegal services – a challenge for the future" by Dr. Avinash Deshpande, Director, CEO & Medicolegal Consultant, Manavi Medicolegal Consultancy, Aurangabad. This topic was chaired by

Dr MB Shrigiriwar and Dr RB Deokar. This was followd by lecture on topic" Biological Evidence – Role & challenges for RMP by Dr. R. S. Bangal, Professor & Head (FMT), Symboisis Medical College for Women, Pune. Next topic was on Mini Toxicology Laboratory at A Tertiary Health Care Centre – Need of an Hour. Dr. S. V. Ghumatkar, Dy. Director, FSL, Mumbai. Chairpersons for this lecture were Dr Sunil Kadam and Dr Pawan Sabale. Last lecture for second day was on topic "Toxic trends – designer drugs." by Dr. Naresh Zanjad, Professor & Head (FMT), BJGMC, Pune. This lecture was chaired by Dr Mohan Pawar and Dr Navinkumar Verma. Eventually, as every good thing comes to end, the conference was concluded by Valedictory function. This function was moderated by Dr Rajesh Dere with the dignitaries on dias. Prize distribution to the Winners of paper presentation for Faculty and Postgraduate students was done. Faculty paper presentation winners were Dr Ravindra Deokar and Dr Ajay Patil for 1st and 2nd position respectively while for postgraduate students, Dr Rutuja Kanekar and Dr Ashwini Bhosale secured 1st and 2nd position respectively. Delegates from different fraternity were provided chance to express their views about the conference. Dr Rajesh Dere briefed about the preparations of the conference and offer thanks to all the delegates, honorable dignitaries, respected guest speakers and the whole organizing team. (**Photograph 08**).[5]

3. Conclusion

Forensicon 2021 was the state chapter of Medicolegal Association of the Maharashtra conducted by the department of Forensic Medicine and Toxicology, LTMMC & GH, Mumbai under the guidance of Dr Rajesh Dere. This was first time in the history of Medicolegal Association of the Maharashtra that the annual conference was organized within record time of 24 days. This was only possible by the support and constant encouragement of all faculty of Forensic Medicine from whole Maharashtra. The purpose of this conference was to add the rich heritage of Forensic Medicine through lectures and discussions as well as to boost the morale of future pioneers from the current pioneers.

Concluding points drawn from this conference were about need for maintaining the uniformity of the format of the reports and about the procedures involved in various medicolegal cases in different types of hospitals. There is also need to maintain proper coordination with police and Forensic science experts to avoid undue delay of viscera and other samples.

Journal of Forensic Medicine, science and Law currently index with Scopus due to the valiant efforts of editorial committee under the guidance of Dr Ravindra Deokar. It is also aimed for getting indexed in PUBMED, DOAJ and other indexes at the earliest. The editors also has aim of discrete website for online submission of articles for the journal.

The science gave forensics and law gave crimes!!! Such academic gatherings at regular interval can serve as booster for advancement of the knowledge of Faculty, PG students, police, Lawyers and Forensic science personnel which can thereby serve as base in imparting justice to the mankind.

References:

1. Mohite SC, Sabale PR, Tonse SB, Patil SS, Waghmare PB, Waghmare VN, Sawardekar SG. Executive Summary of the XXIII Annual State Conference of Medicolegal Association of Maharashtra (MLAM): Forensicon 2020. J For Med Sci Law 2021; 30(2):71-75.
2. Deokar R, Bhise SS, Patil SS. Journal of Forensic Medicine, science and law, Official publication of Medicolegal Association of Maharashtra. (Internet) [Cited 2022 Jan 20].Available from: https://www.mlam.in/journal.htm
3. Deokar RB, Patil SS. Basics of Research and Publications. J For Med Sci Law 2021; 30(2):1-3.
4. Chavan KD, Dere RC, Deokar RB. Medicolegal Association of Maharashtra. (Internet) [Cited 2022 Feb 18].Available from: http://www.mlam.in/aboutmlam.htm
5. Dere RC, Kukde HG, Patil SS, Kumar NB. Forensicon 2021 annual State conference of Medicolegal Association of Maharashtra at Lokmanya Tilak Municipal Medical College and General Hospital. (Internet) [Cited 2022 Feb 11].Available from: http://www.ltmgh.com/frontview/index.aspx

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Case Report

Carelessness leading to Impalement injury to orbit – an avoidable consequence for motorcyclists.

Karthi Vignesh Raj. K[a]*, Siddhartha Das[b], Venkatesh J[a], T Sudharson[c], Anam Khan[d]

[a]Senior Resident, [d]Junior Resident; Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences, New Delhi, 110029. [b]Additional Professor and Head, Department of Forensic Medicine and Toxicology, Jawaharlal Institute of Postgraduate Medical Education & Research, Puducherry India, 605006. [c]Professor and Head, Department of Forensic Medicine, Department of Forensic Medicine, Bhaarath Medical College and Hospital, Chennai 600073.

Article Info

Received on: 13.09.2021
Accepted on: 01.02.2022

Key words
Road traffic incident,
Impalement injuries,
Penetrating injury,
Orbit fracture,
Road Safety.

Abstract

A Road traffic incident (RTI) is an accident which is defined "as any injury due to crashes originating from, terminating with or involving a vehicle partially or fully on a public road". It is the leading cause of mortality which happens due to the carelessness of the people. There are multiple types and pattern of injuries observed in such incidents. However, the impalement injuries also play a major role in causing devastating and deadly injuries. Here we report a case of one such deadly incident involving an element of impalement. The novelty of this case is to create awareness scientifically among the public to follow the safety measures while driving. In addition to this, the injuries observed is compared with various other literature published and the mechanism by which they had been produced.

1. Introduction

A Road traffic incident (RTI) is an accident which is defined "as any injury due to crashes originating from, terminating with or involving a vehicle partially or fully on a public road".[1] It is heading the list of leading causes of the global disease burden. RTI, not only affect the people physically but also cause huge economic loss to victims and their belongings indirectly affecting the country's productivity as a whole. This cannot be eliminated but can be prevented by following the safety measures like wearing helmets, wearing seatbelts, adhering to speed limits and avoid drunken driving etc. Multiple injuries can be observed in a RTI which are specific to the mechanism of occurrence of respective RTI. The impalement injuries are one such type which occur in RTI however, they are commonly observed in the fall from height cases.

The impalement injuries in the transorbital intracranial region are quite uncommon among the motorcyclist. This is due to strict implementation of Motor Vehicle Act 1988 which was recently amended in the year 2019. Accordingly, section 129 of the act mandates compulsory wearing of the

How to cite this article: Karthi VR, Das S, Venkatesh J, Sudharson T, Khan A. Carelessness leading to Impalement injury to orbit – an avoidable consequence for motorcyclists. J For Med Sci Law 2022;31(2):89-92.

***Corresponding author:** Dr Karthi Vignesh Raj K, Senior Resident, Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences, New Delhi, 110029. Email ID: karadhran1269@gmail.com (M): +91-6374146770.

helmet for every person above four years of age who is driving or riding or being carried on a motorcycle of any class or description shall, while in a public place. Failure to follow this is punishable with a fine of one thousand rupees and he shall be disqualified for holding license for a period of three months.[2] The literature review concludes that impalement injuries in the transorbital intracranial region is an uncommon variant of head injury which occur mostly in accidental manner. The victims are usually children and old age people; however, case reports are also reported in rest of the age groups.[3] There are case reports with intracranial transorbital penetrating injuries into the brain parenchyma without much devastating external injuries.[4] Here we report a case of impalement injury to the transorbital intracranial region due to the careless attitude of driving of the deceased causing complete destruction of the orbit anatomy and corresponding brain parenchyma injury. The possible mechanism of the injury sustained was recreated at autopsy.

2. Case History:

The deceased was a male in third decade of life. He was brought dead to our tertiary health centre after sustaining a fall from two-wheeler hitting upon a barricade placed on the road to control the speed of the vehicles at a highway. He was taken immediately to a nearby government hospital from where he was referred to our tertiary health centre in an unconscious state, where he was declared dead on arrival. He survived for a period of one and half hours approximately following the incident as per police investigation. Autopsy was requested by the police to ascertain the cause of death in this case.

3. Autopsy findings:

At autopsy, an avulsed lacerated wound with surrounding dried blood stains packed with a white gauze in the orbit was present involving the right eye and adnexa measuring 11cm x 5cm x cranial cavity deep. Periorbital ecchymosis was present involving the right eye. The brain matter was found to ooze through the lacerated wound. On removal of the blood-soaked gauze, the brain matter was seen exteriorly along with an organized clot was seen and retrieved (**Fig 1A**). On reflecting the scalp, a diffuse scalp hematoma with the peri-cranial hemorrhage was found underlying the laceration of right eye. A communited fracture of right supraorbital region and glabella was seen exteriorly (**Fig 1B**). The base of skull showed a bony defect of size 2cm x 1cm over the lateral part of right roof of the orbit through which the brain matter herniated through the orbit exteriorly causing a perforating injury. There were communited fractures involving medial end of right roof of orbit with the fractured segments pointing towards the brain causing the brain laceration; along with communited fractures of ethmoidal plate, crista galli (**Fig 1C**). Hemorrhages into the frontal and ethmoidal sinuses seen through the base of skull (**Fig 1D**).

Figure 1A: The herniation of Brain parenchyma through the right orbit. The wound track is showed by a probe. Figure 1B: Communited fracture involving the supraorbital region. Figure 1C: Communited fracture of right orbital roof. Figure 1D: Blood collection in the frontal and ethmoidal sinus.

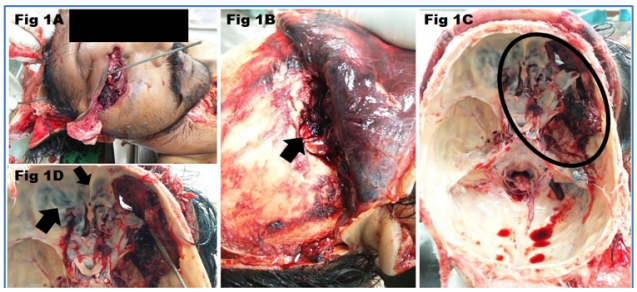
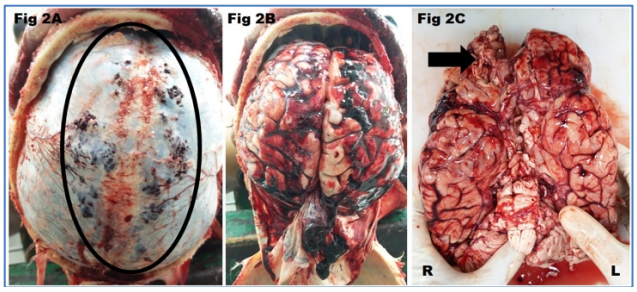


Figure 2A: Extradural hemorrhages over the mid frontoparietal region. Figure 2B: Diffuse subdural hemorrhage, subarachnoid hemorrhage was noted over bilateral fronto-temporo-parietal region. Figure 2C: Contused Laceration over the base and medial aspect of right frontal lobe.

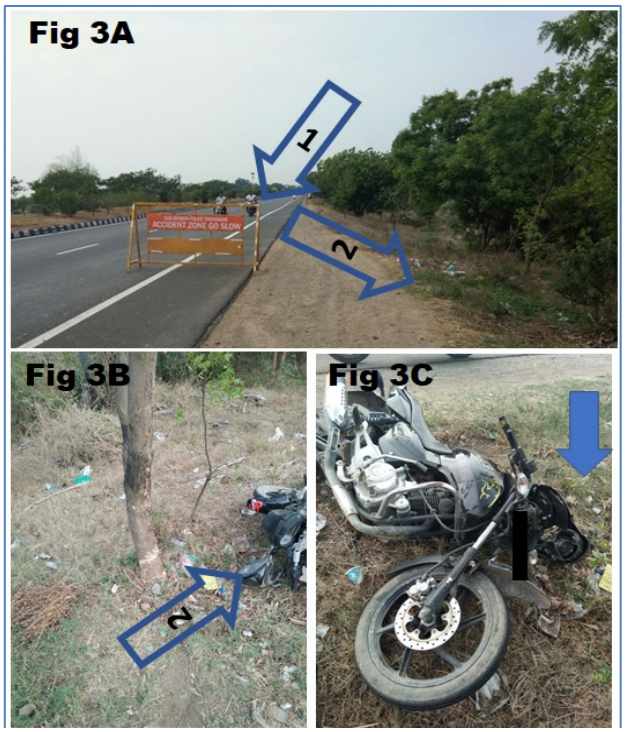


The dura had multiple small extradural hemorrhages over the mid fronto-parietal region (**Fig 2A**). A diffuse subdural hemorrhage, subarachnoid hemorrhage was noted over bilateral fronto-temporo-parietal region (**Fig 2B**). A laceration along with contusion of the base and medial aspect of right frontal lobe was noted with loss of brain parenchyma, measuring size 4cm x 2cm x parenchymal deep was present (**Fig 2C**). Bleeding was noted in the lateral ventricles. There are multiple reddish graze abrasions and reddish contusions noted over the left side of face, left shoulder, left arm and left knee joint. This ruled out the possibility of homicidal element. The cause of death was given as Hemorrhagic shock due to injuries sustained to the right eye and brain consequent upon a blunt force/surface impact possible in the alleged circumstance.

4. Scene reconstruction:

Based on the injuries found on the body, post-mortem findings, crime scene evaluation it was concluded that the deceased hit on the left side of barricade which was placed on the left side of the road. The deceased could have lost balance as a result of which the possibility of a direct impact of barricade on the right eye and the supraorbital region of the face exist. The bike had its damage on the left side coinciding with the majority of the graze abrasions which were seen on the left side of the body of the deceased made us to conclude that the deceased had fallen on his left side. Thus, the injuries interpreted at post-mortem were correlated with the crime scene images submitted by the investigating officer (**Fig 3A, B&C**).

Figure 3A: 1: The direction in which the deceased came in his motorcycle. 2: The impact was on his right orbit over the barricade placed on the road. Figure 3B: The deceased was found at the place adjacent to the road. Figure 3C: The headlight of the deceased is completely broken as a result of fall on the ground.



5. Discussion:

Impalement injury is a penetrating injury caused by a rod-like object that produces a canal-shaped wound track when it pierces the body along its longitudinal axis. The causative agent of such injuries could be both sharp and blunt. The manner in such instances is mostly accidental. The common scenarios of such an occurrence are during road traffic accidents, fall from height where the protruding objects at the time the fall cause such injuries.[5] The orbit is the weakest part following the petrous part of temporal bone in the skull. Hence, it is more prone part of face to sustain damage. A mild amount of force in this region can cause severe amount of damage to the victim. This could be a reason for making a separate clause for the eye while defining grievous hurt i.e., "permanent privation of sight of either eye".[6]

The injuries suffered in RTI to the orbital region are more destructive than self-inflicted injuries to orbital region as the control of injury causation is in the hands of the victim for the latter. The literature review suggested that the impaling objects were mostly bicycle handle brake, pen, umbrella, scissors etc. There were no gross deformity of the face or orbit except for a small laceration.[3,7, 8, 9] In our case, the impaling object was a barricade placed on the road which is rarely reported. The brain parenchyma was found to herniate through the orbit at the time of presentation. The reason for the finding appreciated in our case is explained below by comparison with findings observed in the published case reports from the literature.

The velocity of the impact plays a major role in the type of injuries caused. The high velocity impact causes direct fractures to the walls of orbit.[10-13] The low velocity impact gets deflected by the anatomy of eye ball.[14-17] Thulukkanam K et al. in their study discussed that fracture of roof of orbit is rare in occurrence. [18] In our case, the deceased sustained fracture to the roof and lateral wall of the orbit as a result of direct high velocity impact to the orbit. This explained the periorbital ecchymosis observed in the right eye and the blood collection observed in the frontal and ethmoid sinus. The deceased was riding his two-wheeler without wearing helmet at a high speed. He lost control and sustained injuries from pointed end of barricade due to high velocity penetration. This was confirmed by the eye witness at the time of incident along with crime scene photos given by the investigating officer.

Ahmad et al reported a case of bicycle accident, in which the handle brake had reached the anterior and middle cranial fossa. Chattopadhyay et al. reported a similar finding where the impaling surface was a bicycle handle brake. The impaling surface causing such injuries were narrow and rod like and hence, they had reached the middle cranial fossa in consideration with the velocity of the penetration.[19, 20] Shahpurkar and Agrawal had

reported a case of accidental fall in which the impaling surface was a fencing and a spectacle side bar which was also a rod like in shape. The depth of the injury was observed till middle cranial fossa.[21]

In our case the impact surface is broad and hence the injuries were limited to the anterior cranial fossa causing depressed fracture of roof of orbit with underlying protrusion of brain parenchyma through the orbit with laceration and contusions.

6. Recommendations and Conclusion:

This case scientifically explains the injury caused due to the carelessness of the deceased. The case is published with a social interest to create an awareness about the usefulness of wearing helmet while driving the motor vehicles. Even though the government works hard for safety of the people by implementing the motor vehicle act strictly, people are least bothered about their own safety. The points for an autopsy surgeon from this case is that the impalement injuries are not only caused by the sharp objects but the blunt objects are equally qualified to cause such injuries.

Contributor ship of Author: All authors have equally Contributed.

Conflict of interest: None.

External funding: Nil.

References:

1. NHP CC DC. Road Traffic Accidents. 28 September 2015 [cited 26th March 2021] Available from: https://www.nhp.gov.in/road-traffic-accidents_pg.
2. The Motor Vehicles (Amendment) Act, 2019. Ministry of Law and Justice. Government of India. 09 August 2019 [cited 26th March 2021]. Available at. https://www.egazette.nic.in/WriteReadData/2019/210413.pdf.
3. Gioia S, Bacci M, Lancia M, Carlini L, Suadoni F. Instantaneous death due to transorbital reverse penetration of a screw in an accidental fall: unusual autopsy case report and review of the literature. Am J Forensic Med Pathol.2014 ; 35(1): 15-9.
4. Sathish K, Chaudhari VA, Murthy AS. Fatal transorbital intracranial penetrating injury due to a bicycle brake handle. Am J Forensic Med Pathol. 2018; 39(3): 253-6.
5. Orszagh M, Zentner J, Pollak S. Transorbital intracranial impalement injuries by wooden foreign bodies: clinical, radiological and forensic aspects. Forensic Sci Int. 2009; 193:47–55.
6. Aggrawal A. Injuries: Classification and Medicolegal Aspects. In: Aggrawal A, editor. Textbook of forensic medicine and toxicology. 1st ed. New Delhi: Avichal publishing company;2017: p209.
7. Lunetta P, Ohberg A, Sajantila A: Suicide by intracerebellar ballpoint pen. Am J Forensic Med Pathol. 2002; 23:334-7.
8. Depreitere B, Van Lierde C, Maene S, et al. Bicycle-related head injury: a study of 86 cases. Accid Anal Prev. 2004; 36(4): 561–7.
9. Sarvesvaran ER. Fatal penetrating orbital injuries. Med Sci Law. 1991; 31(3): 261-3.
10. Fanning WL, Willett LR, Phillips CF, et al. Puncture wound of the eyelid causing brain abscess. J Trauma. 1976; 16(11): 919-920.
11. Lee JS, Lee JE, Oum BS, et al. Orbitocranial injury caused by wood. Korean J Ophthalmol. 1999; 13(2): 128-132.
12. O'Neill OR, Gilliland G, Delashaw JB, et al. Transorbital penetrating head injury with a hunting arrow: case report. Surg Neurol. 1994; 42(6): 494-7.
13. Scarfo GB, Mariottini A, Palma L. Oculocerebral perforating trauma by foreign objects: diagnosis and surgery. J Neurosurg Sci. 1990; 34(2): 111-6.
14. Albert DM, Burns WP, Scheie HG. Severe orbitocranial foreign-body injury. Am J Ophthalmol. 1965; 60(6): 1109-11.
15. Alexandrakis G, Davis JL. Intracranial penetrating orbital injury. Ophthalmic Surg Lasers. 2000; 31(1): 61-3.
16. Merritt RD, Chisholm L, Fleming AR, Schwartz ML. Foreign-body penetration through the superior orbital fissure. Arch Ophthalmol.1973 ;90(1): 67-8.
17. Zentner J, Hassler W, Petersen D. A wooden foreign body penetrating the superior orbital fissure. Neurochirurgia (Stuttg). 1991;34(6): 188-90.
18. Thulukkanam K, Moorthy KV, Periyasamy S. Orbital fractures in two-wheeler road traffic accidents. J Evid Based Med Health. 2017;4(40): 2405-10.
19. Ahmad FU, Suri A, Mahapatra AK. Fatal penetrating brainstem injury caused by bicycle brake handle. Pediatr Neurosurg. 2005; 41(4): 226-8.
20. Chattopadhyay S, Sukul B, Das SK. Fatal transorbital head injury by bicycle brake handle. J Forensic Leg Med. 2009;16(6): 352-3.
21. Shahpurkar VV, Agrawal A. Fatal orbitocranial injury by fencing and spectacle sidebar. Indian J Ophthalmol. 2008;56(4): 345-6.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Case Report

Fatal Tracheal Perforation in Self-Inflicted Stab Injury to Neck with a Pair of Scissors – A Case Report.

Gerard Pradeep Devnath[a]*, Kirthika Ravi[b], Ajoy Kumar Ghosh[c]
[a]Assistant Professor, Department of Forensic Medicine and Toxicology, Sri Venkateswaraa Medical College Hospital and Research Centre, Puducherry, India, 605006. [b]Junior Resident, Department of Forensic Medicine and Toxicology, Jawaharlal Institute of Postgraduate Medical Education & Research, Puducherry India, 605006. [c]Senior resident, Department of Forensic Medicine and Toxicology, Sri Lakshmi Narayana Institute of Medical Science Medical College & Hospital, Puducherry, India, 605006.

Article Info

Received on: 07.09.2021
Accepted on: 20.03.2022

Key words
Suicide,
Stab Injury,
Neck, Scissors,
Trachea perforation,
Subcutaneous emphysema.

Abstract

Background: Self-inflicted sharp force injuries to neck are cut throat and stab wounds. Stab wounds to neck are relatively uncommon than cut throat in suicide. Sharp objects such as knives, razor blades, screw drivers and cutters are commonly used to self-inflict injuries over neck. The preferred site for self-inflicted stab are chest, neck and abdomen. Vascular and aero-digestive tract injuries are common in stab injury neck. The spectrum of injuries depend the handedness of the person, type of weapon, force and the relative position of the weapon to the person. **Case Presentation:** We report a case of self-inflicted stab injury over the neck with a pair of scissors by a young male under the influence of alcohol. The injury was single in nature and no tentative cuts were present. **Conclusion:** Self-inflicted stab injury to the neck with a pair of scissors is uncommon. Combination of thyroid, trachea and jugular vein injuries in self-inflicted stab injury with scissors are rare in forensic literature. Meticulous dissection is to be carried out to assess the tract of the injury to correlated with the weapon used.

1. Introduction

A Self-inflicted sharp force injuries to the neck are generally cut-throat and stab wound. Stab injuries to neck are relatively less than cut injuries. Sharp objects like knives, razor blades, screw drivers and cutters are commonly used for stab injuries to the neck. Self-inflicted stab injuries to the neck are generally in the left side of the neck and mostly depends on the handedness of the person.[1] A pair of scissors are relatively uncommon sharp object used for self-inflicting stab injury to neck. Aero-digestive and vascular injuries are common in self-inflicted stab injury neck. Thyroid gland and cartilage injuries are more common in blunt trauma than penetrative neck trauma. Thyroid gland perforation are uncommon in penetrative trauma.

How to cite this article: Devnath GP, Kirthika R, Ghosh AK. Fatal Tracheal Perforation in Self-Inflicted Stab Injury to Neck with a Pair of Scissors – A Case Report. J For Med Sci Law 2022;31(2):93-96.

***Corresponding author:** Dr. Gerard Pradeep Devnath, Assistant Professor, Department of Forensic Medicine and Toxicology, Sri Venkateswaraa Medical College Hospital and Research Centre, Puducherry, India, 605006. Email ID: drgerardfm@gmail.com (M): +91-9442934927.

Thyroid gland perforation are uncommon in penetrative trauma. This case report focusses on spectrum of injuries caused by pair of scissors to the neck.

2. Case presentation:

A 24-year-old male, an unemployed youth from rural background and was a chronic alcoholic and drug addict. He presented to the emergency department, with self- inflicted stab injury over the left side of the neck. On eliciting the history, he had self-inflicted the injury with a pair of scissors and was under the influence of alcohol. On examination there was continuous bleeding from the wound, suggestive of vascular injury. Swelling of face and neck region was observed, which was due to sub cutaneous emphysema, suggestive of aero-digestive tract injuries. The patient was breathless and found to be having feeble pulse and blood pressure. Bilateral intercostal drainage tube was inserted to relieve the pneumothorax. The patient was posted for emergency neck exploration surgery; however, he expired within one hour of the incident. On autopsy examination, an obliquely placed stab wound of size 2.5cm X 1.5cm was present over the left side of the neck and was placed 5cm below the mastoid process. The margin of the wound was clean and the depth of the wound was up to the tracheal lumen **(Fig.1).**

Figure 1: Stab wound on the left side of neck.

Bloodless neck dissection technique was applied in order to assess the track of the wound. On exploring the layers of neck, the tract was observed to be obliquely passing through the submandibular gland, internal jugular vein, left lobe of the thyroid gland and the left lateral wall of the trachea. However, the carotid artery was surprisingly found to be intact. In addition, the left lobe of thyroid was perforated and haemorrhagic. A distinctive finding of note in the autopsy was the air collection seen in the sub-capsular plane of the thyroid gland (**Fig.2**).

Figure 2: Air collection in the sub capsular plane of thyroid gland.

Figure 3: Tracheal perforation at the left lateral wall.

On separating the thyroid gland, the tracheal perforation of size 0.2 cm in diameter in the left lateral wall was present (**Fig.3**). The air collection in the sub-capsular plane in the thyroid could be explained due to the seeping of the air from the tracheal perforation below. On opening the thoracic cavity, lungs were intact and on cut section, both lungs were congested and oedematous. No aspiration of blood was seen in the tracheo-bronchial tract. Rest of the organs were intact and congested.

3. Discussion:

Self- inflicted stab wound were commonly seen in males than females.[2,3,4] The most common sites in self- inflicted stab wound were the chest, neck, abdomen and head.[3,5]A study done by Karger, showed that 63 % of stab injuries were seen in the chest and of which 55% involved the left side of chest.[3] A study by Byard on the clinic-pathological features of fatal self-inflicted stab injuries showed neck was the preferred site in 40% of males and 25% of females.[6]The number of self-inflicted stab injuries may be single or multiple i.e. two or more sites.[3,5,7] A 10-year study by Karlsson on suicidal sharp force injuries showed that there were only two cases of single stab injury to neck out of 105 cases.[8]

The sharp object's used for self-infliction of injuries were mostly knives, razor blades, cutters, and others.[3,5,8] Sharp object such a pair of scissors are not commonly used for self-infliction. Studies by Karger B, Karlsson and Fukube et al have documented minimal cases in which scissors were used for self-inflicting injuries to the neck. However, the type of injury i.e., cut-throat or stab inflicted by scissors was not documented. Generally, cut throat injuries are common with scissors than stab injuries. Study by Vanezis on tentative injuries in self-stabbing showed that there were only two cases of self-inflicted stab neck and of which only one had tentative cuts on the skin.[9] Self-inflicted stab injuries to neck are common, however self-inflicting stab injuries with a pair of scissors is rare in forensic literature.

The most common zone of neck in penetrating neck trauma due to stabbing is zone II and the injury in this case was in Zone –II consistent with literature.[4] Vascular and aero-digestive tract damages are commonly seen in sharp force injuries to neck. Jugular vein followed by carotid artery were the commonly injured vascular structures. Pharynx, trachea, larynx, oesophagus, submandibular gland, floor of the mouth and thoracic duct injuries were common in stab injuries. [10]Study by Shama on tracheal and oesophageal injuries following cervical stab wound has shown 13 cases of oesophageal injuries and 11 cases tracheal injuries. Trachea is commonly injured while oesophagus is least injured because it is positioned safely behind the trachea.[11]As per the Schafer-Fuhrman classification, this case falls under Group-3 of laryngotracheal trauma.[12]

Neck crepitance and pneumothorax are the signs of tracheal injuries. A study by Goudy showed 37% of tracheal injury were associated with cervical emphysema.[13] The subcutaneous emphysema, in this case, falls under Grade IV (chest wall and all of the neck area). [14] Injuries to thyroid gland rupture are common in blunt trauma neck than in penetrating trauma neck. Penetrating injuries include gun-shot, stab and cut injuries.[15] Thyroid gland haemorrhage in this case was very minimal and concealed. However, the sub capsular air collection in the thyroid gland is very uncommon and rarely reported in literature.

4. Conclusion

Cut throat injuries are common than stab injury in suicidal cases. Stab injury neck is more common in homicide than in suicidal deaths. Self-inflicted stab injury to neck with a pair of scissors is uncommon in forensic literature. Injuries to the neck structures and vascular bundle depend upon the following factors such as type of weapon used, angle of the infliction, force of infliction and dexterity/handedness of the person.

The internal jugular vein and the tracheal injury were consistent with self-inflicted sharp force injuries to neck. Thyroid gland injuries are more often common in blunt force impact on neck rather than sharp force injuries [cut throat and stab]. In this case report thyroid gland perforation associated with air collection in subscapular plane of the thyroid gland is a unique finding in stab neck injuries literature. Meticulous dissection of neck by forensic surgeons will be helpful to clearly assess the injuries and track of the wound in such cases.

Conflict of interest: None.

Source of Funding: None.

References:

1. Karlsson T. Homicidal and suicidal sharp force fatalities in Stockholm, Sweden. Orientation of entrance wounds in stabs gives information in the classification. Forensic Sci Int. 1998; 193: 21 –32.

2. Scolan V, Telmon N, Blanc A, Allery JP, Charlet D, Rouge D. Homicide-suicide by stabbing study over 10 years in the Toulouse region. Am J Forensic Med Pathol. 2004; 25(1): 33-6.
3. Karger B, Niemeyer J, Brinkmann B. Suicides by sharp force: typical and atypical features. Int J Legal Med. 2000; 113:259–62.
4. Mahmoodie M, Sanei B, Moazeni-Bistgani M, Namgar M. Penetrating neck trauma: review of 192 cases. Arch Trauma Res. 2012; 1(1):14-8.
5. Fukube S, Hayashi T, Ishida Y, Kamon H, Kawaguchi M, Kimura A, Kondo T. Retrospective study on suicidal cases by sharp force injuries. J Forensic Leg Med. 2008; 15(3):163-7.
6. Byard RW, Klitte Å, Gilbert JD, James RA. Clinicopathologic features of fatal self-inflicted incised and stab wounds: a 20-year study. Am J Forensic Med Pathol. 2002; 23(1):15-8.
7. Kaliszan M, Kernbach-Wighton G, BouHaidar R. Multiple self-inflicted stab wounds to neck, chest and abdomen as a unique manner of suicide. J Forensic Sci.2010; 55(3): 822-5.
8. Karlsson T. Homicidal and suicidal sharp force fatalities in Stockholm, Sweden. Orientation of entrance wounds in stabs gives information in the classification. Forensic Sci Int. 1998; 193: 21 –32.
9. Vanezis P, West IE. Tentative injuries in self-stabbing. Forensic Sci Int. 1983; 21(1): 65-70.
10. Nason RW, Assuras GN, Gray PR, Lipschitz J, Burns CM. Penetrating neck injuries: analysis of experience from a Canadian trauma centre. Can J Surg. 2001; 44(2):122-6.
11. Shama DM, Odell J. Penetrating neck trauma with tracheal and oesophageal injuries. Br J Surg. 1984; 71(7): 534-6.
12. Santiago-Rosado LM, Lewison CS. Tracheal Trauma. In Stat Pearls. 2019. Available from: https://www.ncbi.nlm.nih.gov/books/NBK500015/
13. Goudy SL, Miller FB, Bumpous JM. Neck crepitance: evaluation and management of suspected upper aerodigestive tract injury. The Laryngoscope. 2002; 112(5): 791-5.
14. Aghajanzadeh M, Dehnadi A, Ebrahimi H, Karkan MF, Jahromi SK, Maafi AA, Aghajanzadeh G. Classification and management of subcutaneous emphysema: a 10-year experience. Indian J Surg. 2015; 77(2): 673-7.
15. Lemke J, Schreiber, M.N., Henne-Bruns, D. et al. Thyroid gland hemorrhage after blunt neck trauma: case report and review of the literature. BMC Surg. 2017; 17: 115-9.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Case Report

Parenteral Mercury Poisoning – An Interesting and Rare Case

Anita Yadav[a], Adarsh Kumar[b]*, HT Thejsavi[c], AK Jaiswal[d]
[a]Assistant Professor, Division. of Forensic Science, SBAS, Galgotias University, Greater Noida, UP. [b]Professor, Dept. of Forensic Medicine & Toxicology, AIIMS, New Delhi . [c]Associate Professor, Dept. of Forensic Medicine, RML Hospital, New Delhi. [d]Chemist, Dept. of Forensic Medicine & Toxicology, AIIMS, New Delhi, India.

Article Info

Received on: 07.09.2021
Accepted on: 20.03.2022

Key words
Mercury,
Parenteral Poisoning,
Trace Metal Analyzer,
Voltammogram.

Abstract

Mercury is an element found in the earth's crust. Pure mercury is a liquid metal, sometimes referred to as quicksilver that volatizes readily. It has traditionally been used to make products like thermometers, switches, and some light bulbs, BP machines and also used in dental amalgams. The case represented here is of a 15 years old boy, who injected mercury of an old broken BP machine in his left wrist after watching a famous English movie "Wolverine" which was deposited subcutaneously. Later he developed localized necrosis and non-healing ulcer. He was then referred to AIIMS for further treatment and to corresponding author for further opinion. 24-hours urine, blood and nail samples were collected and analysed further in departmental toxicological laboratory. The samples were digested on closed vessel microwave digestion and the digested clear transparent samples were then quantitatively estimated using trace metal analyzer. The results obtained were calculated according to the average value of blank reference sample and average value of standard of 1 ppm of mercury. After one week, again the samples were taken to check whether there is any increase or decrease in the level of mercury in the body. The analyzed samples showed an increase of 88µg/L in urine in one week duration however it was not present in blood and nails. The case report highlights importance of having well equipped toxicology lab which is of great help to clinical settings in giving clue or confirming the diagnosis.

1. Introduction

Mercury is a naturally occurring element mainly exist in three forms: Elemental or metallic, inorganic and organic mercury. Mercury is found in earth's crust in elemental form. Pure mercury is also known as quicksilver. It has traditionally been used to make products like thermometers, BP machines, dental amalgams, as a preservative in medicines, some batteries and light bulbs.[1] The factors that determine how severe the health effects are

How to cite this article: Yadav A, Adarsh K, Thejsavi HT, Jaiswal AK. Parenteral Mercury Poisoning – An Interesting and Rare Case. J For Med Sci Law 2022;31(2):97-100.

***Corresponding author:** Prof Dr Adarsh Kumar, Room No 315, Dept. of Forensic Medicine & Toxicology, All India Institute of Medical Sciences, New Delhi -110029.Email id: dradarshk@yahoo.com (M): +91-9868438856.

from mercury exposure include: chemical form of mercury, the dose, age of the person exposed (fetus is the most susceptible), duration of exposure, route of exposure (inhalation, ingestion, dermal contact) and the health of the person exposed.[2] Elemental (metallic) mercury primarily causes health effects when it is breathed as a vapour where it can be absorbed through the lungs. These exposures can occur when elemental mercury is spilled or products that contain elemental mercury break and expose mercury to the air, particularly in warm or poorly-ventilated indoor spaces. Symptoms of mercury exposure include tremors, emotional changes like mood swings, irritability, nervousness, excessive shyness, insomnia, neuromuscular changes (such as weakness, muscle atrophy, twitching), headaches, disturbances in sensations.[3]

Acute exposure to elemental mercury and vapour can result in acrodynia or "pink disease", which is characterized by bright pink peeling palms, fingers and soles of the feet, excessive perspiration, itching, rashes, joint pain and weakness, elevated blood pressure and heart palpitations.[3] Mercury exposures in a particular population has been monitored by measuring mercury in blood, cord blood, hair, urine and breast milk. The presence of mercury in blood indicates recent or current exposure to mercury. Mercury level in hair is an indicator of long-term exposure. The presence of mercury in urine generally represents exposure to elemental mercury.[2]

2. Case History:

A 15-years old boy presented with symptoms of mercury exposure was referred to AIIMS, New Delhi by local hospital. An internal referral was sought from emergency medicine to corresponding author for further advice. Upon interaction with patient, it was found that the boy injected mercury of a broken BP machine on his left wrist using syringe to become superman/spiderman after getting inspiration from a famous Hollywood movie "Wolverine" ***(Fig. 1 - 4).*** On further psychological evaluation it was revealed by him that he had also tried to become Shaktiman (a fictitious Indian superhero) few years ago after watching the Famous TV serial Shaktiman on Doordharshan channel but he failed in his attempt. It was advised to collect two biological samples i.e., Blood- 2 ml & 24-hours urine and send to toxicology laboratory of the department for further analysis. Further it was also advised to keep him admitted for one week and then repeat the tests. Again, same biological samples along with nails were collected and brought to toxicology laboratory, Dept of Forensic Medicine & Toxicology, AIIMS, New Delhi for further analysis.

Fig.1: Site of injection on left wrist and the non - healing ulcer

Fig.2: Effect of poisoning on left forearm - the ulcer and necrosed skin.

Fig.3: Effect of poisoning : bullous eruptions on tattoo.

Fig.4: Scar of previous surgery done for removal of subcutaneously accumulated mercury.

3. Material & Methods:

3.1. Reagents and their preparation:

3.1.1. Microwave Digestion (Fig. 5): The nitric acid used was 69% obtained from Merck (7.5 ml of Nitric acid and 7.5 ml of ultrapure water was mixed and used for digestion for per sample).

Fig. 5: Make - Aurora Instruments Ltd, Canada Model - MW 680 Microwave Digestor

Fig. 6: Make-Metrohm, Switzerland, Model – 797VA Trace Metal Analyzer (Application Bulletin 96/5e by Metrohm India Limited) [4]

3.1.2 Trace Metal Analyzer (Fig. 6):

Primary Solution: a) NaCl – 0.175 gm b) EDTA – 0.75 gm c) HClO4 – 9.4 ml. All reagents were mixed and made up to 500 ml with the help of ultrapure water.

Hg Standard:1 ppm – 0.1 ml of mercury standard from 1000 ppm mercury standard and make upto 100 ml for 1ppm of Hg using N1V1= N2V2 formula.

Reference blank sample/ Control sample: The biological samples from (blood, urine and nails) from an individual was taken without the history of Hg Poisoning were taken and digested and analyzed. All the reagents were from MERCK.

3.2 Digestion Procedure:

All the biological samples (Blood and 24 hours urine for the first time and after a week blood, 24 hours urine and nails for the second time) were collected and prepared for digestion in microwave digestion. (1 ml of blood and 5 ml of urine each) samples were mixed with 15 ml of 34.5 % HNO_3 then loaded in the carrousel of microwave digestion oven and digested using the program on microwave digestion as shown in **table no. 1.** Both the control samples and suspected samples were digested using the same procedure. The samples were then cooled and outgased in the fumehood and transferred into volumetric flask of 25 ml and make up 25 ml with the help of ultrapure water. The samples were then analysed by trace metal analyzer.

Table 1: Program for Digestion

Step	Time (sec)	Starting temp (°C)	Ending temp (°C)
1.	210	28	100
2.	600	100	160
3.	600	160	170

3.3 Analysis by Trace Metal Analyzer

Trace metal analyzer (TMA) of model no. 797 VA computrace of Metrohm company was used for qualitative as well as quantitative analysis. The samples were analysed using glassy carbon and gold electrode. First the cleaning procedure was done using 10 ml ultrapure water and 2 ml of primary solution. Then for sample analysis 10 ml of primary sample was taken in the vessel and the analysis was started.

The voltamogramme of the blank was recorded. 0.1 ml of the prepared sample solution was added to the polarographic vessel and then voltamogramme of the sample solution was recorded under the same conditions. Afterwards 0.1 ml of 1 ppm Hg standard was added twice and then voltamogramme of the standard was recorded. Finally the concentration of the metal was calculated by linear regression method using following formula:

$$\text{Final Results} = \text{Concentration X} \frac{\text{Cell Volume}}{\text{Sample amount}} \text{ X } \frac{\text{Multiplier}}{\text{Divisor}}$$

Where, Multiplier = dilution
Divisor = sample amount taken for preparation
The control samples, suspected samples and the standard samples were analysed using the same procedure.

4. Results:

The level of mercury in different biological samples after interpretation are shown in **table no 2**. The results showed an increase of 88µg/L in urine in one week duration suggesting slow elimination of Hg from the body since only urine gave positive results for elemental Hg poisoning (**Fig.7**). The values of mercury in the urine > the toxicity level given by OSHA. As per OSHA (Occupational Safety & Health Administration exposure) the reference values are given in **table no 3**.[5]

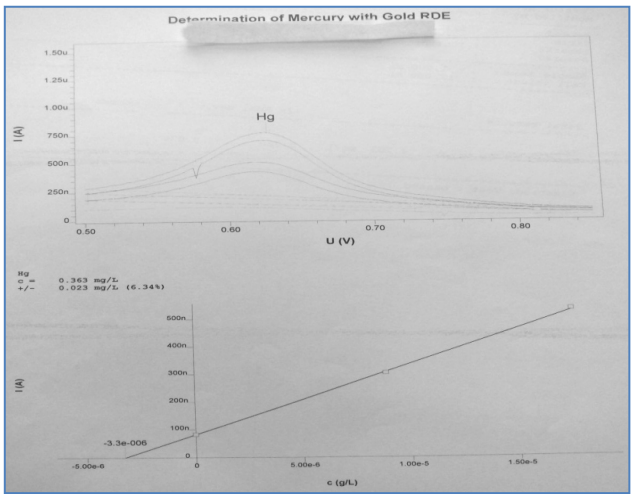
Table: 2: Quantity of mercury in biological samples

S.No	Duration	Blood	Urine	Nails
1.	1st Day	Nil	139 µ/L	Nil
2.	7th Day	Nil	227µ/L	Nil

Table.3: Normal and Toxic levels of Mercury

Matrix	Normal Level	Toxic Level
Blood	<2 µg/L	>3 µg/L
Urine	<10 µg/L	>20 µg/L
Nails	<1 µg/g	>2 µg/g

Fig.7: Voltamogramme and Calibration curve of Hg in Urine.



5. Conclusions:

Mercury in sphygmomanometer is in elemental form and is non-toxic, unless it is heated or its vapours are inhaled and reached to lungs. If it is ingested, it will be excreted out though faeces. If it is injected, it forms subcutaneous embolism which happened in this case. Elemental mercury is excreted from the body in a very slow manner and it is mostly found in urine. The series of investigations which were performed helped in reaching the diagnosis so that chelation therapy can be started. For every case of poisoning there should be proper history taking, examination and investigations that should be carried out in meticulous manner.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None.

Source of funding: Nil.

References:

1. Karthik K, Uttekar PS. Medicinenet. What Happens When You Get Mercury Poisoning? [Cited 20th November 2021]. Available from: www.medicinenet.com/mercury_poisoning/article.htm
2. United Nations Environment Programme Chemicals. Toolkit for identification and quantification of mercury releases. November 2005 [Cited 22nd November, 2021]. Available from: www.chem.unep.ch/mercury/Guidance-training-materials.htm
3. United Nations Environment Programme. Mercury Inventory Toolkit. [Cited 15th December 2021]. Available from: www.chem.unep.ch/mercury/Toolkit/default.htm
4. Metrohm AG. Determination of mercury at the rotating gold electrode by ASV. Application Bulletin 96/5 e. [Cited 15th December 2021]. Available from: https://www.metrohm.com/en_my/applications/ab-application-bulletins/ab-096.html
5. United States Environmental Protection Agency. Mercury. [Cited 3rd December 2021]. Available from: www.epa.gov/mercury.htm