Indian Journal of Forensic Medicine and Pathology

(A PEER-REVIEWED AND REFEREED JOURNAL)

VOLUME 17 ISSUE 2 APRIL - JUNE 2024

RED FLOWER PUBLICATIONS PVT LTD
New Delhi - 110091

Revised Rates for 2024 (Institutional) Title of the Journal	Frequency	India (INR) Print Only	India (INR) Online Only	Outside India (USD) Print Only	Outside India (USD) Online Only
Community and Public Health Nursing	Triannual	6500	6000	507.81	468.75
Indian Journal of Agriculture Business	Semiannual	6500	6000	507.81	468.75
Indian Journal of Anatomy	Quarterly	9500	9000	742.19	703.13
Indian Journal of Ancient Medicine and Yoga	Quarterly	9000	8500	703.13	664.06
Indian Journal of Anesthesia and Analgesia	Bi-monthly	8500	8000	664.06	625
Indian Journal of Biology	Semiannual	6500	6000	507.81	468.75
Indian Journal of Cancer Education and Research	Semiannual	10000	9500	781.25	742.19
Indian Journal of Communicable Diseases	Semiannual	9500	9000	742.19	703.13
Indian Journal of Dental Education	Quarterly	6500	6000	507.81	468.75
Indian Journal of Diabetes and Endocrinology	Semiannual	9000	8500	703.13	664.06
Indian Journal of Emergency Medicine	Quarterly	13500	13000	1054.69	1015.63
Indian Journal of Forensic Medicine and Pathology	Quarterly	17000	16500	1328.13	1289.06
Indian Journal of Forensic Odontology	Semiannual	6500	6000	507.81	468.75
Indian Journal of Genetics and Molecular Research	Semiannual	8000	7500	625	585.94
Indian Journal of Law and Human Behavior	Semiannual	7000	6500	546.88	507.81
Indian Journal of Legal Medicine	Semiannual	9500	9000	742.19	703.13
Indian Journal of Library and Information Science	Triannual	10500	10000	820.31	781.25
Indian Journal of Maternal-Fetal & Neonatal Medicine	Semiannual	10500	10000	820.31	781.25
Indian Journal of Medical and Health Sciences	Semiannual	8000	7500	625	585.94
Indian Journal of Obstetrics and Gynecology	Quarterly	10500	10000	820.31	781.25
Indian Journal of Pathology: Research and Practice	Triannual	13000	12500	1015.63	976.56
Indian Journal of Plant and Soil	Semiannual	7500	7000	585.94	546.88
Indian Journal of Preventive Medicine	Semiannual	8000	7500	625	585.94
Indian Journal of Research in Anthropology	Semiannual	13500	13000	1054.69	1015.63
Indian Journal of Surgical Nursing	Triannual	6500	6000	507.81	468.75
Indian Journal of Trauma and Emergency Pediatrics	Quarterly	10500	10000	820.31	781.25
Indian Journal of Waste Management	Semiannual	10500	10000	820.31	781.25
International Journal of Food, Nutrition & Dietetics	Triannual	6500	6000	507.81	468.75
International Journal of Forensic Science	Semiannual	11000	10500	859.38	820.31
International Journal of Neurology and Neurosurgery	Quarterly	11500	11000	898.44	859.68
International Journal of Pediatric Nursing	Triannual	6500	6000	507.81	468.75
International Journal of Political Science	Semiannual	7000	6500	546.88	507.81
International Journal of Practical Nursing	Triannual	6500	6000	507.81	468.75
International Physiology	Triannual	8500	8000	664.06	625
Journal of Aeronautical Dentistry	Quarterly	8000	7500	625	585.94
Journal of Animal Feed Science and Technology	Semiannual	9000	8500	703.13	664.06
Journal of Cardiovascular Medicine and Surgery	Quarterly	11000	10500	859.38	820.31
Journal of Emergency and Trauma Nursing	Semiannual	6500	6000	507.81	468.75
Journal of Food Additives and Contaminants	Semiannual	6500	6000	507.81	468.75
Journal of Food Technology and Engineering	Semiannual	6000	5500	468.75	429.69
Journal of Forensic Chemistry and Toxicology	Semiannual	10500	10000	820.31	781.25
Journal of Global Medical Education and Research	Semiannual	7000	6500	546.88	507.81
Journal of Global Public Health	Semiannual	13000	12500	1015.63	976.56
Journal of Microbiology and Related Research	Semiannual	9500	9000	742.19	703.13
Journal of Nurse Midwifery and Maternal Health	Triannual	6500	6000	507.81	468.75
Journal of Orthopedic Education	Triannual	6500	6000	507.81	468.75
Journal of Pharmaceutical and Medicinal Chemistry	Semiannual	17500	17000	1367.19	1328.13
Journal of Plastic Surgery and Transplantation	Semiannual	27500	27000	2148.44	2109.38
Journal of Psychiatric Nursing	Triannual	6500	6000	507.81	468.75
Journal of Radiology	Semiannual	9000	8500	703.13	664.06
Journal of Social Welfare and Management	Quarterly	8500	8000	664.06	625
New Indian Journal of Surgery	Quarterly	9000	8500	703.13	664.06
Ophthalmology and Allied Sciences	Triannual	7000	6500	546.88	507.81
Pediatrics Education and Research	Quarterly	8500	8000	664.06	625
Physiotherapy and Occupational Therapy Journal	Quarterly	10000	9500	781.25	742.19
RFP Gastroenterology International	Semiannual	7000	6500	546.88	507.81
RFP Indian Journal of Hospital Infection	Semiannual	13500	13000	1054.69	1015.63
RFP Indian Journal of Medical Psychiatry	Semiannual	9000	8500	703.13	664.06
RFP Journal of Biochemistry and Biophysics	Semiannual	8000	7500	625	585.94
RFP Journal of Dermatology	Semiannual	6500	6000	507.81	468.75
RFP Journal of ENT and Allied Sciences	Semiannual	6500	6000	507.81	468.75
RFP Journal of Gerontology and Geriatric Nursing	Semiannual	6500	6000	507.81	468.75
RFP Journal of Hospital Administration	Semiannual	8000	7500	625	585.94
Urology, Nephrology and Andrology International	Semiannual	8500	8000	664.06	625

Terms of Supply:

1. Agency discount 12.5%. Issues will be sent directly to the end user, otherwise foreign rates will be charged.
2. All back volumes of all journals are available at current rates.
3. All journals are available free online with print order within the subscription period.
4. All legal disputes subject to Delhi jurisdiction.
5. Cancellations are not accepted orders once processed.
6. Demand draft/cheque should be issued in favour of "**Red Flower Publication Pvt. Ltd.**" payable at **Delhi.**
7. Full pre-payment is required. It can be done through online (http://rfppl.co.in/subscribe.php?mid=7).
8. No claims will be entertained if not reported within 6 months of the publishing date.
9. Orders and payments are to be sent to our office address as given below.
10. Postage & Handling is included in the subscription rates.
11. Subscription period is accepted on calendar year basis (i.e. Jan to Dec). However orders may be placed any time throughout the year.

Order from

Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India)
Mobile: 8130750089, Phone: 91-11-79695648 E-mail: sales@rfppl.co.in, Website: www.rfppl.co.in

Indian Journal of Forensic Medicine and Pathology

Indexing Information: Scopus, Netherlands; NLM catalogue & Locator Plus, USA; Google Scholar; Index Copernicus, Poland; Genamics JournalSeek; WorldCat; Gaudeamus Academia; The International Committee of Medical Journal Editors (ICMJE).

Corresponding address

Red Flower Publication Pvt. Ltd.

48/41-42 DSIDC, Pocket II, Mayur Vihar,
Phase - 1, New Delhi - 110091, India.
Phone: 91-11-79695648, Email: info@rfppl.co.in
Website: www.rfppl.co.in

Indian Journal of
Forensic Medicine and Pathology

April-June 2024
Volume 17 Number 2

CONTENTS

ORIGINAL ARTICLES

CASE REPORTS

Subscription Information

India

Institutional (1 year) (Print+Online): INR 17000

Rest of the World

Institutional (1 year) (Print+Online): $ 1328.13

Payment instructions Online payment link:

http://rfppl.co.in/payment.php?mid=15

Cheque/DD:

Please send the US dollar check from outside India and INR check from India made payable to 'Red Flower Publication Private Limited'. Drawn on Delhi branch

Wire transfer/NEFT/RTGS:

Complete Bank Account No. 604320110000467

Beneficiary Name: Red Flower Publication Pvt. Ltd.

Bank & Branch Name: Bank of India, Mayur Vihar

MICR Code: 110013045

Branch Code: 6043

IFSC Code: BKID0006043 (used for RTGS and NEFT transactions)

Swift Code: BKIDINBBDOS

Send all Orders to:

Subscription and Marketing Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II,
Mayur Vihar Phase-I,
Delhi - 110 091(India)
Mobile: 8130750089
Phone: 91-11-79695648
E-mail: sales@rfppl.co.in
Website: www.rfppl.co.in

SCAN HERE TO PAY
WITH ANY BHIM UPI APP

RED FLOWER PUBLICATIONS PRIVATE LIMITED

boism-9718168299@boi

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.1

A four-year Retrospective Epidemiological Study on Hanging at A Tertiary Care Hospital of Western Maharashtra

Antara Debbarma[1], KV Radhakrishna[2], Sravan Kumar[3], Abhishek Rathee[4], Sandip Bansal[5], Naveen Kumar[6], Rohith Raveendran[7]

How to cite this article:

Antara Debbarma, KV Radhakrishna, Sravan Kumar *et al*. A four-year Retrospective Epidemiological study on hanging at A Tertiary Care Hospital of Western Maharashtra. Indian J Forensic Med Pathol.2024;17(2):75-80.

ABSTRACT

India is currently the fastest growing economy in the world. A fast-paced life also caters to the stress and strain, especially in metro cities. Hanging was noted as the preferred method of suicide in almost all countries in Eastern Europe and South Asia.

Aims: To study prevalence and pattern of hanging in Western Maharashtra.

Settings and Design: Retrospective cross-section study.

Methods and Material: This retrospective cross-section study was carried out at Tertiary Care Hospital, Western Maharashtra from 1st Sept 2019 to 30th Sept 2023. Data was collected retrospectively and analysed statistically.

Statistical analysis used: Microsoft Excel version 2013

Results: During the study period, 810 post-mortems were conducted, out of which 138 cases (17.04%) were hanging. Highest number i.e., 40.58% of cases reported within the age group of 21- 30 out of which 74.74% were males with a Male: Female ratio of 3:1. Males of 21 to 30 years showing the highest number of cases (36.89%). 67.39% were Urban population and 32.61% of cases were from rural. 47.83% of them were Typical Hanging where knot mark was present over the occiput, while 29.71% of cases were of Atypical Hanging, 100% suicidal with 01 case only of hyoid bone fracture.

Conclusions: This study reflects the alarming data of the vulnerable age and gender, the method of hanging adapted, and the geography involved.

Keywords: Typical hanging, Atypical hanging, Suicide

Key Messages: This current study reflects the vital age group, gender and geographical data of committing suicide by hanging in a "Typical Method".

Author's Credentials: *[1]Assistant Professor, Department of Forensic Medicine, 92 Base Hospital, Srinagar 190001, Jammu and Kashmir [2]Professor and Head, Department of Forensic Medicine, Armed Forces Medical College, Pune 411040, Maharashtra, [3]Assistant Professor, Department of Forensic Medicine & Toxicology, Command Hospital, Southern Command, Pune 411001, Maharashtra, [4]Assistant Professor, Department of Forensic Medicine & Toxicology, Command Hospital, Western Command, Panchkula 134114, Haryana, [5]Assistant Professor, Department of Forensic Medicine & Toxicology, Acharya Shri Chander College of Medical Sciences and Hospital, Jammu and Kashmir 180017, [6,7]Junior Resident, Department of Forensic Medicine & Toxicology, Armed Forces Medical College, Pune 411040, Maharashtra, India.*

Corresponding Author: ***Antara Debbarma,*** *Assistant Professor, Department of Forensic Medicine, 92 Base Hospital, Srinagar 190001, Jammu and Kashmir, India.*

Email: *antaradebbarma@gmail.com*

Received on: *28-11-2023* ***Accepted on:*** *05-07-2024*

Introduction

India is currently the fastest-growing economy in the world. Although such a growing economy contributes to the development of the country and society, a fast-paced life also caters to the stress and strain of daily life, especially in metro cities. According to the World Health Organization (WHO) 2000-2019 estimates, almost 800000 people die every year due to suicide across the world.[1] In India, as per NCRB data for the year 2021, of the 1,64,033 persons who died by suicide, 57% were by hanging, out of which 1,18,970 were men and 45,026 were women.[2] Spicer and Miller[3] in their study indicated hanging as the most lethal method of suicide, following firearms and drowning. Hanging was noted as the preferred method of suicide in almost all countries in Eastern Europe and South Asia.[1,4] Occupational stresses including long work periods, in addition to other aspects such as social loneliness, the aging population, and poor access to healthcare facilities have also been suggested for the high burden of suicide.[5,6] The aim of this current study is thus to highlight the current prevalence and pattern of hanging in today's fast-paced competitive society.

Materials and Methods

This retrospective cross-section study was carried out at Tertiary Care Hospital, Western Maharashtra from 1st Sept 2019 to 30th Sept 2023. All medico-legal autopsy records of hanging during the study period were retrospectively reviewed while other cases of medico legal deaths were excluded from the study. The data were obtained from autopsy reports and inquest papers, tabulated systematically and analysed statistically through Microsoft Excel version 2013. Data were recorded as per the tables described below. Being a retrospective analytical study ethical clearance from the institutional ethics committee is not applicable.

Results

During the study period, a total of 810 post-mortems were conducted, out of which 138 cases were hanging, constituting 17.04% of total cases. The following variables were recorded retrospectively: Age, sex, address, position of knot mark over the neck, manner of death, and presence of any hyoid bone fracture.

Age wise distribution

The age wise distribution of the frequency of hanging is being described under table No 1 and Chart No 1. The maximum number of cases are being seen within the age group of 21- 30 (40.58%), followed by 31-40 (24.64%) and least number of cases are being seen in the age group of 61-70 (4.35%).

Table 1: Age wise distribution

Age	Frequency	Percentage
<20	14	10.14%
21-30	56	40.58%
31-40	34	24.64%
41-50	16	11.59%
51-60	12	9%
61-70	6	4.35%
>70	0	0.00%
TOTAL	**138**	**100.00%**

Chart No 1 reflects the pattern of the age wise distribution where the spike is seen in the most productive age group of 21 to 30 years (40.58%). The teenage age group of <20 years shows a trend of about 10.14% of cases. After 30 years, there is a decline trend of hanging gradually over the decades of each life.

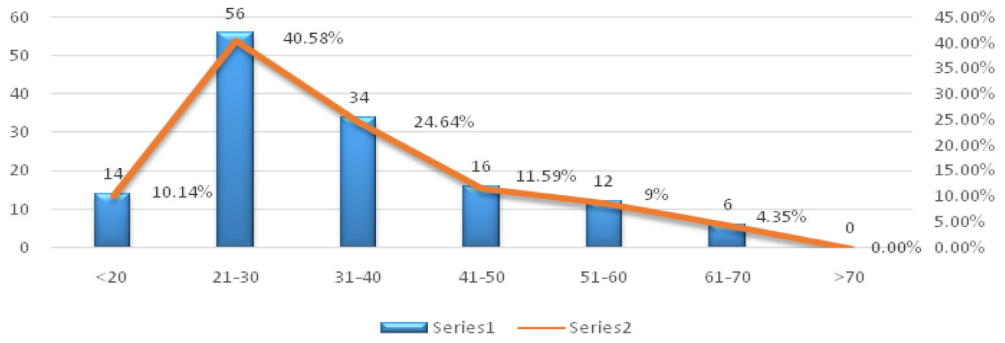

Fig. 1: Age wise Distribution

Sex wise distribution

Table 2 depicts the gender-wise distribution of cases where predominantly male genders are being seen with 74.64% of cases being reported with Male: Female ratio of 3:1.

Table 2: Sex wise distribution

Sex	Frequency	Percentage	Ratio
Male	103	74.64%	
Female	35	25.36%	3:1
Total	**138**	**100.00%**	

Age and Gender stratification

The authors have done age and gender stratification and reported that the highest number of cases within the age group of 21 to 30 years also shows highest number of male fatalities by hanging with 38 cases out of 56 within that age group.

Location

Maximum number of cases were reported from urban area (67.39%) with an Urban: Rural ratio of 2:1. Only 32.61% of cases were from rural area.

Table 4: Location wise distribution

Location	Frequency	Percentage	Ratio
Urban	93	67.39%	
Rural	45	32.61%	2:1
Total	138	100.00%	

Position of knot/ Typical or Atypical hanging

Out of 138 cases, 47.83% of them (total 66) were Typical hanging where knot mark was present over the occiput, while rest of the cases were of Atypical hanging where 29.71% knot mark was present over the left side of mandible and mastoid, 19.57% cases it was on right side of mandible and mastoid and only about 2% of cases it was below chin.

Table 3: Age and gender stratification

Age	Frequency	Percentage	Male	Percentage	Female	Percentage
<20	14	10.14%	7	7%	7	20%
21-30	56	40.58%	38	36.89%	18	51.43%
31-40	34	24.64%	28	27.18%	6	17.14%
41-50	16	11.59%	12	12%	4	11%
51-60	12	9%	12	12%	0	0.00%
61-70	6	4.35%	6	6%	0	0.00%
>70	0	0.00%	0	0.00%	0	0.00%
TOTAL	**138**	**100.00%**	**103**	**100%**	**35**	**100%**

Chart 2: Reflects the pattern of the age and gender stratification where the spike is seen among the Male of 21 to 30 years age group. After 30 years, there is a decline trend of hanging gradually over the decades of each life, yet with male predominance in the charts.

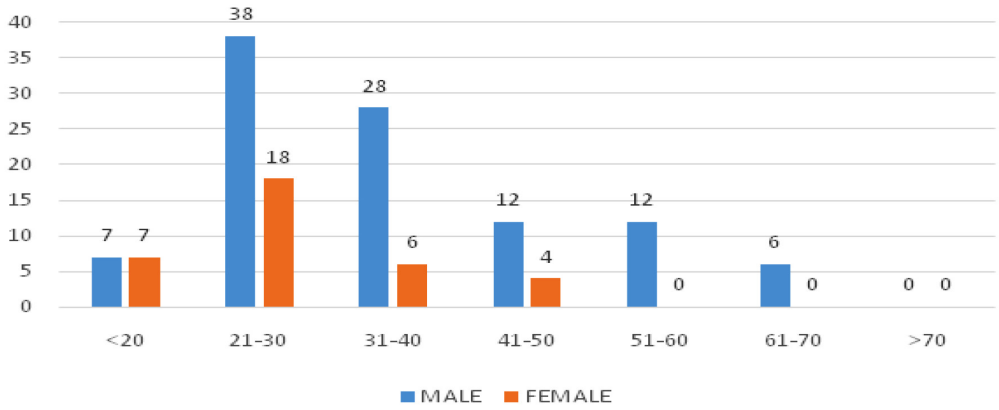

Fig. 2: Age and Gender Stratification

Table 5: Position of Knot Mark

Position of Knot	Frequency	Percentage
Occipital	66	47.83%
Left Angle of Mandible/Mastoid	41	29.71%
Right Angle of Mandible/Mastoid	27	19.57%
Any Other (Below the Chin)	4	2.90%
Total	**138**	**100.00%**

Manner of death

All 138 cases (100%) were of the suicidal manner of death. The manner of death has been determined based on the inquest report findings and post-mortem findings.

Hyoid Bone Fracture

Only 01 (0.72%) case had a finding of hyoid bone fracture, which was an outward fracture of the greater horn. However, post-mortem findings and inquest reports were corroborative of suicidal hanging.

Discussion

Suicide remains a raging socio-economic problem, especially in today's competitive society. Hanging being one of the commonest methods, has been seen to be affecting both sexes across all age groups. In the present study, out of 810 post-mortem cases over four years, 17.04% were hanging out of which the maximum number of cases were seen within the age group of 21 to 30 years (40.48%) followed by the age group of 31 to 40 years (24.64%). The cumulative percentage of 21 to 40 years was 65.21%. The lowest percentage was among the 61 to 70 years (4.35%). Such high incidence of hanging among the age group of 21 to 30 and 31 to 40 years are also discussed by Kandade PS, Zanjad NP (60.92%),[7] Sharma BR (73.0%),[8] Bhosale SH et al. (64.5%),[9] Zanjad NP et al. (61.24%),[10] Osama Madni et al. (64.66%),[11] Azmak D (40.2%).[12] Such a high percentage among the most productive age group reflects that economic and social performance pressure and demanding responsibilities lead to high-stress levels and drive a person to commit an untoward act.

In this present study, predominantly males (74.64%) were seen with Male: Female ratio of 3:1. The authors also did Age and Gender stratification where the maximum number of cases were seen among males of age group 21 to 30 years (36.89%) followed by 31 to 40 years (27.18%) with male preponderance across all age groups.

The findings are in accordance with Sharma BR (Male: female 2:1) (8) Azmak D (Male: female 3.95:1) (12), Nikolic S et al. (Male: female 03.16:1),[13] Odabasi AB et al. (Male: female 2.49:1)[14] and Valerie J. Callanan Mark S (77.3% males and 22.7% females).[15]

Bhosale et al[9] reported that females outnumbered males within the 10-19 years age group contrary to male preponderance among all other age groups. However, the authors in this study reported male preponderance across all age groups.

Goceoglu UU and Balci Y[16] in their study reported 76% to be males with 42 years as the mean affected age which differs from our study where even though male preponderance is seen, the highest number of cases were seen among 21 to 30 years age. Kanchan T and Menezes RG[17] in their study reported male predominance with the highest (29.8%) number within the age group of 20 to 29 years which is in accordance with this study.

A maximum number of cases were reported from urban areas (67.39%) with an Urban: Rural ratio of 2:1 and 32.61% of cases were from the rural area which is in accordance with a study by Rawat V, Rodrigues EJ (72.28% urban and 27.72% rural).[18] However, Tirpude B.H et al found that 90.32% of cases were from rural areas and 9.68% were from urban areas.[19]

The 20s and the 30s are the maximum output age group, especially in urban areas where all genders and predominantly males of Indian society are out and about either to pursue a career or to earn bread and butter for family and at times maintain a high lifestyle. Especially in today's urbanized society, where pursuing a good and high-flying lifestyle seems to be the goal for every other person, such peer pressure and societal norms and in ability to cope with the competition seem to drive them to commit extreme acts.

Of all the cases, 47.83% were Typical Hanging while the rest of the cases were Atypical Hanging with a 29.71% knot mark present over the left side of the mandible and mastoid, 19.57% of cases, on the right side of the mandible and mastoid and only about 2% of cases it was below the chin. This finding is unique as typical hangings were reported only 15% by Pednekar AY et al,[20] 5.94% by Rawat V, Rodrigues EJ (18) 16.40% by Bhausaheb et al,[21] 11 % by Sonkar VK et al.[22] These authors reported a maximum number of cases as atypical hangings.

All 138 cases (100%) were of the suicidal manner of death in this study which is in accordance with Rawat V andRodrigues, E.J,[18] Tirpude B.H et al,[21] Bastia BK and Kar N.[23]

The authors found only 1 case (0.72%) of hyoid bone fracture which is consistent with other authors who reported very less cases of hyoid bone fracture. Rawat V and, Rodrigues E.J.reported 2.97%,[19] Pednekar AY et al reported 3%.[20] In contrast to that, Tirpude B.H et al[19] reported 64.51% of cases of hyoid bone fracture.

Conclusion

This current study reflects the vital age group, gender and geographical data of committing suicide by hanging in a "Typical Method". The prime youth (more so for males) ranging between 21 to 40 years are the most active age group who are chasing after their career, responsibilities, and chosen lifestyle; which may or may not be achieved. Failure is not always taken in a sporty manner by all and inability to cope with such becomes a prime driving force towards committing an untoward act. Easy access to the internet delivers readily available articles on "Typical and Atypical Methods of Hanging" and online topics on various methods on "how to commit suicide" are floating all around. This study certainly reflects the fact that the affected 21 to 30 years and 31 to 40 years male population of urban areas used the typical hanging method to commit suicide. The authors feel it's high time to start having deliberations on various internet contents before flashing them to the world, especially when various OTT platforms showcase uncensored versions of many incidences and methods. Especially, in today's competitive and growing economy, where everyone is part and parcel of the rat race, many are not able to cope with such peer pressure and shouldering responsibilities of families and loved ones. It is high time to start deliberating on mental health and not overlook any symptoms of a "cry for help" from a loved one or a peer. This study reflects the alarming data of the vulnerable age and gender, the method of hanging adapted and the geography involved. It is high time to start taking preventive and remedial measures at all societal levels in order to contribute towards a mentally healthy society.

Funding: ***Not a funded project.***

Conflict of interest: ***None.***

Ackowledgements: ***Nil***

Ethical clearance: ***Not applicable.***

References

1. ***Mental Health and Substance Use, Suicide data.***
World Health Organization; 2021. Accessed October 12 2023. https://www.who.int/teams/mental-health-and-substance-use/suicide-data.

2. ***Accidental Deaths and Suicide Deaths in India (ADSI) 2021.***
National Crime Record Bureau; 2021. Accessed October 20 2023. https://ncrb.gov.in/sites/default/files/ADSI-2021/adsi2021_Chapter-2-Suicides.pdf.

3. ***Spicer RS, Miller TR.***
Suicide acts in 8 states: incidence and case fatality rates by demographics and method. Am J Public Health. 2000 ;90:1885–1891. doi: 10.2105/ajph.90.12.1885.

4. ***Arafat SMY, Ali SA, Menon V et al.***
Suicide methods in South Asia over two decades (2001-2020). Int J Soc Psychiatry. 2021; 67(7):920–934. doi: 10.1177/00207640211015700

5. ***Judd F, Jackson H, Fraser C, Murray G, Robins G, Komiti A.***
Understanding suicide in Australian farmers. Soc Psychiatry PsychiatrEpidemiol. 2006; 41:10–16. doi: 10.1007/s00127-005-0007-1.

6. ***Conner KR, Duberstein PR, Conwell Y.***
Domestic violence, separation, and suicide in young men with early onset alcoholism: re-analyses of Murphy's data. Suicide Life Threat Behav. 2000; 30:354–359.

7. ***Kandade PS, Zanjad NP.***
Pattern of Suicidal Deaths by Hanging at Tertiary Health Care Centre During COVID Pandemic. J Indian Acad Forensic Med. 2023 Apr-Jun; 45 (2):164-166. doi: https://doi.org/10.48165/jiafm.2023.45.2.17.

8. ***Sharma BR, Harish D, Sharma A, Sharma S, Singh H.***
Injuries to neck structures in death due to constriction of neck with special reference to hanging. J Forensic and legal Med.2008; 15(5):298-305. doi: 10.1016/j.jflm.2007.12.002.

9. ***Bhosale SH, Zanjad NP, Dake MD, Godbole HV.***
Trends and reasons of suicide deaths by hanging: Analysis of 431 cases autopsied at medical teaching institute of India. J Indian Acad Forensic Med.2017;39(1):67-72. doi: 10.5958/0974-0848.2017.00015.X.

10. ***Zanjad NP, Bhosale SH, Dake MD, Godbole HV.***
Study of violent asphyxia death: a 10-year retrospective study. Medicolegal update.2015;15(1):43-48.

11. ***Madni O, Kharoshah M, Zaki M, Ghaleb S.***
Hanging deaths in Dammam, Kingdom of Saudi Arabia. J Forensic Leg Med. 2010; 17(5):265-68. doi: 10.1016/j.jflm.2010.04.003.

12. ***Azmak D.***
Asphyxial Death: A retrospective study and review of the literature. Am J Forensic Med Pathology. 2006; 27:134-144. doi: 10.1097/01.paf.0000221082.72186.2e.

13. ***Nikolic S, Micic J, Atanisijevic T, Djokic V, Djonic D.***
Analysis of neck injuries in hanging. Am J For Med Pathol. 2003;24(2):179-82. doi:10.1097/01.PAF.0681069550.31660.f5.

14. ***Odabasi AB, Turkmen N, Fedakar R, Tumer AR.***
The characteristics of suicidal cases regarding the gender. Turk J Med Sci. 2009;39(6):917-922. doi: https://doi.org/10.3906/sag-0904-5.

15. ***Callanan VJ, Davis MS.***
Gender differences in suicide methods. Soc Psychiatry PsychiatrEpidemiol. 2012;47(6):857–869.doi: 10.1007/s00127-011-0393-5.

16. ***Goceoglu UU ,Balci Y.***
Gender differences in completed suicidal hangings from 2013 to 2018

in Muğla, Turkey. Ann Saudi Med. 2021 Jan-Feb;41(1):43-50. doi: : 10.5144/0256-4947.2021.43.

17. ***Kanchan T, Menezes RG.***
Suicidal hanging in Manipal, South India – Victim profile and gender differences. J Forensic Leg Med.2008 Nov;15(8):493-496.doi: 10.1016/j.jflm. 2008.05.004.

18. ***Rawat V, Rodrigues EJ.***
Medicolegal Study of Hanging Cases in North Goa. Int J Forensic SciPathol. 2015; 3(5):110-118.

19. ***Tirpude B.H, Murkey PN, Pawar VG, Shende SA.***
Profile Of Hanging Cases On Autopsy At A Tertiary Care Hospital In Central India. J Kar Med Leg Soc. 2010 Jan-Jun;19(2): 3-8.

20. ***Pednekar AY, Lyngdoh NNK, Kokatanur CM.***
To Evaluate The Pattern Of Ligature Marks And Their Relationship To Death Mode. Journal of Positive School Psychology. 2022;6(10): 3051-3056.

21. ***Bhausaheb NA, Baburao C, 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;4:1536-1539. doi: 10.5455/ijmsph.2015.22062015318.

22. ***Sonkar VK, Kaul A, Rai RK, Kumar A, Kumar R.***
A prospective study of Knot, Ligature Pattern & other External Findings observed in various cases of Hanging in Allahabad; Uttar Pradesh. Int J Eth Tra umaVictimology.2019;5(1):17-22. doi. org/10.18099/ijetv.v5i1.2.

23. ***Bastia BK, Kar N.***
A Psychological Autopsy Study of Suicidal Hanging from Cuttack, India: Focus on Stressful Life Situations. Arch Suicide Res. 2009;13(1):100-104. doi: 10.1080/13811110802572221.

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.2

Profile of Drowning Deaths: A Cross Sectional Study from Loni, Maharashtra

Bimbisar Mukherjee[1], Kalidas D Chavan[2], Sanjay B Buktar[3], Shivnarayan Manjhi[4]

How to cite this article:

Bimbisar Mukherjee, Kalidas D Chavan, Sanjay B Buktar *et al.* Profile of Drowning Deaths: a cross sectional study from Loni, Maharashtra. Indian J Forensic Med Pathol.2024;17(2):81-84.

ABSTRACT

A descriptive cross-sectional study was conducted on all cases of deaths due to drowning autopsied at the mortuary of Pravara Rural Hospital attached to Rural Medical College, Loni, a rural region in Western Maharashtra, India. The study was conducted over a period of 4 years, two years retrospective (record based) from September 2012 to August 2014 and two years prospective from September 2014 to August 2016. Data was being collected from medico-legal autopsy records of drowning victims. The cases were studied to know the socio-demographic profile of victims, manner of death and place of drowning. The cases represented approximately 3.42% of all autopsy cases. The manner of the death in most cases(68.89%) was accidental in nature. Majority of the victims were male (57.78%) belonging to the age group of 11-20 years (31.11%). Most of the victims (31.11%) were students followed by housewives (28.89%). Most of the drowning cases (51.11%) occurred in well, followed by river (20.0%). Deaths due to drowning can be prevented by proper education and awareness programmes. Preventive measures include teaching swimming to children as well as adults, installing barriers controlling access to water and training bystanders in safe rescue and resuscitation measures.

Keywords: Drowning; Asphyxia; Rural.

Introduction

Asphyxia is derived from Greek word and literally means "pulselessness".[1] However in Forensic Medicine the term asphyxia is a condition in which the process of respiration *i.e.* exchange of air between the atmosphere and the lung beds is prevented by some violent mechanical means. Violent asphyxial deaths can be caused by different methods such as hanging, strangulation, drowning and suffocation.[2]

Investigation of bodies found in various types of water is an important and sometimes difficult part of medico-legal examination. The World Health Organization (WHO) defines drowning as a "process of experiencing respiratory impairment from submersion/immersion in liquid." WHO estimate indicates around 236000 people died from drowning in 2019, making drowning a major public health problem worldwide. In 2019, injuries accounted for almost 8% of total global mortality. Drowning is the third leading cause of

Author's Credentials: *[1]Assistant Professor, Department of Forensic Medicine & Toxicology, Diamond Harbour Government Medical College and Hospital, West Bengal, 743331, [2]Dean, ESIC Medical College & Hospital, K.K. Nagar 600078, Chennai, [3]Professor, Department of Forensic Medicine & Toxicology, Dr. Balasaheb Vikhe Patil Rural Medical College of Pravara Institute of Medical Sciences, Ahmednagar 413736, Maharashtra, [4]Senior Medical Officer, Department of Forensic Medicine & Toxicology, Pt. JNM Medical College, Raipur 492001, Chattisgarh, India.*

Corresponding Author: ***Bimbisar Mukherjee,*** *Assistant Professor, Department of Forensic Medicine & Toxicology, Diamond Harbour Government Medical College and Hospital, West Bengal, 743331, India.*

Email: *bimbimukherjee@gmail.com*

Received on: *04-09-2023* ***Accepted on:*** *04-04-2024*

unintentional injury death, accounting for 7% of all injury-related deaths.[3] Bodies retrieved from water medium pose several recognized challenges to the autopsy surgeon. Sometimes the assailants dispose off the dead bodies of victims in the rivers, seas and wells to simulate death due to drowning. In essence, the diagnosis of drowning is one of exclusion.

We have undertaken this study to evaluate the socio-demographic profile of victims, manner of death, place of drowning and postmortem features of drowning victims in Loni, a rural region of Western Maharashtra.

Material and methods

The current study was a descriptive cross-sectional study carried out at Department of Forensic Medicine, Rural Medical College of Pravara Institute of Medical Sciences. The study was conducted over a period of 4 years, two years retrospective (record based) from September 2012 to August 2014 and two years prospective from September 2014 to August 2016.

Detailed analysis of the cases was based on medicolegal records and evaluation of postmortem reports of drowning victims. Information regarding the deceased, circumstances of death were collected from the investigating officer and relatives. In some of the instances, this information was supplemented by either a visit to the scene of crime or from the photographs of crime scene, supplied by police. Putrefied bodies were excluded from this study. Approval for study was obtained from Institutional Ethics Committee of Pravara Institute of Medical Sciences.

Results

Overall, 1315 medico legal autopsies were carried out during the study period, out of which 45 cases were deaths due to drowning which constitutes around 3.42% of total cases. In our study,most of the drowning deaths (68.89%) were accidental in nature, 12 cases (26.67%) were suicidal while 2 cases were homicidal in nature. Majority of the victims (57.78%) were male as compared to female (42.22%) and the male/female ratio was 1.37:1. The age range of victims in the study period was 8 days to 73 years and the commonest age group involved was 11-20 years (31.11%), followed by 21-30 years (20%). The incidence of drowning was more common in married persons (53.33%) as compared to unmarried ones (46.67%). In present study, most of the deaths were seen in students (31.11%), followed by housewives (28.89%). Most of the drowning cases (51.11%) occurred in well, followed by river (20.0%). Among the 45 drowning deaths in present study, froth at mouth and nostrils was found in 35 cases (77.78%), cutis anserina in 25 cases (55.55%) and washerwoman's hand/feet in 23 cases (51.11%). No any case of cadaveric spasm was seen. Mud/water in trachea was present in 40 cases (88.88%), water (>100 ml) in pleural cavities in 35 cases (77.78%) while mud/water in stomach was seen in 29 cases (64.44%). Paultauff's hemorrhage was observed in 31.11% of the victims.

Table 1: Distribution in relation to marital status and occupation of victims

	n	%
Total number of autopsies	1315	100
Total deaths due to drowning	45	3.42
Manner of death		
Accidental	31	68.89
Suicidal	12	26.67
Homicidal	2	4.44

Table 2: Distribution in relation to age and gender of victims

	n	%
Sex		
Male	26	57.78
Female	19	42.22
Age		
00 - 10	5	11.11
11 - 20	14	31.11
21 - 30	9	20
31 - 40	6	13.33
41 - 50	6	13.33
51 - 60	3	6.67
61 - 70	1	2.22
>70	1	2.22

Table 3: Distribution in relation to marital status and occupation of victims

	n	%
Marital Status		
Married	24	53.33
Unmarried	21	46.67
Occupation		
Student	14	31.11

table cont....

Housewife	13	28.89
Laborer	5	11.11
Farmer	4	8.89
Service	3	6.67
Business	1	2.22
Unemployed	1	2.22
Not Applicable (Kids)	4	8.89

Table 4: Distribution in relation to place of drowning

	n	%
Well	23	51.11
River	9	20
Canal	6	13.33
Pond	4	8.89
Swimming Pool	1	2.22
Bathtub	1	2.22
Water-drum	1	2.22

Table 5: Postmortem Features of Drowning

	n	%
External Features		
Froth at mouth and nostrils	35	77.78
Cutis anserina	25	55.55
Washerwoman's hand/feet	23	13.33
Cadaveric spasm	0	0
Internal Features		
Mud/water in trachea	40	88.88
Water in pleural cavities (>100ml)	35	77.78
Mud/water in stomach	29	64.44
Paultauff's hemorrhage	14	31.11

Discussion

Drowning is a serious public health problem worldwide. Most of the drowning deaths (68.89%) in our study were accidental in nature. This was in accordance with the study of other researchers.[4-7] In the study of Stemberga et al at Croatia, suicide by drowning accounted for 10% of all suicides and 31% of all cases of drowning.[8] Racz *et al* showed that accidental drowning was commonly related to alcohol consumption in South-west Hungary.[9]

Majority of the victims in our study were male. A male predominance was also seen in most of the studies by other researchers.[4-7,9-11] Exposure to water and aquatic environments is usually more in males as compared to females. Lack of proper swimming training, working near water-bodies under influence of alcohol and absence of precautionary measures are important risk factors for accidental drowning in males.

The most common age group affected in our study was 11-20 years which is consistent with the studies of other researchers.[12-14] In the study of Kiakalayeh et al in Northern Iran around one-third of the drowning fatalities were under the age of 20 years.[15] Other studies have highlighted an increasing trend of drowning deaths in the age group of 21-30 years which is also the second most common age group affected in our study.[4,7,10,11] Teenagers and young adults have a tendency to overestimate their skills and underestimate dangers associated with water. They engage in adventurous water activities without proper safety measures, often under influence of alcohol and drugs which leads to accidental drowning.

In our study drowning deaths were more commonly observed in married persons. Married victims also contributed to majority of cases in the studies of other researchers.[10,11,14] This might be due to the fact that married persons are exposed more to aquatic environment for their work or means of transportation. Increased familial responsibilities, maladjustment in married life and limited source of income are important causes of suicidal drowning in married persons.

In present study, most of the deaths were seen in students (31.11%). Students also contributed to majority of the victims in the studies of other researchers.[10,11,14] This is mostly due to the carelessness and adventurous attitude of the youngsters while swimming and involving in watersports and recreational activities in water.

Most of the drowning cases (51.11%) in our study occurred in well, followed by river (20.0%). It is known that access to water and type of water settings available will have an impact on the drowning deaths of that particular region. Well is present in many houses as well in farms in Loni where the rural people work all day long. Also there is the Pravara River which flows by the neighbouring Pravaranagar region as well as the Pravara Canal which provides water for irrigation purposes. Well was also seen to be the common place of drowning in the studies of Chaudhary et al and Shetty et al.[4,5] Swimming pools contributed to majority of drowning deaths in the study of Morris et al in Pretoria, South Africa.[16] Some researchers have also reported natural waterbodies to be responsible for majority of drowning deaths. In the study of Anary et al at Mazandaran Province, Iran, most of

the deaths were seen in the unprotected beaches of Caspian Sea while, Racz et al reported majority of the deaths occurred in River Danube (26.32%) followed by Lake Balaton (19.30%) in Southwest Hungary.[8,9]

In our study, the most common external autopsy finding was froth at mouth and nostrils seen in 77.78% cases. This is consistent with the study of Patel et al in Baroda, India.[17] However, in the study of Morris et al in Pretoria, South Africa, froth was seen in only 31% cases.[16] The most common internal autopsy finding in our study was mud/water in trachea found in 88.88% cases. In the study of Patel et al mud/water in trachea was present in all cases of drowning victims.[17]

Conclusion

Though drowning is a major public health concern, there is ample scope for its prevention and reduce the number of fatalities through proper education and awareness programmes. Preventive measures include teaching swimming to children as well as adults, installing barriers controlling access to water, training bystanders in safe rescue and resuscitation measures and improving flood risk management. Use of alcohol and drugs should be avoided while swimming or engaging in recreational activities in water. To reduce the rate of suicides by drowning, awareness has to be created by appropriate education and by influencing the media in their portrayal of suicidal news.

Funding: ***Nil***

Conflict of Interest: ***None***

References

1. ***Bardale R.***
Principles of Forensic Medicine and Toxicology,1st Edition, New Delhi, Jaypee Brothers Medical Publishers (P) Ltd, 2011, pp.284.

2. ***Reddy K.S.N, Murty OP.***
The Essentials of Forensic Medicine and Toxicology, 33rd Edition, New Delhi, Jaypee Brothers Medical Publishers (P) Ltd, 2014, pp.338-376.

3. ***World Health Organization (WHO).***
Drowning. 25th July 2023. https://www.who.int/news-room/fact-sheets/detail/drowning Accessed on July 28, 2023.

4. ***Chaudhary BL, Singh D, Meel V, Tirpude B.H.***
Study of drowning cases in Kasturba Hospital Sevagram, Wardha. Journal of Forensic Medicine and Toxicology. 2005;22 (2):29-30.

5. ***Suresh Kumar Shetty B, Shetty M.***
Epidemiology of drowning in Mangalore, a coastal Taluk of South India. J Forensic Leg Med. 2007;14:410-15.

6. ***Saberi Anary SH, Sheikhazadi A, Ghadyani MH.***
Epidemiology of drowning in Mazandaran Province, north of Iran. Am J Forensic Med Pathol. 2010,31(3):236-242.

7. ***Uppu RS. Ananda Rao BVS, Rajesh B.***
An Autopsy Study of Drowning Deaths in and around Vishakhapatnam. Indian Journal of Forensic Medicine & Toxicology. 2020;14(1):23-7

8. ***Stemberga V, Bralic M, Coklo M, Cuculic D, Bosner A.***
Suicidal drowning in southwestern Croatia. Am J Forensic Med Pathol. 2010, 31(1):52-4.

9. ***Rácz E, Könczöl F, Mészáros H, et al.***
Drowning-related fatalities during a 5-year period (2008-2012) in South-West Hungary - a retrospective study. J Forensic Leg Med. 2015;31:7-11.

10. ***Phad LG, Dhawane SG.***
Epidemiological profile of drowning deaths: a cross sectional study. Egypt J Forensic Sci. 2018;8:26.

11. ***Maheboob B, Maheboob N, Gulsha M.***
Deaths due to drowning. International Journal of Current Research. 2019;11(8):6235-8.

12. ***Maity S, Chowdhuri S, Das S, Das SK, Karmakar R.***
A Demographic Study on Cases of Drowning with Special Reference to Histopathological Changes of Lung and Other Tissues in a Tertiary Centre. Indian Journal of Forensic Medicine & Toxicology. 2020;14(3):63-9.

13. ***Palimar V, Manjunath S.***
Drowning deaths in Manipal. Int J Med Toxicol Legal Med. 2010;12:41-3.

14. ***Kiakalayeh AD, Mohammadi R, Ekman DS, Chabok SY, Janson B.***
Unintentional drowning in northern Iran: a population-based study. Accid Anal Prev. 2008;40(6):1977-81.

15. ***Raut SM, Haridas SV.***
Socio-demographic profile of drowning deaths in a rural region-An autopsybased study. Indian Journal of Forensic and Community Medicine. 2021;8(2):80-83.

16. ***Morris NK, du Toit-Prinsloo L, Saayman G.***
Drowning in Pretoria, South Africa: A 10-year review. J Forensic Leg Med. 2016;37:66-70.

17. ***Patel AP, Bhoot RR, Patel DJ, Patel KA.***
Study of violent asphyxial death. International Journal of Medical Toxicology and Forensic Medicine, 2013; 3(2):48-57.

Instructions to Authors

Submission to the journal must comply with the Guidelines for Authors.
Non-compliant submission will be returned to the author for correction.

To access the online submission system and for the most up-to-date version of the Guide for Authors please visit: http://www.rfppl.co.in

Technical problems or general questions on publishing with **IJFMP** are supported by Red Flower Publication Pvt. Ltd.'s Author Support team (http://rfppl.co.in/article_submission_system.php?mid=5#)

Alternatively, please contact the Journal's Editorial Office for further assistance.

Editorial Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi - 110 091(India)
Mobile: 9821671871, Phone: 91-11-79695648
E-mail: author@rfppl.co.in

Subscription Information

India
Institutional (1 year) (Print+Online): INR 17000

Rest of the World
Institutional (1 year) (Print+Online): $ 1328.13

Payment instructions Online payment link:
http://rfppl.co.in/payment.php?mid=15

Cheque/DD:
Please send the US dollar check from outside India and INR check from India made payable to 'Red Flower Publication Private Limited'. Drawn on Delhi branch

Wire transfer/NEFT/RTGS:
Complete Bank Account No. 604320110000467
Beneficiary Name: Red Flower Publication Pvt. Ltd.
Bank & Branch Name: Bank of India, Mayur Vihar
MICR Code: 110013045
Branch Code: 6043
IFSC Code: BKID0006043 (used for RTGS and NEFT transactions)
Swift Code: BKIDINBBDOS

Send all Orders to:
Subscription and Marketing Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi - 110 091(India).
Mobile: 8130750089,
Phone: 91-11-79695648
E-mail: sales@rfppl.co.in
Website: www.rfppl.co.in

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.3

Histopathological Findings in Medicolegal Autopsies with Emphasis on Rare Incidental Findings

Clement Wilfred D[1], Amrutha Shankar B[2], Akshit Raj S Shetty[3], Ashwini Kondapura Thimmegowda[4]

How to cite this article:

Clement Wilfred D, Amrutha Shankar B, Akshit Raj S Shetty *et al*. Histopathological findings in Medicolegal Autopsies with emphasis on rare Incidental findings. Indian J Forensic Med Pathol.2024;17(2):87-94.

ABSTRACT

Context: Medicolegal autopsies are not only indispensable to identify the cause of death; they are of vital importance in discovering various interesting and rare lesions/ diseases which were unnoticed or undiagnosed during the person's life. Whether these incidental lesions are the cause of death or not, they are of academic and research importance. Hence this study was aimed to evaluate the various histopathological findings in medico-legal autopsies and to highlight the rare incidental lesions.

Method: This was a prospective cross-sectional study conducted on medico-legal autopsy specimens over duration of five years, between August 2018 August 2023, at Ramaiah Medical College Hospital, Bangalore. The viscera of each autopsy case were evaluated grossly and microscopically to identify the various histopathological findings.

Results: A total of 554 histopathological lesions were identified in 549 cases, majority of which were found in cardiovascular system (47.6%), followed by pulmonary (31.3%), hepatic (12.6%), renal (6.3%), central nervous (4.3%), splenic (3.8%), pancreatic (3.5%) and female genital (0.5%) systems. The commonest lesion detected was atherosclerosis (26%) followed by myocardial infarction (11.9%) and pulmonary edema (9.6%) Rare incidental findings were observed in 5.8% of cases and incidental neoplasia was detected in 1.6% of cases.

Conclusion: Varied spectrum of incidental lesions, which are not recognised during the person's life, are discovered at autopsy. Some of these lesions are preventable; some warrant screening of close relatives and some, had they been detected before death, would have changed therapeutic management. These incidental findings are important for academic purpose, evaluating disease trends and introducing interventions.

Keywords: Autopsy; Histopathological findings; Incidental; Lesions; Medicolegal.

Author's Credentials: *[1]Professor, [2]Post Graduate, [3]Associate Professor, [4]Senior Resident, Department of Pathology, Ramaiah Medical College and Hospitals, Bangalore 560054, Karnataka, India.*

Corresponding Author: ***Clement Wilfred D,*** *Professor, Department of Pathology, Ramaiah Medical College and Hospitals, Bangalore 560054, Karnataka, India.*

Email: *clement.wilfred@yahoo.com*

Received on: *03-02-2024*

Accepted on: *04-06-2024*

Introduction

Autopsy is a specialised procedure that entails critical, detailed and systematic examination of the deceased body either for Medico-legal or Clinical purposes.[1,2] The Medicolegal autopsy is performed to address medicolegal objectives on the directions from legal authority in all unnatural (accidents, homicide, suicide) and suspicious deaths and unexpected deaths

that require a legal investigation.[3] The Academic autopsy is performed, with the consent of the relatives, to determine the nature of the disease when ante-mortem diagnostic evaluation is inconclusive or to evaluate the pathology, character and extent of the disease which has been diagnosed ante-mortem.[1,4]

In addition to identifying the cause and manner of death, the circumstances in which it occurred and the time of death, many incidental findings which were unnoticed or undiagnosed during the person's life are discovered during histopathological analysis of medico-legal autopsy specimens.[2,4] These findings could have been the contributing factor for death or may be unrelated to the cause of death.[1,2] However they are of great academic value and research importance as they provide vital information about etiopathogenesis of untreated, rare and undiagnosed lesions.[5] Considering the vital role of autopsy in medical science, this study was conducted to evaluate the various histopathological findings in medico-legal autopsies and to highlight the rare incidental lesions.

Materials and Methodology

The current study was a single centre prospective cross-sectional descriptive study conducted on routine consecutive medico-legal autopsy specimens received over duration of five years between August 2018 and August 2023, in Pathology department, Ramaiah Medical College Hospital, Bangalore, Karnataka. The viscera of each autopsy case was received in adequate volume of 10% formalin fixative from the Forensic medicine department along with details such as age, sex, post-mortem examination findings and preliminary cause of death. In every case the standard protocol for surgical grossing and histopathogical processing was followed. After a detailed gross specimen examination, representative tissue bits were taken, processed and stained with Haematoxylin and Eosin (H&E) for light microscopic evaluation. Special stains were done wherever required. The interesting and incidental histopathological features were studied and recorded. Autolysed specimens, specimens from poorly preserved bodies, perinatal and neonatal cases and clinical autopsies were excluded from the study.

Statistical Analysis: SPSS Version 18.0software was used for analysis. Continuous parameters were expressed as mean and standard deviation and qualitative variables as proportion. The percentage and frequency of each type of histopathological/ incidental lesion was determined.

Results

Specimens from total of 572 medicolegal autopsies were received over 5 years duration, of which 23 cases were excluded as the specimens were either poorly preserved or autolysed. The remaining 549 cases were included in the study. The age of the deceased ranged from 2.5 to 91 years with male: female ratio of 3.6:1. Most of the autopsy cases occurred in the4th decade followed by 3rd decade. In 549 cases 554 histopathological lesions were identified, majority of which were found in cardiovascular system (47.6%), followed by pulmonary (31.3%), hepatic (12.6%), renal (6.3%), central nervous (4.3%), splenic (3.8%), pancreatic (3.5%) and female genital (0.5%) systems (Table 1). The "more common lesions" and "interesting and rare incidental lesions" are depicted in Table 1. The most common lesion detected was atherosclerosis (26%) followed by myocardial infarction (11.9%) and pulmonary edema (9.6%) Rare incidental findings were observed in 5.8% of cases (32/549). Table 2 depicts the details of rare incidental cardiac lesions and Table 3 the details of rare incidental lesions in other organ systems.

Table 1: Histopathological findings in medicolegal autopsy specimens

Organ		Histopathological findings	No. of cases (%)
Heart	More common lesions	Atherosclerosis	144 (26%)
		Myocardial Hypertrophy	33 (6%)
	Interesting and rare Incidental lesions	Myocardial Infarction	66 (11.9%)
		Aortic Dissection	6 (1.1%)
		Valvular Heart Disease	5 (0.9%)
		Cardiac Tamponade	4 (0.7%)
		Pericarditis	3 (0.5%)
		Myocarditis	2 (0.4%)
		Cardiomyopathy	1 (0.2%)

Table Cont...

Lungs	More common lesions	Pulmonary edema	53 (9.6%)
		Chronic venous congestion	33 (6%)
	Interesting and rare Incidental lesions	Pneumonia	16 (2.9%)
		Emphysematous changes	8 (1.4%)
		Tuberculosis	5 (0.9%)
		Pulmonary thromboembolism	2 (0.4%)
		Aspergillosis	1 (0.2%)
Liver	More common lesions	Fatty liver	33 (6%)
		Chronic venous congestion	26 (4.7%)
	Interesting and rare Incidental lesions	Cirrhosis	7 (1.3%)
		Hepatocellular carcinoma	2 (0.4%)
		Non-Hodgkin's lymphoma	1 (0.2%)
		Metastasis	1 (0.2%)
Kidneys	More common lesions	Acute tubular necrosis	18 (3.2%)
		Simple cyst	6 (1.1%)
	Interesting and rare Incidental lesions	Chronic pyelonephritis	9 (1.6%)
		Tuberculous pyelonephritis	1 (0.2%)
		Renal cell carcinoma	1 (0.2%)
CNS	More common lesions	Subarachnoid hemorrhage	20 (3.6%)
	Interesting and rare Incidental lesions	Acute on chronic meningoencephalitis	1 (0.2%)
		Acute meningitis	1 (0.2%)
		Meningioma	1 (0.2%)
		Berry aneurysm	1 (0.2%)
Spleen	More common lesions	Chronic venous congestion	21 (3.8%)
Pancreas	More common lesions	Necrotizing pancreatitis	16 (2.9%)
		Chronic pancreatitis	2 (0.4%)
	Interesting and rare Incidental lesions	Pancreatic pseudocyst	1 (0.2%)
Ovary	Interesting and rare Incidental lesions	Serous cystadenoma	2 (0.4%)
		Krukenberg tumor of ovaries	1 (0.2%)
Total			**554**

Table 2: Rare incidental cardiac lesions in medicolegal autopsies

Sl. NO	Age / Gender	Indication for autopsy; History	Incidental findings
1	43/F	Brought dead; H/o sudden collapse	Aortic Dissection
2	65/F	Brought dead; H/o severe breathlessness	Aortic Dissection
3	27/M	Hospital death; severe breathlessness, collapsed in ICU	Aortic Dissection
4	26/M	Brought dead; H/o chest pain and collapse	Aortic Dissection
5	28/M	Brought dead; Marfan syndrome	Aortic Dissection
6	55/M	Brought dead; K/c/o hypertension, suddencollapse	Aortic Dissection

Table Cont...

7	13/M	Brought dead; H/o fever	Chronic rheumatic heart disease
8	29/M	Brought dead	Chronic rheumatic heart disease
9	55/M	Found dead	Chronic rheumatic heart disease
10	50/M	Found dead	Infective endocarditis
11	32/M	Found dead	Infective endocarditis
12	31/M	Brought dead	Pericarditis
13	45/F	Brought dead	Pericarditis
14	65/M	Found dead	Pericarditis
15	28/M	Brought dead; H/o fever	Myocarditis
16	2.5/F	Brought dead	Myocarditis
17	19/M	RTA	Hypertrophic Cardiomyopathy

Table 3: Rare incidental lesions in organs other than cardiovascular system

Sl. NO.	Age / Gender	Indication for autopsy; History	Incidental findings
1	24/M	Accidental fall	Pulmonary thromboembolism
2	22/M	Brought dead; H/o severe respiratory distress	Pulmonary thromboembolism with infarct.
3	22/F	RTA	Bronchopulmonary aspergillosis
4	57/F	Suicide by hanging	Hepatocellular carcinoma
5	58/M	Found dead	Hepatocellular carcinoma
6	91/M	aluminium phosphide poisoning	Non-Hodgkin's lymphoma, liver
7	72/F	Found dead	Metastatic Adenocarcinoma, liver
8	29/M	Found dead	Tuberculous pyelonephritis
9	75/M	Suicide by consumption of insecticide	Renal cell carcinoma, papillary type
10	38/M	Brought dead; H/o chronic headache	Acute on chronic meningoencephalitis
11	16/M	Brought dead; H/o fever	Acute meningitis
12	47/M	Found dead; H/o old myocardial infarction and epilepsy	Transitional Meningioma
13	42/F	Brought dead	Berry aneurysm
14	38/M	Found dead; chronic alcoholic	Pancreatic pseudocyst
15	48/F	Brought dead; K/c/o Carcinoma stomach, H/o hematemesis	Krukenberg tumor of ovaries

Discussion

Histopathological evaluation of medicolegal autopsy specimens not only provides information concerning cause and nature of death, it also reveals lesions that were undiagnosed during life. In the present study various lesions were found, some of which are rare.

Majority of the histopathological findings were found in cardiovascular system (47.6%) with the commonest lesion being atherosclerosis (54.5%), which is in synchrony with most of the published studies, including those by conducted by Sulegaon R et al, Arunalatha P et al, Kaur M et al, Manjula K et al, and Patel S et al.[1,2,6-8] The second commonest cardiac lesion identified was myocardial infarction (25%), similar to the study conducted by Manjula K et al.[7] Aortic dissection (AD) was detected in five cases, none of these cases were detected prior to death and were first identified at autopsy examination (Fig. 1 A). Huynh et al reviewed cardiac autopsy specimens for AD and found only 336 cases over duration of 60 years. Majority of these cases (63%) were diagnosed only at autopsy.[9] We identified one case, who was brought dead, as Marfan syndrome with fatal aortic dissection. Literature review reveals that aortic dissection is an important cause that limits

life expectancy in Marfan syndrome patients.[10]There were five cases of valvular heart disease with three cases of chronic rheumatic heart and two cases of infective endocarditis, two cases of myocarditis and three cases of pericarditis. All these cases were either brought dead or found dead under suspicious circumstances. Khiste JA et al retrospectively evaluated 300 cases of medicolegal autopsies and reported the frequencies of infective endocarditis, myocarditis and pericarditis as 0.3%, 6% and 4.6% respectively.[11] Literature review reveals that valvular heart disease accounts for 1 to 5% and myocarditis accounts for 1% of sudden cardiac deaths (SCD)rerespectively.[12,13]Although these lesions are rarely encountered in autopsies, once identified, the cause of death may be explained with greater reliability. We reported one case of hypertrophic cardiomyopathy (HCM)in a 19 year male who died in RTA (road traffic accident).HCM is an important cause of SCD in young individuals especially in males involved in sporting activities.[14] Arrhythmias, a consequence of myocardial fibrosis, could be the cause of SCD.[2] Generally these individuals are asymptomatic without previous clinical diagnosis.[2,14]Arunalatha P et al reported two cases of HCM in 16 and 26 years males with H/o of sudden death.[2] As HCM is a genetic disease, its identification is useful for screening close relatives to prevent SCD.[2]

Pulmonary system was the second commonest system with histopathologial findings (21.3%) The commonest lesion in our study was pulmonary edema (9.6%), which is in synchrony with study by Sulegaon Ret al (37.7%), Arunalatha P et al, Patel S et al (11%) and Khiste JA (43%) et al.[1,2,8,11] The other respiratory lesions encountered were chronic venous congestion (6%), pneumonia (2.9%)and tuberculosis (0.9%). Kaur M et al reported the frequencies of latter lesions as 5.9%, 1.8%, and 1.4% respectively.[6] In a study of 159 sudden deaths, by Chaudri et al, 11.3% was due to tuberculosis and 7.5% due to pneumonia, thus highlighting the importance of histopathological examination of autopsy specimens.[15] We encountered two cases of pulmonary thromboembolism (PTE), both in young male adults. One case had H/o accidental fall and exhibited acute saddle thrombus at bifurcation of pulmonary trunk with acute corpulmonale (Figure 1 B & C). The other case was brought dead with H/o respiratory

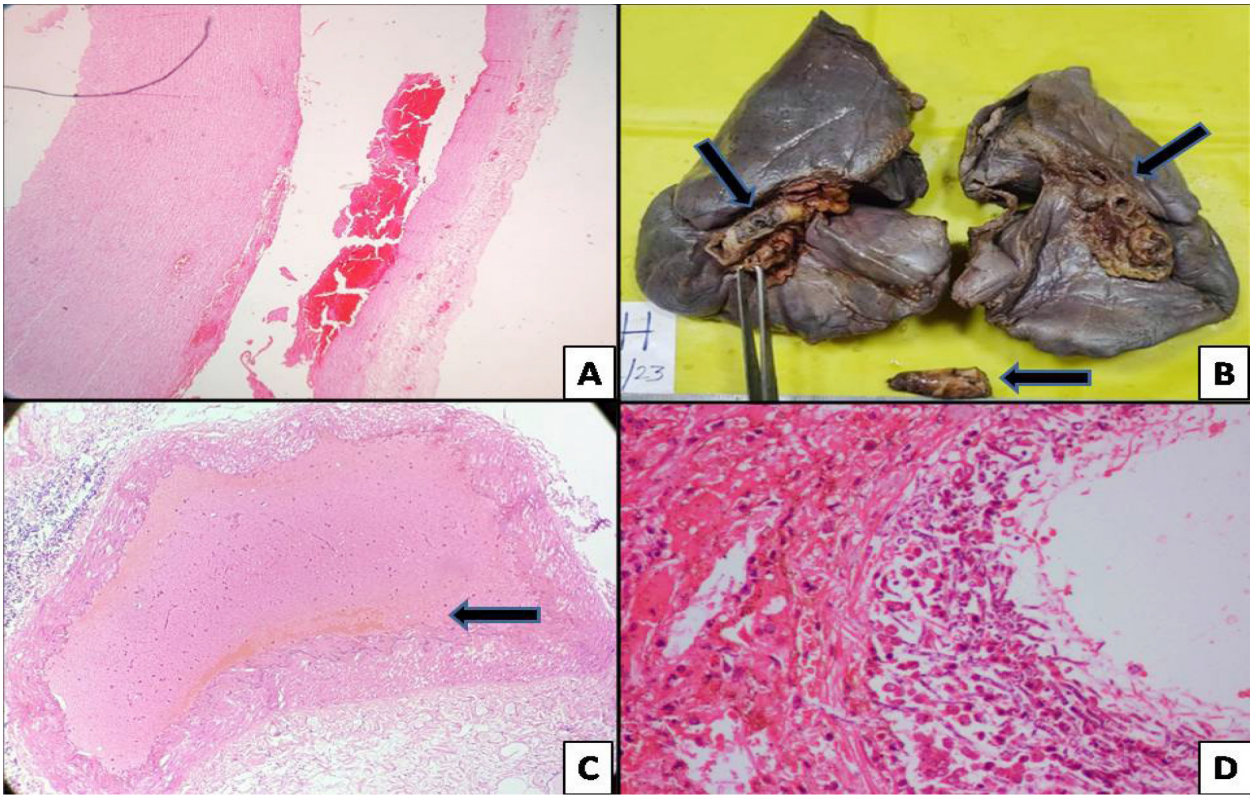

Fig. 1: A) Aortic dissection. B) Gross image showing saddle thromboembolus (arrows) at bifurcation of pulmonary trunk. C) Thromboembolus in pulmonary artery D) Bronchopulmonary aspergillosis (arrow shows fungal hyphae). (H&E stain; A- x10; C- x10; D- x20)

distress, and showed thromboemboli in medium sized pulmonary arteries with associated hemorrhagic infarcts. Histopathological examination in these cases confirmed thromboemboli and excluded post-mortem clots. PTE usually originate from deep vein thrombosis of the lower limbs and can cause sudden unexpected collapse.[2,16]

Arunalatha P et al studied 155 autopsy cases and reported a single case of PTE (saddle thrombus) causing sudden death in a 25 years male.[2] We found bronchopulmonary aspergillosis in a RTA case who was hospitalised (Figure 1D). Hospital stay with mechanical ventilation was the predisposing cause of Aspergillosis in this case. Similarly Singh G et al reported Aspergillosis in 62 year male, a case of assault, who was hospitalised and was on mechanical ventilation.[17]Aspergillosis, in autopsy specimens, is a rare finding with an average incidence of around 0.19%.[17] The predisposing conditions for Aspergillosis include immunosuppression, chronic debilitating diseases and prolonged hospitalization with mechanical ventilation.[17]

In the current study hepatic system was the third commonest system with histopathologial findings (12.6%) with fatty liver being the commonest lesion (6%) followed by chronic venous congestion (4.7%) and cirrhosis (1.3%). Similar to our observations, Kaur M et al reported fatty liver (17.6%) as the commonest hepatic lesion followed by chronic venous congestion (8%) and cirrhosis (3.3%).[6] In majority of the studies the commonest hepatic lesions identified at autopsy was fatty liver.[1,2,8,11] This probably reflects the alcohol consumption habit, as alcohol is the major etiopathogenetic factor of fatty liver. We found two cases of, previously undiagnosed, hepatocellular carcinoma (HCC) as rare incidental lesions (0.4%; 2/554). Recent data on the epidemiology of HCC in autopsies is unavailable. Schlageter M et analysed 44,104 autopsies and found HCC in only 0.9% of the cases.[18] The major risk factors include hepatotropic viruses (Hepatitis B and C) and chronic alcoholism and as these risk factors result in cirrhosis, over 80% of HCC occur in cirrhotic background.[18,19] Similarly, in our study both the cases occurred in backdrop of cirrhosis. We had a case of Non-Hodgkin's lymphoma involving the liver, in a 91 years male, a case of homicidal aluminium phosphide poisoning. The liver showed diffuse sinusoidal infiltration of dyscohesive medium to large sized atypical lymphoid cells morphologically favouring diffuse large cell lymphoma (Figure 2 A & B).

Primary malignant lymphoma involving the liver is very rare, secondary involvement from extrahepatic lymphomas is relatively more common.[19]In our case, even though the other organs submitted for examination were negative for lymphoma infiltration, we couldn't determine the primary/ secondary nature of the disease

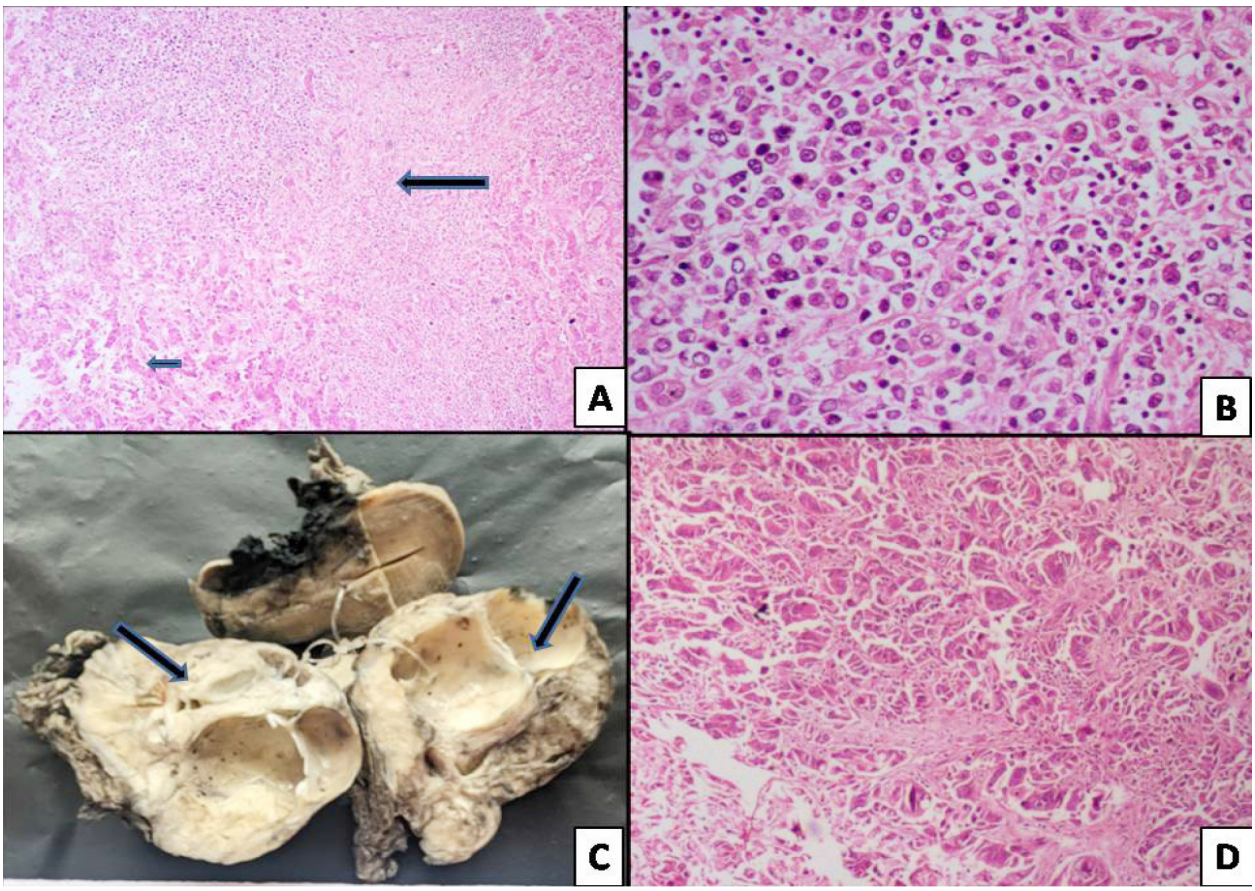

Fig. 2: A) Non-Hodgkin's lymphoma (long arrow) involving the liver parenchyma (short arrow). B) Diffuse infiltration of large Non-Hodgkin's lymphoma cells. C) Gross image showing metastatic ovarian malignancy (arrows). D) Cohesive and dyscohesive metastatic tumor cells involving the ovarian parenchyma. (H&E stain; A- x5; B- x20; D- x10).

as neither were the lymph nodes received for examination nor was there any past history of lymphoma. Manjula K et al reported a single case of Primary Mediastinal B cell lymphoma with secondary liver involvement, in a young male who was brought dead, following autopsy examination.[7]We identified adenocarcinoma metastasis to liver in a 72 years female who was found dead. In a large autopsy series, conducted on adult patients with malignant tumors, liver metastasis was found in 39% of the cases.[19]

The commonest lesion identified in the renal system was acute tubular necrosis (3.2%) followed by chronic pyelonephritis (1.6%), which is in concordance with studies by Manjula K et al and Kaur M et al.[6,7] The incidence of the latter two lesions, in other autopsy studies, varies from 7 to 22% and 0.8 to 5%, respectively.[7] We reported a case of tubercular pyelonephritis in a young male who was found dead. The commonest cause of death from infectious disease is tuberculosis. The diagnosis of urogenital tuberculosis can be easily missed due to its nonspecific clinical presentation. Autopsy studies have provided valuable information about the natural history and pathogenesis of urogenital tuberculosis and have indicated that antemortem diagnosis of these diseases is often missed and usually recognised at autopsy.[20] We detected a case of incidental Papillary renal cell carcinoma (RCC) that was limited to the kidney (early TNM stage), in a case of suicidal poisoning. Patel B et al reported two cases of incidental RCC's (one case of clear cell RCC and another case of multilocular cystic RCC) with a rate of 2/269 autopsies.[8] Early stage RCC's are usually asymptomatic and may be first detected at autopsy.

The interesting and rare incidental findings in Central Nervous System (CNS) were- single case each of meningitis, meningoencephalitis, berry aneurysm and transitional meningioma. Kaur M reported three cases of meningitis, one case of diffuse astrocytoma and three cases of gliosis.[6]The authors concluded that autopsy plays an important role in these cases as usually antemortem biopsies, for these cases, are not normally received.[6] A study on incidental meningiomas observed that they are detected at a frequency of 2-3% at autopsy with a predilection for WHO grade I morphology and male preponderance. Similarly, our case was a male and exhibited WHO grade I morphology.[21]

The other incidental findings detected in our study were pancreatic pseudocyst in an alcoholic and Krukenberg tumour of the ovaries in a case of carcinoma stomach (Figure 2 C & D). Pancreatic pseudocyst is a localised collection of secretions and necrotic material, that develops after pancreatitis. Majority occur as a complication of alcohol induced pancreatitis.[22]Arunalatha P reported a single case of pancreatic pseudocyst with associated fatty liver.[2]Krukenberg tumor is metastatic signet ring cell carcinoma of the ovaries, with stomach being the primary site in 70% of the cases.[23]

The frequency of incidental neoplasia in our study was 1.6% (9/554) which is close to that quoted by Patel S et al who detected unsuspected neoplasia with a frequency of 2%.[8] Sinhasan SP et al encountered 32 neoplasms in 795 autopsy cases (*i.e.* frequency of 4%) and stated that not only does medicolegal autopsy provides an opportunity to evaluate diagnosed and treated tumors, but also is vital to understand the natural evolution of untreated tumors.[24] Thus histopathological evaluation of autopsy specimens is vital in the detection of unsuspected neoplasms and the true incidence of cancer.[8]

Conclusion

The study presents the varied histopathological spectrum of lesions detected at medicolegal autopsies and highlights the unexpected rare incidental cases. Atherosclerosis, pulmonary edema, fatty liver and acute tubular necrosis are the commonest histopathological lesions detected in cardiac, pulmonary, hepatic and renal systems respectively. Many incidental findings, which are not recognised or diagnosed during the person's life, are identified at autopsy. The latter lesions either contribute to death or may be unrelated to the cause of death. Some of these concealed lesions are preventable and their identification is useful for screening of close relatives. Further, some of the histopathological lesions, had they been detected before death, would have significantly changed patient management. These incidental findings enrich medical knowledge and are vital for academic purpose, research, evaluating disease trends and introducing interventions.

References

1. ***Sulegaon R, Kulkarni D, Chulki S.*** *Medicolegal Autopsies-Interesting and Incidental Findings. Int J Forensic Sci Pathol. 2015;3(8):156-60.*
2. ***Arunalatha P, Sangeetha A, Devi NRS.*** *Spectrum of Histopathological Findings in Autopsies -Highlighting the Interesting and Incidental Findings. International Journal of current Medical and Applied sciences. 2017;15(2):61-6.*
3. ***Menezes RG, Monteiro FN.***
4. ***Forensic Autopsy.*** *[Updated 2022 Sep 5]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK539901/*
5. ***Costache M, Lazaroiu AM, Contolenco A, Costache D, George S, Sajin M, et al.*** *Clinical or postmortem? The importance of the autopsy; a retrospective study. Maedica (Bucur). 2014 Sep;9(3):261-5.*
6. ***Subitha K.***

Incidental and Interesting Pathologies Diagnosed at Autopsy –A Case Series. Saudi J Pathol Microbiol.2021;6(7):240-5.

7. ***Kaur M, Bhandari L, Bodal VK, Kaur S.*** *A Pathologist's Perspective on Histopathology Examination of Autopsies and Various Incidental Findings. Indian Journal of Forensic Medicine & Toxicology.2021;15(4):1867–5.*

8. ***Manjula K, Srinivas RP,Kalyani R.*** *Study of Incidental Histopathological Findings in Medico Legal Autopsies. Indian J Forensic Med Pathol. 2019;12(1):5-8.*

9. ***Patel S, Rajalakshmi BR, Manjunath GV.*** *Histopathologic Findings in Autopsies with Emphasis on Interesting and Incidental Findings-A Pathologist's Perspective. J Clin Diagn Res. 2016;10(11):EC08-EC12.*

10. ***Huynh N, Thordsen S, Thomas T, Mackey-Bojack SM, Duncanson ER, Nwuado D, et al.*** *Clinical and pathologic findings of aortic dissection at autopsy: Review of 336 cases over nearly 6 decades. Am Heart J 2019;209:108-15.*

11. ***Roman MJ, Devereux RB.*** *Aortic Dissection Risk in Marfan Syndrome. J Am Coll Cardiol. 2020;75(8):854-6.*

12. ***Khiste JA, Dantkale SS, Pandit GA, Bendre MA.*** *Histomorphological Study of Medicolegal Autopsy Cases. International Journal Dental and Medical Sciences Research. 2021;3(2):92-7.*

13. ***Henriques de Gouveia RHAM****, Corte Real Gonçalves FMA. Sudden cardiac death and valvular pathology. Forensic Sci Res. 2019;4(3):280-6.*

14. ***Bhatia RT, Finocchiaro G, Westaby J, Chatrath N, Behr ER, Papadakis M, et al.*** *Myocarditis and Sudden Cardiac Death in the Community: Clinical and Pathological Insights From a National Registry in the United Kingdom. Circ Arrhythm Electrophysiol. 2023;16(9):e012129. doi: 10.1161/CIRCEP.123.012129.*

15. ***Tapia BA, Mier MPS.*** *Post-mortem diagnoses of structural cardiopathies.Spanish Journal of Legal Medicine. 2018;44(1);22-31.*

16. ***Chaudhari SH, Mugadlimath A, Sane M, Zine KU, Ingale DI, Hiremath R et al. Study***

17. *Study Of Sudden Natural Deaths In Medico-Legal Autopsies With Special Reference To Cardiac Causes. International Journal of current Research and Review. 2013;5:37-42.*

18. ***Lalhminghlua R, Nayak M, Saiyed MZG, Jani C.*** *Pulmonary thromboembolism: A momentous event in a case of polytrauma. Indian J Forensic Community Med. 2021;8(3):191-6.*

19. ***Singh G, Kalyan S, Kataria SP, Sharma J, Parmar P, Gilotra M, et al.*** *Disseminated invasive aspergillosis in a prolonged stay in the intensive care unit. Autops Case Rep. 2017;30;7(1):17-21.*

20. ***Schlageter M, Quagliata L, Matter M,Perrina V, Tornillo L, Terracciano L.*** *Clinicopathological Features and Metastatic Pattern of Hepatocellular Carcinoma: An Autopsy Study of 398 Patients. Pathobiology.2016; 83 (6): 301–7.*

21. *Lamps LW.Liver: Tumors and Tumor like Conditions. In: Goldblum JR, Lamps LW, McKenney JK, Myers JL, editors. Rosai and Ackerman's Surgical Pathology. 11th ed. Philadelphia, Elsevier. 2018;1:803-43.*

22. ***Muneer A, Macrae B, Krishnamoorthy S, Zumla A.*** *Urogenital tuberculosis - epidemiology, pathogenesis and clinical features. Nat Rev Urol .2019;16:573–98.*

23. ***Johnson MD, Abu-Farsakh S.*** *Clinicopathologic features of incidental meningiomas: A review of the literature and the University of Rochester autopsy experience. Clin Neuropathol. 2019;38(3):118-21.*

24. ***Misra D, Sood T. Pancreatic Pseudocyst.*** *[Updated 2023 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557594/*

25. *Lyngdoh BS, Dey B, Mishra J, Marbaniang E. Krukenberg tumor. Autops Case Rep.2020;10(2), e2020163.*

26. ***Sinhasan SP, Bharathi. K. V, Bharathi OM, Bhat RV.*** *Incidental Tumors Detected At Medicolegal Autopsies- A Retrospective Study. International Journal of Scientific Research. 2019;8(10):1-4.*

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.4

An Insight into Experiences of Forensic Expert and Pathologist on Prostrate Degeneration with Post Mortem Interval in Human Cadavers

Mopuri Venkateswarlu[1], C. Lakshmi Kalavathi[2], Ananth Rupesh Kattamreddy[3], Arun Ravula[4], Zunaid Ali Ahamed S[5]

How to cite this article:

Mopuri Venkateswarlu, C. Lakshmi Kalavathi, Ananth Rupesh Kattamreddy *et al.* An insight into experiences of Forensic expert and Pathologist on Prostrate Degeneration with Post Mortem interval in Human Cadavers. Indian J Forensic Med Pathol.2024;17(2):95-100.

ABSTRACT

Background: Estimating postmortem interval is effective forensic tool for investigating time of death useful in criminology. Many gross, microscopic and molecular methods available for estimating postmortem interval. Human prostate is last soft tissue organ to degenerate in human cadavers and its histopathology in cadavers can be used for estimation of post mortem interval. Studies reported Histopathologies of different organs to estimate postmortem intervals for purpose of calculating time since death. In our study we tried to observe Post mortem interval estimation in human cadavers with Histopathological changes in Prostrate.

Objectives: To estimate postmortem interval from Histopathological examination of prostate in human cadavers and identify Histopathological changes in human prostate in relation to time since death.

Methodology: Prostate from cadavers registered for autopsy in our institute were examined grossly along with histopathology as per criteria laid down for sampling.

Results: Histopathological sections from total of 36 human cadavers were studied. Changes like epithelial disruption of acini, nuclear changes, inflammatory cell collection in stroma, fatty degeneration and sequential necrotic changes were reported in relation to time since death. Earliest degeneration changes in prostrate acini began at 6 hours postmortem and changes in stroma began at 12 hours. First atrophic changes in acini began at 19 hours postmortem and continued to progress till 3 days after which identification of any glandular or stromal tissue became extremely difficult.

Conclusion: Significant changes in Prostrate were documented between 6 hours and 72 hours postmortem. Changes in human prostate can be used for estimating postmortem interval.

Keywords: Forensic Pathology; Autopsy; Histology; Prostate; Criminalistics.

Author's Credentials: *[1]Associate Professor, Department of Forensic Medicine and Toxicology, [2]Assistant Professor, Department of Pathology, ACSR Government Medical College, Nellore 524004, Andhra Pradesh, India, [3]Assistant Professor, Department of Forensic Medicine and Toxicology, Andhra Medical College, Visakhapatnam 530002, Andhra Pradesh, India, [4,5]Postgraduate, Department of Forensic Medicine and Toxicology, ACSR Government Medical College, Nellore 524004, Andhra Pradesh, India.*

Corresponding Author: ***C Lakshmi Kalavathi,*** *Assistant Professor, Department of Pathology, ACSR Government Medical College, Nellore 524004, Andhra Pradesh, India.*

Email: *drclk30@gmail.com*

Received on: *17-11-2023* ***Accepted on:*** *06-04-2024*

Introduction

Post Mortem Interval and Estimating the time since death is one of the important objectives and major difficulty in a medico legal autopsy especially in unwitnessed death investigations. Common methods used in practice for assessment of early postmortem interval include gross examination of corpse for postmortem lividity, rigor mortis, algor mortis, histo-morphological analysis, thanato-chemistry and supra-vital reactions are few to mention.[1]

Studying degenerative histopathology in different organs at microscopic level will increase the precision of predicting early postmortem interval to some extent.[2] General architecture of each organ is observed along with cellular membrane changes, cytoplasmic staining ability and integrity, nucleolemma integrity, nuclear contraction or vacuolation, chromatin appearance are generally studied as part of autolytic process to estimate time since death with support of organ study by histopathology. Molecular methods like studying the degeneration of DNA, mRNA, RNA transcripts, DNA and proteins are also used for estimating the early postmortem interval.[3]

Novel scoring methods of Histo indices are emerging as a further development of Histopathological methods for estimating postmortem interval. Hepatic Decomposition Score (HDS) based on autopsy histopathology of human livers was proposed for more accurate assessment of postmortem interval for bodies from indoor setting. The model was also found to be statistically robust in predicting the postmortem interval.[4]

However, there are multiple endogenous and exogenous variables which influence the estimation of time since death. Humidity, temperature, septicemia are few such factors.[5] Over reliability and over generalizations are seriously discouraged in any frontier of research. Studies reported Histopathologies of different organs to estimate postmortem intervals for purpose of calculating time since death. Most of these studies were performed on animals where testes, leydig cells, sertoli cells, liver, heart and kidney were used as specimens to estimate the time since death.

It is often stated in medical literature that prostate is one of the most resistant organs to decompose in human cadavers and its histopathology in cadavers can be used for estimation of post mortem interval. Abdel Rahman Mahmoudet al conducted a study on prostate samples obtained from albino rats which revealed post mortem changes observed in prostrate over a period of more than two weeks. Also it was observed in their study that light microscopic examination of prostate samples didn't show any significant structural alteration during the first twelve hours after death. Significant epithelial disruption, inflammatory cells and fatty degeneration began to appear in the prostatic acini after 24 hours. When post mortem was performed they observed that after two days the prostatic acini showed significant atrophy and necrosis. Stromal calcification started to appear 6 days postmortem. One week to four weeks PM, the prostatic acinar epithelial disruption, atrophic acini, necrosis and stromal calcification became more common till no more normal glandular or fibro muscular architecture can be detected.[6]

Studying the relationship between post-mortem changes, decomposition time intervals, and prostrate degeneration in human bodies can have significant implications in forensic science, pathology, and medical research.[7] Understanding the patterns and timelines of post-mortem changes can aid forensic investigators in estimating the time since death. This information is crucial in criminal investigations to establish timelines and gather evidence. For donated organs, it's essential to know the effects of post-mortem changes on different organs. Research can provide insights into the viability of organs for transplantation and enhance the success rates of organ transplants. Also time of prostrate degeneration with time of death as estimated from post mortem interval contributes to a better understanding of how diseases affect post-mortem changes, especially in organs like the prostate. This knowledge may lead to improved diagnostic tools and methods for identifying or studying diseases in deceased individuals.

Interdisciplinary collaboration between forensic scientists, pathologists, and medical researchers would be essential to ensure a comprehensive and well-rounded approach to the study. Conducting research on the relationship between post-mortem changes, decomposition time intervals, and prostate degeneration is not only scientifically intriguing but also holds practical applications that can benefit various fields, from forensics to medicine. Every single study in the field of estimation of time since death will complement to the existing literature and increase scientific rigor of medico legal work.

In our study we tried to identify Histo-pathological changes in human prostate in relation to time since death with estimate postmortem interval from Histopathological examination

of prostate in human cadavers and observe applicability of Histopathological examination of human prostate in medico-legal practice.

Methodology

In our study Human Cadavers registered for Medico Legal autopsy at Tertiary Hospital constituted the study sample. The study was carried for one-year duration and only those satisfying the criteria of enrolment were included. Limited purposive sample was used for the preliminary observational study.

We included cases of cadavers of male sex registered for medico legal autopsy in which time since death is exactly verifiable over a range of less than 2 hours in the study. We excluded cadavers of female sex were excluded from the study. Also cadavers of male sex with age group less than 20 years and more than 60 years, with any history of prostatic pathology or surgical intervention, with discernible gross pathology during dissection were excluded. Also cadavers with trauma causing damage to urinary bladder, urethra as observed physically during autopsy and also cadavers with loss of prostrate integrity physically or due to severe systemic sepsis and cases preserved in cold storage were excluded from the study sample.

Whole prostate is removed from human cadavers during autopsy and divided in to four equal halves and were sent to the Department of Pathology preserved in 10% formalin along with clinical details and gross findings. The tissue samples received were processed for histopathology. All Histopathological sections were stained with Haematoxylin and Eosin stain and examined. No other special stains were used during the study for observing the degenerative changes in the prostrate as H&E staining provides a good overall assessment of tissue morphology and allows for the visualization of cellular details, including nuclear and cytoplasmic structures.

Observations and Results

A total of 36 samples were studied. The age distribution of the sample is as follows:

The time since death profile of the study sample is as follows:

Table 1: Showing Post Mortem Interval of Study Sample

Sl. No	Post Mortem Interval	No. of Cases studied
1	0-6 hours	5
2	7-12 hours	7
3	13-18 hours	6
4	19-24 hours	10
5	25-36 hours	4
6	37-48 hours	2
7	49-72 hours	1
8	73 hours and above	1

Specimens showing gross pathology were excluded in the study. However, incidental findings were noted in few cases. Prostatitis, Squamous metaplasia, prostatic intraepithelial neoplasia were seen in one case each. Three cases of 41-50 years age group and three cases of 51-60 years age group showed adenomatous fibro-muscular fibroplasia changes. Among the study sample stromal hyperplasia was noticed earlier than hyperplasia of adenomatous component with advancing age.

Table 2: Age distribution of study sample

Sl. No	Age	No. of Cases
1	21-30	9
2	31-40	10
3	41-50	11
4	51-60	6

The following histological changes were seen with respect to time since death:

Table 3: Histological changes were seen with respect to time since death

Post Mortem Interval	Light Microscopy- Histo-Pathological changes
0-6 hours	No significant structural changes in both acinar and stromal compartments.
7-12 hours	Epithelial disruption in prostatic acini in some fields. Stroma showed no significant changes.
13-24 hours	Marked epithelial disruption in prostatic acini, pyknosis of nuclei, inflammatory cell collection seen in stroma. (Fig 1-2)
25-48hours	Marked atrophy of acini along with karyorrhexis, karyolysis of nuclei and significant inflammatory cell collection in stroma. (Figure 3)
49-72 hours	Marked atrophy and necrosis of acini, karyolysis of nuclei, distortion and necrosis of stromal tissue noticed. (Fig 4-5)
73 hours – 1 week	Necrosis, complete distortion of glandular and fibro muscular architecture, occasional stromal calcification and decreased stain uptake seen. Even corpora amylacea is not identifiable in specimens in which postmortem interval is close to 1 week. (Fig 6)

The temperature max / min / day varied between 27/20°C to 39/27°C during the study. Humidity varied from 78% to 99% during the study.

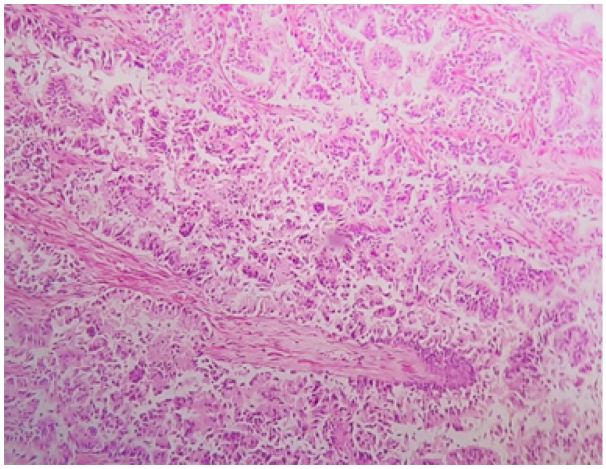

Fig. 1: Marked epithelial disruption in prostatic acini, pyknosis of nuclei, inflammatory cell collection seen in stroma (H& E Staining - 40X)

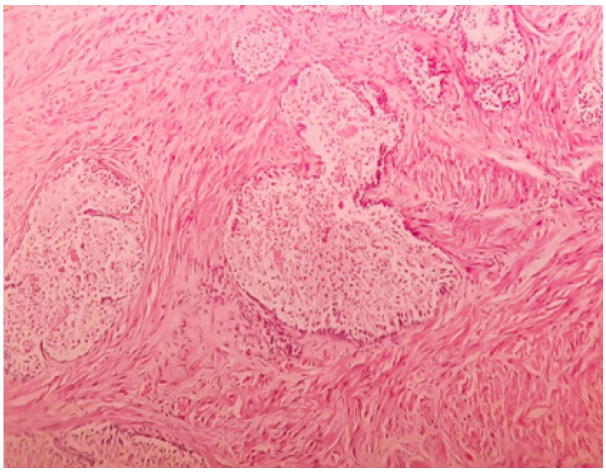

Fig. 2: Marked epithelial disruption in prostatic acini, pyknosis of nuclei, inflammatory cell collection seen in stroma (H& E Stain - 40X)

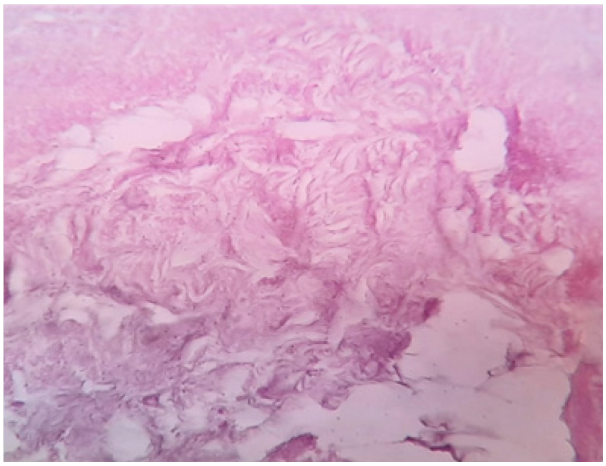

Fig. 3: Marked atrophy and necrosis of acini, karyolysis of nuclei, distortion and necrosis of stromal tissue noticed (H& E Stain - 40X)

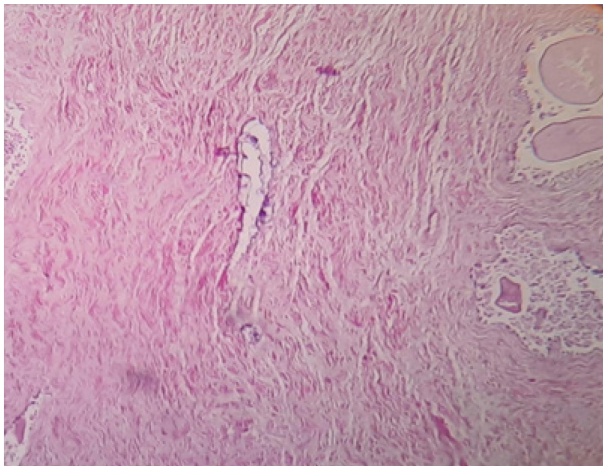

Fig. 4: Marked atrophy of acini along with karyorrhexis, karyolysis of nuclei (H& E Stain - 40X)

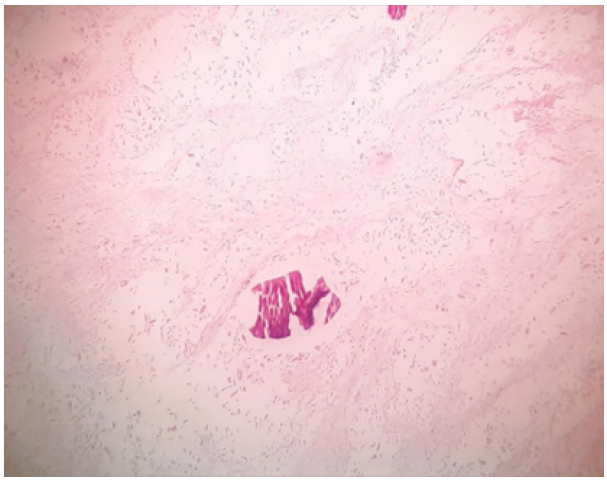

Fig. 5: Marked atrophy of acini along with karyorrhexis, karyolysis of nuclei (H&E Stain - 40X)

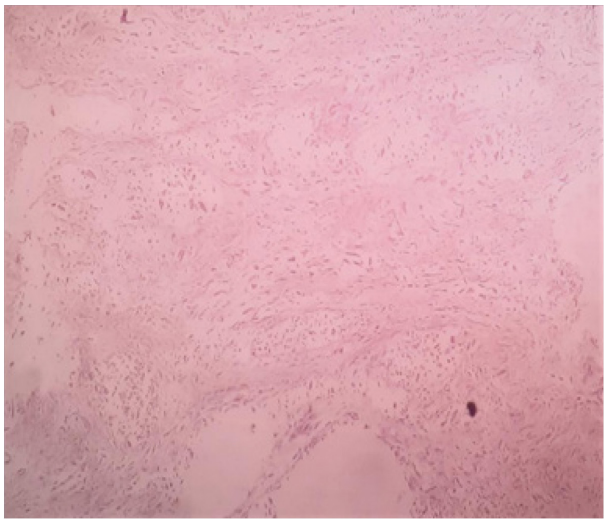

Fig. 6: Necrosis, complete distortion of glandular and fibro muscular architecture, occasional stromal calcification and decreased stain uptake seen. Even corpora amylacea is not identifiable in specimens in which postmortem interval is close to 1 week. (H & E Stain - 40X)

Discussion

The absence of any study on estimating postmortem interval from histology of human prostate justifies the necessity of current study. It is often stated in medical literature that prostate and virgin uterus are the most resistant organs to decompose,[8] hence prostate can be a good candidate for estimating time since death in early postmortem and fresh phase of late postmortem period that is from 7 to 10 days after death. In current study, in-situ and in-vivo degeneration of human prostate are evaluated.

In forensic investigations, determining the time of death is a critical aspect that often involves a multidisciplinary approach. Forensic experts play a pivotal role in this process by employing various methods to assess postmortem changes. Prostate degeneration is one such indicator utilized in postmortem examinations. As the prostate undergoes specific structural alterations following death, forensic experts carefully examine these changes to estimate the time since death. Combined team approach of a forensic expert with Pathologist allows the forensic expert to observe histopathological alterations, including cellular disintegration and changes in tissue appearance. By correlating these findings with established postmortem intervals, forensic experts contribute valuable insights to investigations. While the assessment of prostate degeneration is just one facet of a comprehensive forensic examination, it underscores the intricate nature of forensic science and its role in unraveling the mysteries surrounding the circumstances of death.

The timelines of degenerative changes in prostate with an inherent pathology may vary. In our study the first evidentiary degeneration changes in acini begin at 6 hours and in stroma begin at 12 hours postmortem. Thereafter, first atrophic changes in acini begin at 19 hours postmortem and continue to progress till 3 days, after which identification of any glandular or stromal tissue becomes extremely difficult.

There were variations compared with animal study[9] on prostate. Initial changes were seen as early as 6 hours postmortem in human prostate whereas no structural alteration was seen in prostate of albino rats up to 12 hours. Significant epithelial disruption, inflammatory cells and fatty degeneration began to appear in the prostatic acini prior to 24 hours and sometimes as early as 18 hours, whereas such changes in animal study were seen after 24 hours only. Marked atrophy of acini and necrotic changes started to appear between 24 to 48 hours in our study whereas such changes were seen only after two days in animal study. Stromal calcification with increasing postmortem interval was less significant in late specimens compared to animal studies. Overall degeneration changes were seen early compared to the animal study.

The composition of prostate tissue may undergo changes with age. These changes can include alterations in glandular structures, connective tissue, and overall tissue organization.[10] The rationale of restricting study sample between 20-60 years is that the prostate volume is considerably very less in individuals less than 20 years and the alterations of benign prostatic hyperplasia increases after the age of 60. During early adulthood around 20 years of age, the prostate undergoes a phase of growth and development. This growth is primarily influenced by hormonal factors, particularly testosterone.

Also there was difficulty in obtaining samples from dead bodies beyond 36 hours because of the excluding bodies preserved in cold storage in the study. However, we recruited few trauma cases and drowning cases as per inclusion criteria.

These variations in human prostate study are worth noticing for any further research. The variations may be because of structural variations, temperature variations and any other exogenous or endogenous variable.

Limitations: Prostrate is confined to male sex only which is the major limitation of the study where it can be utilized for estimation of time of death in males only and not in females.Also the present study did not attempt to study degeneration of human prostate in controlled environment like at different known temperatures, humidity and other atmospheric variables. This study provides a cross sectional data of autolytic and putrefactive changes.

Recommendations: Further studies are advised preferably with large sample and with emphasis molecular studies like studying DNA degradation patterns in human prostate. Further studies in controlled settings are advisable. Corpse related factors like clothing, built; cause of death may also induce an element of unpredictable subtle randomness which is beyond the scope of this preliminary study.

Conclusion

Changes in human prostate can also be used to complement other scientific data in estimating postmortem interval for a prolonged period of time in comparison with other soft tissue organs of human cadavers. Histopathological changes in human prostate in relation to time since death can be effective forensic tool useful for crime investigators. Forensic Histopathology proves yet another sensitive tool of medico legal importance.

Conflict of Interest: ***None to declare***

Financial Support: ***Nil***

Ethical declaration: There is no ethical issue involved in the study and Post Mortem will be performed after obtaining necessary medico legal permissions and consents which also include organ observation and preservation in Human mortal specimens.

References

1. ***Shrestha R, Kanchan T, Krishan K.*** *Methods of Estimation of Time Since Death. [Updated 2020 Apr 29]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK549867/*

2. ***Ceciliason, AS., Andersson, M.G., Nyberg, S. et al.*** *Histological quantification of decomposed human livers: a potential aid for estimation of the post-mortem interval?. Int J Legal Med (2020). https://doi.org/10.1007/s00414-020-02467-x*

3. ***Scrivano S, Sanavio M, Tozzo P, Caenazzo L.*** *Analysis of RNA in the estimation of post-mortem interval: a review of current evidence. Int J Legal Med. 2019 Nov; 133(6):1629-1640.*

4. ***Tomita Y, Nihira M, Ohno Y, Sato S.*** *[Histological study of early postmortem changes in various organs: comparison of the paraffin embedding method and the epoxy resin embedding method]. Nihon HoigakuZasshi. 1999 Jun; 53(2):207-17. Japanese. PMID: 10536439.*

5. ***Zhou C, Byard RW (2011)*** *Factors and processes causing accelerated decomposition in human cadavers – an overview. J Forensic Legal Med 18:6–9. https://doi.org/10.1016/j.jflm.2010.10.003*

6. ***N Abdel Rahman Mahmoud, A Abdel Rahman Abdel Rahman Hassan, A Hassan Abdel Rahim, S Mostafa Mahmoud, O Hassan Nada,*** *Molecular versus histopathological examination of the prostate gland in the estimation of post-mortem interval (an experimental study), QJM: An International Journal of Medicine, Volume 111, Issue suppl_1, December 2018, hcy200.054, https://doi.org/10.1093/qjmed/hcy200.05*

7. ***Mahmoud NA, Hassan AA, Abdel Rahim AH, Abdel Rahim AH, Suzan Mostafa Mahmoud SM, Nada OH.*** *Molecular versus histopathological examination of the prostate gland in the estimation of post-mortem interval (an experimental study). Egypt. J. Forensic Sci. Appli. Toxicol. 2018;18(1):35-54.*

8. ***Murty OP.*** *Histopathology in forensic practice. Journal of Forensic Medicine and Toxicology. 2016;33(2):1-89.*

9. ***Thakur R, Tiwari A.*** *Estimation of time since death by histological examination of proximal convoluted tubule in human kidney. International Journal of Science & Healthcare Research. 2019; 4(4): 131-141.*

10. ***Goncalves BF, de Campos SG, Costa CF, Scarano WR, Góes RM, Taboga SR.*** *Key participants of the tumor microenvironment of the prostate: An approach of the structural dynamic of cellular elements and extracellular matrix components during epithelial–stromal transition. Actahistochemica. 2015 Jan 1;117(1):4-13.*

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.5

Cause and Manner of Death in Medicolegal Autopsy of Lung: A Tertiary Care Centre Study from North India

Dezy Singh[1], R. C. Tiwari[2], Ashish Bhute[3], Ravi P Meshram[4], Bhawana Mittal[5], Arvind Kumar[6]

How to cite this article:

Dezy Singh, R. C. Tiwari, Ashish Bhute *et al*. Cause and Manner of Death in Medicolegal Autopsy of Lung: A Tertiary Care Centre Study from North India. Indian J Forensic Med Pathol.2024;17(2):101-107.

ABSTRACT

Context: Medicolegal autopsy results are determined by the pathological examination hence there is a need to check and consolidate all the factors that contribute in the interpretation of histology finding. Lung is vital organ in contributing the certain histologic pattern that can unfold the cause and manner of death.

Aims: To note the role of gross and histopathological examination in ascertaining the cause and manner of death in lung autopsy.

Setting and Design: Study was conducted in department of Pathology with Forensic department collaboration over the period of one year. It's a prospective observational study including 100 medicolegal autopsy cases taken.

Material and Method: Gross examination followed by histopathological examination on hemotyxilin and eosin stained slide of lung tissue were done. Special stains were used wherever required and findings noted. All variable were correlated using Chi-squared test, Fisher's Exact and Kruskal Wallis and strength of association with Kendall's Tau, Chi-squared test, Cramer's V statistical tools.

Results: Majority of cases were in between 20-39 yrs with male predominence. Most common gross finding was congestion followed by consolidation. In histology pulmonary edeme followed by pneumonitis were noted. Most frequent cause of death was brain injury followed by septicemia and manner of death was accidental followed by natural. There was significant assocaition observed between histopathology and age as well as in between gross finding with cause and manner of death.

Conclusion: Gross finding coupled with microscopy can link in the detection of cause and manner of death.

Keywords: Autopsy; Cause of death; Lung, Manner of death and pathology

Key Message: Gross findings in conjunction of histopathology can lead to ascertain the cause and manner of death in majority of medicolegal autopsy cases.

Author's Credentials: *[1]Post Graduate Scholar, [2]Professor and HOD, Department of Agad Tantra evum Vidhi Vaidyak, Uttarakhand Ayurved University Dehradun 248001, Uttarakhand, [3,4]Additional Professor, Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences, Rishikesh 249203, [5]Assistant Professor, Department of Agad Tantra evum Vidhi Vaidyak, Uttarakhand Ayurved University Dehradun 248001, Uttarakhand, [6]Additional Professor, Department of Pathology and Laboratory Medicine, All India Institute of Medical Sciences, Rishikesh 249203, India.*

Corresponding Author: ***Arvind Kumar,*** *Additional Professor, Department of Pathology and Laboratory Medicine, All India Institute of Medical Sciences, Rishikesh 249203, India.*

Email: *drarvindkumar10@gmail.com*

Received on: *01-02-2024* ***Accepted on:*** *20-06-2024*

Introduction

Auopsy has expanded into a multidisciplinary field that may be used to study the evolution of disease, its causative agents, and organisms. It also provides insight into the biological foundation of disease, as evidenced by changes in the architecture of cells and tissues. An autopsy may uncover some natural diseases, the existence of which may raise concerns about the disease's relative role to mortality and its relationship to trauma, employment, criminal activity, etc.[1] A forensic autopsy is carried out in situations involving suspected suicide, murder, accidents, persistent drug or alcohol abuse, mistreatment by medical personnel, unexpected deaths, long post-mortem delays (*i.e.*, body decomposition), or other challenges in identifying the deceased. On an individual basis, it is critical to accurately diagnose the cause of death and any coexisting illnesses.

Precise identification of the cause of death and coexisting illnesses is crucial not only for the individual's family and relatives but also for health care planning and research on a population level.[2] In cases where the cause of death is uncertain, pathological investigation, which includes both gross and histological examination, can help identify the manner and cause of death.[3,4]

The lungs are engaged in all terminal diseases in form of inflammation and neoplastia. In situations of asphyxia, strangulation, drowning, hanging, and aspiration, pathological findings of the lung are particularly significant. Since many Indian facilities rarely take a biopsy unless there are unclear findings on gross inspection, gross findings must be verified by histopathology. When the cause of death is unknown, we are attempting to determine the demography of the disease and the relationship between pathological findings and cause and manner of death.

Material and Method

Aims and Objectives

To evaluate the role of histopathological examination of lung in medicolegal autopsy and to correlate the histopathological findings of lung organ with manner and cause of death.

Study design: This is an prospective observational study was conducted in the Department of Forensic Medicine and Toxicology at AIIMS Rishikesh with collaboration of Department of pathology. Hundred medical-legal cases for autopsy were received in mortuary between March 2022 to March 2023. The autopsy and clinical findings were noted. Representative tissue from macroscopically variable areas of bilateral lungs, collected in 10% neutral buffered formalin in the autopsy room. For histopathological analysis, specimens from all of the medico-legal cases were fixed in a 10% neutral buffered formalin solution. The H&E (haematoxylin and eosin) stain was used to stain sections. Special stains, including Ziehl Neelsen stain for tubercular bacilli, Fite faraco stain for lepra bacilli and sliver stains like Grocotte Methenamine Silver stain along with Periodic Acid Schiff (PAS) for fungal profiles were done wherever required. Gross and microscopic features were studied, and a brief discussion of the incidental and interesting findings were noted. All confidentiality was maintained, and only non-identifiable data of the patient was collected and tabulated for analysis. Additional consent was also taken from deceased relatives for taking histological samples.

Statistical Tools: To ascertain significant correleation between two or more than two groups and variables Chi Squqred Test and Fisher's Exact test along with Kruskal Wallis Test were used. Strength of association between variables were assessed using Cramers V, Kendall Tau.

Inclusion and exclusion criteria:

It included all the medicolegal autopsy cases except:

Previously autopsied cases, police encounter deaths, decomposed body and Unidentified bodies.

A prospective observational study was conducted in Forensic Medicine department and Toxicology, All India Institute of Medical Sciences (AIIMS) Rishikesh. One hundred medico legal cases presented in department of Forensic Medicine and Toxicology (FMT) for autopsy, were taken. After gross inspection and measuring the weight, representative histopathological samples were taken from bilateral lungs kept in 10% neutral buffered formalin and sent to the Department of Pathology at AIIMS Rishikesh, during March 2022 - March 2023 taken. Sections were processed and finally paraffin tissue embedding was done to prepare tissue blocks. Five (5.0) mm thickness sections were cut in microtome and all prepared sections slides were stained with Haematoxylin and Eosin (H&E) stain and mounted and examined microscopically. This is a part of study that was approved by institutional ethics committee vide letter no. AIIMS/IEC/22/16.

Results

Total of hundred cases were included in the study

with age ranges from 20 years to 90 years with male predilection. Age group 30-39 years constituted the most cases (27.0%) followed by 20-29 years. Parenchymal hemorrhage and COPD with pneumonitis histopathological types showed the lowest (26.9%) and highest (76.0%) mean age in years. There was no significant difference between the various groups in terms of distribution of Gender (p = 0.595). However, Over all male dominence was noted in the majority of subgroups.

Congestion (33.0%) was the most common gross finding with majority of cases in 20-29 yrs age group followed by consolidation (24.0%) and pulmonary edema (18.0%) both noted in 30-39 yrs age group. However, there was no statistical correlation could be find out between gross findings and age distribution. (p = 0.656). (Fig. 1).

Pulmonary edema (34.0%) was the most common histopathological finding noted followed by pneumonitis (15.0%) both groups presented in 30-39

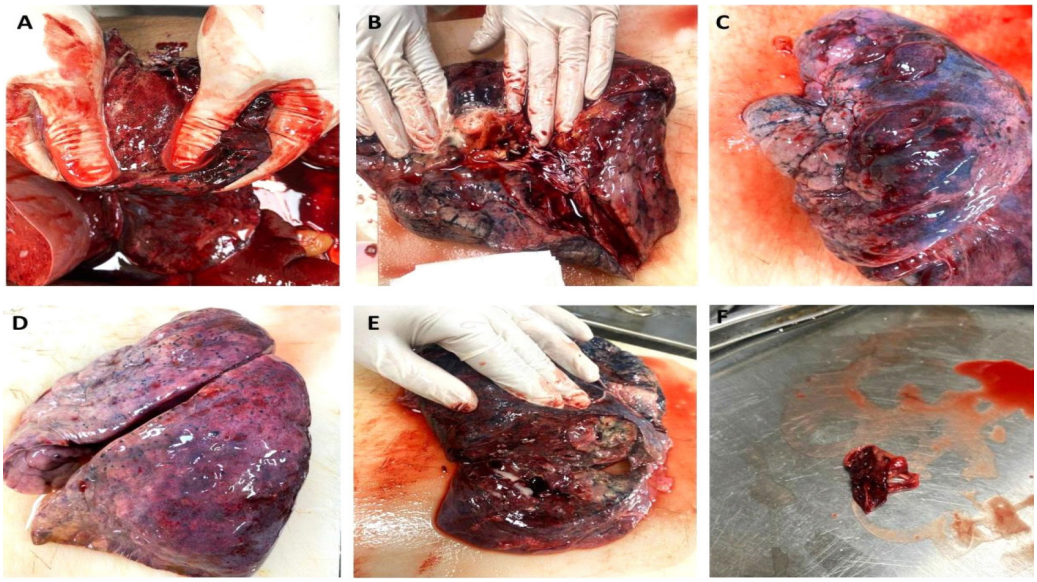

Fig. 1: Gross findings- A) Cut surface is congested. B) Cut surface exudes the fluid (Pulmonary edema). C) Outer surface shows emphysematous bullae. D) Outer surface shows petechial hemorrhagic spots. E) Cut surface shows pleura based cercumscribed tumor. F) Blood clot like pulmonary embolus

yrs age group. Overlap of pneumonitis and pulmonary edeme was noted in 8.0% of cases. Parenchymal hemorrhage and emphysematous change were noted in 6.0% of cases. Focal fibrosis, granuloma and malignant tumor were noted in 5.0% and 3.0% and 4.0% of cases respectively. There was significant association between histopathology and age groups (p=0.033). (Table1) (Fig. 2).

Brain injury (35.0%) was the most common cause of death followed by septicemia (16.0%). Hundred percent cases of lung abscess and pulmonary embolism with pneumonitis had cause of death septicemia and

Table 1: Association of histopathology with age distribution

S. N.	Histopathology	Number	Percentage	Most common age group (Yrs)
1	Pulmonar edema	34	34	30-39
2	Pneumonitis	15	15	30-39
3	Miscellaneous	14	14	40-49
4	Pulmonary edema and Pneumonitis	8	8	30-39, 60-69
5	Emphysema	6	6	40-49
6	Parenchymal hemorrhage	6	6	20-29
7	Fibrosis	5	5	50-59

Table Cont...

8	Tumor	4	4	50-79
9	Granuloma	3	3	20-49
10	Pulmonary embolism and Pneumonitis	2	2	30-49
11	COPD and Pneumonitis	1	1	70-79
12	Lung abscess	1	1	40-49
13	Pneumonitis and Bronchiectasis	1	1	60-69
	Total	**100**	**100**	

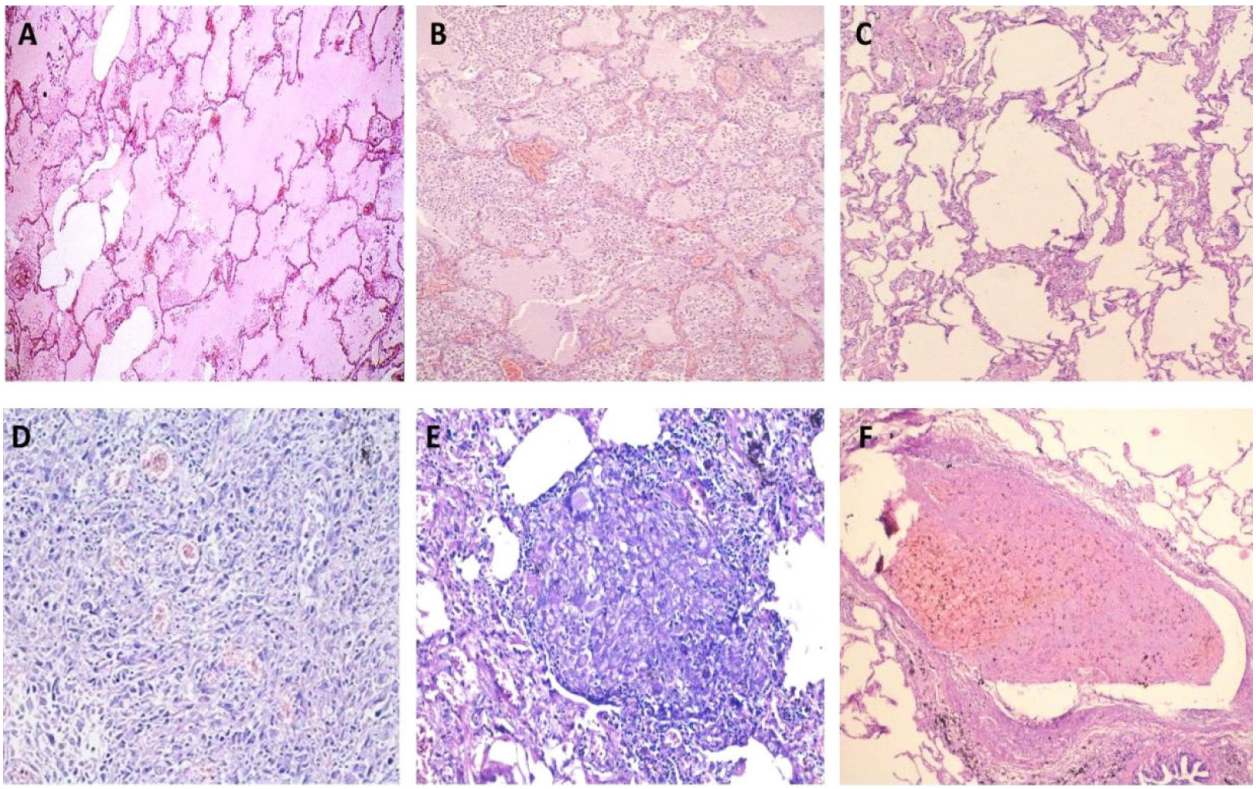

Fig. 2: A) Proteinaceous material in alveoli (Pulmonary edema). (H&E,200X), B) Alveolar spceces and septa infiltrated by neutrophils (Pneumonitis)(H&E,200X), C) Destruction of alveolar septa (Emphysematous change)(H&E,200X), D) Oval to spindled neoplastic cell proliferation in lung tissue (Tumor)(H&E, 200X), E) Aggregates of epithiloid cell (Granuloma)(H&E, 200X), F) Adhered embolus to endothelium. (H&E, 200X)

brain injury respectively. All cases of pneumonitis with bronchiectasis had also coronary artery disease as a cause of death. There was no significant difference between the various groups in terms of distribution of Cause of Death and histology (p = 0.100).

Contrary to that there was statistically significant association between gross findings and cause and manner of death. Brain injury is the most common cause of death in gross types of congestion (42.4%), consolidation (37.5%), pulmonary edema (27.8%) and variable dilated spaces (40.0%). 66.7% of the participants in the group gross of laceration had cause of death was hemorrhagic shock. Cases in the gross group of abscess had the largest proportion of cause of death of septicemia. Grossly lacertaed lung cases had the largest proportion of cause of death from hemorrhagic shock. Pneumonia was the most common cause of death in cases whose gross finding was consolidation. There was a significant difference between the various groups of gross finding and distribution of Cause of Death (p = 0.015). (Table 2). Accidental (67.0%) was the most common manner of death followed by natural (18.0%) and suicidal (14.0%). Pulmonary edema was the most frequent histopathology followed by pneumonitis in both accidental and natural types of manner of death.

Those cases who had gross features of laceration and abscess were having the accidental largest proportion of manner of death. Most of the cases

Table 2: Association of gross finding with cause of death

Cause Of Death	Lung: Gross								
	Congestion	Consolidation	Pulmonary Edema	Variable Dilated Spaces	Petechial Hemorrhages	Adherent To Chest Wall	Laceration	Abscess	Total
Brain Injury	14 (42.4%)	9 (37.5%)	5 (27.8%)	4 (40.0%)	1 (16.7%)	1 (20.0%)	1 (33.3%)	0 (0.0%)	35 (35.0%)
Septicemia	4 (12.1%)	7 (29.2%)	3 (16.7%)	0 (0.0%)	0 (0.0%)	1 (20.0%)	0 (0.0%)	1 (100.0%)	16 (16.0%)
Hemorrhagic Shock	3 (9.1%)	0 (0.0%)	1 (5.6%)	2 (20.0%)	0 (0.0%)	1 (20.0%)	2 (66.7%)	0 (0.0%)	9 (9.0%)
Unclear	3 (9.1%)	2 (8.3%)	2 (11.1%)	2 (20.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	9 (9.0%)
Miscellaneous	2 (6.1%)	1 (4.2%)	2 (11.1%)	2 (20.0%)	0 (0.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)	8 (8.0%)
Antemortem Hanging	4 (12.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (50.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	7 (7.0%)
Poisoning	1 (3.0%)	1 (4.2%)	3 (16.7%)	0 (0.0%)	2 (33.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	7 (7.0%)
Coronary Artery Disease	2 (6.1%)	1 (4.2%)	1 (5.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (4.0%)
Pneumonia	0 (0.0%)	3 (12.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (3.0%)
Pulmonary Edema	0 (0.0%)	0 (0.0%)	1 (5.6%)	0 (0.0%)	0 (0.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)	2 (2.0%)
Total	**33 (100%)**	**24 (100%)**	**18 (100%)**	**10 (100%)**	**6 (100%)**	**5 (100%)**	**3 (100%)**	**1 (100%)**	**100 (100%)**

Table 3: Association of histopathology with gross findings

Gross	Pulmonary edema	Pneumonitis	Miscellaneous	Pneumonits and Pulmonary edema	Emphysema	Parencymal hemorrhae	Fibrosis	Tumor	Granuloma
Congestion	16 (47.1%)	1 (6.7%)	12 (85.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (60.0%)	0 (0.0%)	1 (33.3%)
Consolidation	4 (11.8%)	8 (53.3%)	0 (0.0%)	4 (50.0%)	0 (0.0%)	1 (16.7%)	1 (20.0%)	2 (50.0%)	1 (33.3%)
Pulmonary Edema	10 (29.4%)	4 (26.7%)	1 (7.1%)	2 (25.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Variable Dilated Spaces	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (12.5%)	6 (100.0%)	1 (16.7%)	0 (0.0%)	2 (50.0%)	0 (0.0%)
Petechial Hemorrhages	3 (8.8%)	2 (13.3%)	1 (7.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Adherent To Chest Wall	1 (2.9%)	0 (0.0%)	0 (0.0%)	1 (12.5%)	0 (0.0%)	1 (16.7%)	1 (20.0%)	0 (0.0%)	1 (33.3%)
Laceration	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (50.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Abscess	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total	**34 (100%)**	**15 (100%)**	**14 (100%)**	**8 (100%)**	**6 (100%)**	**6 (100%)**	**5 (100%)**	**4 (100%)**	**3 (100%)**

with gross finding of pulmonary edema had the pnatural manner of death. Cases with gross features of petechial hemorrhages had the largest proportion of manner of death as Suicidal and cases with gross feature of pulmonary edema had the largest proportion of manner of death, Homicidal.

All (100%) cases of parenchymal hemorrhage and pulmonary embolism with pneumonitis had accidental manner of death. Similarly all cases of pneumonitis with bronchiectasis showed natural manner of death. There was no significant difference between the various groups in terms of distribution of Manner of Death ($\chi 2$ = 28.470, p = 0.810). Most common gross finding was congestion (33.0%) and its corresponding tissue section showed pulmonary edema (47.7%) on histology. Second most frequent gross finding was consolidation and it revealed pneumonitis on microscopy (53.3%).

All cases (100.0%) of pneumonitis with bronchiectasis which are the sub group of histopathology had consolidation on gross appearence followed by 85.7% cases of miscellaneous group and fibrosis (60.0%) that exhibited congestion grossly. There was a significant association between the histopathology and gross findings (p = <0.001). (Table 3).

Discussion

Most patients that are brought for investigation in medicolegal autopsy have no known medical history. If any morbid anatomical change in tissue is noticed, a

histopathological investigation is performed as part of a medicolegal autopsy to determine the cause of death. However, a number of unintentional discoveries from histological tests have been brought to light, and these have shown to be excellent resources for pathologists and forensic experts to learn from. Planning for public health and health services depends on the collection of mortality statistics, which is made possible by histopathological investigation.[5] After death, a thorough physical examination is carried out, and internal organs are visually and histologically inspected in order to determine the reason or manner of death. A forensic professional ascertains the cause of death by comparing the findings of the histopathological study.

Inflammation, infections, occupational diseases, and neoplastic tumours are common manifestations of lung pathology. Even if the lung lesion diagnosis is supported by the clinical history, laboratory tests, and radiographic examination, invasive biopsy for histological evaluation is sometimes necessary for confirmation and determining the prognosis of the lung lesion.[6] Rapid progression of disease and high cost of modern diagnotic techniques compile the practitioner under pressure. Finding the most common causes of death and the frequency of various lung abnormalities is essential for developing a preventive plan for prevention.[1,2]

Pathological examination (macro and microscopic): To examine the remaining parenchyma, it is helpful to make a horizontal cut through each lobe using a large-bladed knife, such as a brain knife, after the airways and veins have been dissected. The lung is laid flat on the dissecting board, medial side facing the board. To prevent accidental harm to the securing hand while slicing, a sponge might be placed over the exterior of the lobe to be cut.

Even in cases when no evident pathology is found, tissue samples ought to be obtained from each lung lobe. By using a technique of cutting certain tissue shapes for a specific spot, it becomes easier to identify where these blocks originated. Prior to processing and sectioning, the tissue blocks must be securely fastened and of the standard size, measuring roughly 3 x 2 x 0.4 cm. Any bulk or regions of interest that are found will require additional blocks to be taken. Recall that if there is surplus tissue, it is preferable to preserve and repair it at the postmortem stage.

Congestion (33.3%) and consolidation (24.0%) were the two most frequent gross findings. In the lung, the average age of congestion was 38.36 ± 14.53. The most prevalent age group, with a male preponderance, was 20–29 years old. In congestion cases, the male to female ratio was 2.3:1, whereas in consolidation cases, it was 11:1.

Pneumonitis (15.0%) was the most frequent histological finding, with pulmonary edoema (34.0%) being the most prevalent age group. The ratio of men to women was 3.25:1. In the lungs, there was a strong correlation between the histological and gross findings. P<0.0012. In our study common histopathological finding is in line with research conducted by Minal G *et al*.[7], P. Arunlatha et al.[8]

According to Pulak Chakma et al.[9], 10.56% of pneumonia patients were identified on histology; this figure is similar to 15.0% in our analysis. This percentage is consistent with findings from other research by Chauhan G et al.,[10] (14.62%), Fang *et al.*, 2004 (18%), and Nichols *et al.*, 2012 (12%). However, in contrast to the results of other studies, Hanmante *et al.*, 2014[22] detected pneumonia in 39%, Sumaya et al., 2020 in 33.9%, and Udayashankar *et al.*, [2] in 41.18% of the study population. General lung tissue inflammation is referred to as pneumonia.[1,2] Chest radiation therapy is one possible cause.[3] Pneumonitis and pneumonia can be differentiated by their respective causes and clinical manifestations. Pneumonia is defined as pneumonitis along with lung tissue consolidation and exudation as a result of microbial infection.[5] Prolonged inflammation, if left untreated, can cause irreversible harm, including lung fibrosis. Pneumonia-related mortality may be largely explained by host characteristics regardless of the significance of the aetiology and treatment. Granuloma frequency 3.0% was consistent with previous researches done by Sangma *et al.*, 2014, 1.68%, Kaur JK *et al.*, 2013, 1.6%, Theegarten *et al.*, 2006, 1.39%, and Pavic *et al.*, 2012, 1.8%. According to research by Theegarten *et al.*, 2006, Pavic *et al.*, 2012, and Sangma MM *et al.*, 2014 males were more susceptible to infection than females. The incidence of pulmonary tuberculosis was found in 6 of the 8 cases, with 2 of those cases occurring in the 60–70 age range. One study by Pulak Chakma et al. found 1.87% of participants had tuberculosis.[9] Emphysematous lesions were noted in 6.0% cases with deceased male only. It was found more commonly in the age group of 40-49 years. This was in accordance with the studies by Amin NS *et al.*, 2017 exhibiting 6.6% of cases with age goup 30-49 year.

Lung cancer is the most frequent cancer globally and the leading cause of cancer-related deaths annually. Its 8–16% 5 year survival rate is largely due to the disease's late onset of symptoms, which is incurable, but it is also partially caused by comorbidities that preclude curative therapy. Five year survival chances for lung cancer are significantly greater (up to 67%) when the disease is discovered early and is treatable with drastic measures such radical radiation and possibly curative surgery. Thus, a key strategy to enhance results should be the accurate identification of lung cancer at this earlier (often

asymptomatic) stage of the illness. As an inadvertent finding, four male autopsy cases (4.0%) with lung cancer ranging in age from 30 to 79 years were found. This was similar to research conducted over a 5-year period by P. Khare *et al.*, 2017 and Vaideeswar P *et al.*, 2022, which found that 19.7% of Mumbai, Maharashtra, residents had lung cancer. In neoplastic diseases, autopsies are crucial for accurately identifying the primary cancer sites, evaluating the behaviour of the disease, describing the harmful effects of novel treatment regimens, and determining the actual causes of death. All of these benefits will contribute to local, national, and worldwide research as well as the management of health care.

This study presents a variety of lung abnormalities that were either incidental or the direct cause of mortality and were verified by histopathology. Studying such lung abnormalities through autopsy can help develop preventive measures to lower mortality from lung pathology.

After poisoning, hanging is the second most common means of suicide in India. Suicide by hanging has become more common during the last 30 years, particularly among young individuals. A significant social, psychological, and financial burden is placed on our society by the fact that 71% of suicides in India occur in people under the age of 44. The National Crime Records Bureau study from 2012 states that throughout the decadal periods of 2003–2013, there were, on average, over one lakh suicides in India.

In the current study, 7.0 % cases of hanging were observed. Of the total cases, 57.1% belonged to the 30-39 age bracket. Premortem hanging was the cause of death, and gross findings in the lungs included congestion, petechial haemorrhages, and pulmonary edoema. The findings of this investigation were consistent with those of Chaudhari *et al.*[10] and Vijaykumar L *et al.*1 Suicidal hanging are happening more frequently every day. Effective and thorough programmes are needed to identify the relevant factors and stop suicide behaviours.

This study showed that macroscopic and histological findings are reliable and together can predict the method and cause of death in a reasonable number of medicolegal autopsy cases. Thus, it is necessary to emphasise both gross and microscopic.

Assessment of the range of gross features and subsequent microscopy are critical skills for a pathologist. Site of tissue taken from the organ determines the outcome. Hence, there is a no scope of overlooking the reprentative site from the organ. Unless until, there is a proper and sound training of forensic residents/doctors Let the pathologist must take the lead in this regard rather than to allow forensic expert to determine the site of tissue taken.

Conclusion

In most medicolegal autopsies, lung gross findings combined with histological characteristics can determine the cause and manner of death. Therefore, it is imperative to enhance the ability to evaluate both gross and histological findings.

References

1. ***Vijaykumar L.***
Suicide and its prevention: The urgent need in India. Indian J Psychiatry2007; 49: 81-4.
2. ***Udayashankar SK, Shashikala P, Kavita GU, Pruthvi D.***
Histomorphological pattern of lung in medicolegal autopsies. Internat J Sci Res. 2015; 4:1937–9
3. ***Singh D, Tiwari RC, Kumar A, Bhute AR, Meshram RP, Dikshit M, et al.***
A Comprehensive Review of Pathological Examination in Forensic Medicine: Past, Present, and Future. Cureus. 2022 Mar 1;14(3):e22740. doi: 10.7759/cureus.22740.
4. ***Narayan Reddy KS, Murty OP.***
33rd ed. Jaypee Brothers; 2014. The Essentials of Forensic Medicine and Toxicology.
5. ***Todorović MS, Mitrović S, Aleksandrić B, Mladjenović N, Matejić S.***
Association of pulmonary histopathological findings with toxicological findings in forensic autopsies of illicit drug users. Vojnosanit Pregl 2011 Aug;68(8):639-42.
6. ***Jameson JL, Kasper D, Hauser S, Longo D, Fauci A, Loscalzo J.***
Harrison's Principles of Internal Medicine. 19th ed. Vol. 2. Bhavnagar: Mc Graw Hill; 2015.
7. ***Minal G. Panchal, Rupali Giridhar Sonwane.***
Histopathological Study of MLC and Autopsy Cases in Our Hospital. Indian J Forensic Med Pathol. 2019;12(2):106-112
8. ***P. Arunalatha, A. Sangeetha & Nalli. R. Sumitra Devi.***
Spectrum of Histopathological Findings in Autopsies - Highlighting the Interesting and Incidental Findings. International Journal of Current Medical and Applied Sciences. 2017 July;15(2):61-66.
9. ***Pulak Chakma et al.***
Indian Journal of Forensic and Community Medicine, July-September 2017;4(3):189-194 191.
10. ***Chauhan G, Agrawal M, Thakkar N, Parghi B.***
Spectrum of histopathological lesions in lung autopsy. J Res Med Den Sci 2015; 3(2):109-12.

SUBSCRIPTION FORM

I want to renew/subscribe international class journal "**Indian Journal of Forensic Medicine and Pathology**" of Red Flower Publication Pvt. Ltd.

Subscription Rates:
• Institutional: **INR 17000 / USD 1328.13**

Name and complete address (in capitals):_____

_____

Payment detail:
Online payment link: http://rfppl.co.in/payment.php?mid=15

Cheque/DD: Please send the US dollar check from outside India and INR check from India made payable to 'Red Flower Publication Private Limited'. Drawn on Delhi branch.

Wire transfer/NEFT/RTGS:
Complete Bank Account No. 604320110000467
Beneficiary Name: Red Flower Publication Pvt. Ltd.
Bank & Branch Name: Bank of India; Mayur Vihar
MICR Code: 110013045
Branch Code: 6043
IFSC Code: BKID0006043 (used for RTGS and NEFT transactions)
Swift Code: BKIDINBBDOS

Term and condition for supply of journals
1. Advance payment required by Demand Draft payable to **Red Flower Publication Pvt. Ltd**. payable at **Delhi.**
2. Cancellation not allowed except for duplicate payment.
3. Agents allowed 12.5% discount.
4. Claim must be made within six months from issue date.

Mail all orders to
Subscription and Marketing Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi - 110 091(India)
Phone: 91-11-79695648
Cell: +91-9821671871
E-mail: sales@rfppl.co.in

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.6

Radiological Study of Pattern of Intracranial Haemorhages and Skull Fractures in Fatal Head Injury

Lohit Naik[1], Vishnu IV[2], Abraham Jobby[3]

How to cite this article:

Lohit Naik, Vishnu IV, Abraham Jobby. Radiological Study of Pattern of Intracranial Haemorhages and Skull Fractures in Fatal head Injury. Indian J Forensic Med Pathol.2024;17(2):109-111.

ABSTRACT

Background: India in last few years have grown in leaps and have undergone major economic and demographic transition coupled with increasing urbanization and motorization. Among the top ten causes of mortality in the country, Road traffic accidents was one among the tenth cause. But with the increasing urban expanse and lifestyle changes, it is projected that road traffic accidents will occupy the second position in the list of major killers among the causes of disease burden in this century. Road accidents are one of the leading cause of death globally and mainly occurs in the age group of 15 to 49 years.

Methods: This cross-sectional study was carried out in 120 cases being brought in the casualty of Travancore Medical College, Kollam, from July 2023to December 2023. A detailed data of sociodemographic profile, type of skull fractures and type of intracranial hemorrhages were noted.

Results: The maximum cases (30.9%) were in the age of 31-40 years (37 cases); followed by 31 cases (25.9%) from the age group 41-50years. The mean age of the patients was 33.24 (SD14.66) years. Linear fractures were the commonest type of skull fracture which were seen in 48 cases (40%), followed by comminuted fracture in 12 cases (10%) and depressed fracture in 2 cases (1.7%). Subdural hemorrhage was the commonest intracranial hemorrhage, seen in 58 cases (48.3%), followed by subarachnoid hemorrhage in 48 cases (40%).

Keywords: Skull fractures; Intracranial hemorrhages; Road traffic accident.

Author's Credentials: *[1,3]Professor, [2]Assistant Professor, Department of Forensic Medicine and Toxicology, Travancore Medical College, Quilon, Kerala, 691020, India.*

Corresponding Author: ***Vishnu IV,*** *Assistant Professor, Department of Forensic Medicine and Toxicology, Travancore Medical College, Quilon, Kerala, 691020, India.*

Email: *drvishnuvardaniv@gmail.com*

Received on: *28-02-2024*

Accepted on: *18-07-2024*

INTRODUCTION

India in last few years have grown in leaps and have undergone major economic and demographic transition coupled with increasing urbanization and motorization. Among the top ten causes of mortality in the country, Road traffic accidents was one among the tenth cause of mortality but with the increasing urban expanse

and lifestyle changes, it is projected that road traffic accidents will occupy the second position in the list of major killers among the causes of disease burden in this century. Road accidents are one of the leading cause of death globally and mainly occurs in the age group of 15 to 49 years. During the calendar year 2022, road crashes in India claimed about 1.68 lakh lives and caused injuries to more than 4.4 lakh people.[1] Among all the regional injuries, the injury to the head and neck are the most important in forensic practice which may or may not be representative of the extent of the internal injury as head injuries provide the major contribution of the death due to assaults, falls and transportation accidents. Road traffic injuries are the leading cause of traumatic brain injuries. CT scan is commonly used as the initial diagnostic tool to look for various kinds of lesions in cases of head injury and that CT scan might play an ever-increasing role in forensic neuro-traumatology, this study was carried out to analyse the significance of nature of injury, most common skull fracture involved and also the pattern of intracranial haemorrhages.

MATERIALS AND METHODS

This cross-sectional study was carried out in 120 cases of head injury followed by road traffic accidents being brought to the casualty of Travancore Medical College, Kollam, from July 2023 to December 2023. A detailed data of sociodemographic profile, CT study of skull fracture and type of hemorrhage were noted.

Statistical Analysis

The data was analyzed using SPSS software version 16. Descriptive statistics like mean and percentages were used to interpret the results. The chi-square test was applied and a p-value of 0.05 was considered as statistically significant.

RESULTS

A total of 120 cases were included in this study.

Table 1: Age wise distribution of study subjects

Age (Years)	Cases	Percentage
11-20	4	3.3
21-30	27	22.5
31-40	37	30.9
41-50	31	25.9
51-60	16	13.3
>60	5	4.1
Total	**120**	**100**

Out of 120 subjects enrolled into the study, maximum cases (37 Cases-30.9%) were in the age of 31-40 years, followed by 31 cases (25.9%) from the age group 41-50years. The mean age of the patients was 33.24 (SD14.66) years.

Table 2: Sex wise Distribution of study subjects

Sex	Cases	Percentage
Male	72	60
Female	48	40
Total	**120**	**100**

In our study, 72 cases (60%) were males and (40%) were females, males were more prone to head injuries in road traffic accidents since they are more into outdoor activities like driving vehicles, working outdoor posing them risk due to accidents. Females succumbed to road traffic accidents were mainly because they are being pillion riders and pedestrians.

Table 3: Distribution of Cases According to Types of Fractures of the Skull

Fracture	Cases	Percentage
Intact	57	47.5
Fissured	48	40
Comminuted	12	10
Diastatic	1	0.8
Depressed	2	1.7
Total	**120**	**100**

In our study, linear fractures were the commonest type of skull fracture which were seen in 48 cases (40%) followed by comminuted fracture in 12 cases (10%) and depressed fracture in 2 cases (1.7%). In 57 cases skull bone was intact without any fractures.

Table 4: Distribution of Cases According to Intracranial Haemorrhages

Intracranial Haemorrhages	Cases	Percentage
Subdural	58	48.3
Subarachnoid	48	40
Extradural	14	11.7
Intracerebral	7	5.8
Intraventricular	6	5
Brainstem	2	1.7

Subdural hemorrhage was the commonest intracranial hemorrhage seen in 58 cases (48.3%), followed by subarachnoid hemorrhage in 48 cases (40%), extradural hemorrhages were seen in 14 cases (11.7%), intra cerebral hemorrhage in 7 cases (5.8%), intraventricular hemorrhage in 6 cases (5%)

and brain stem hemorrhage in 2 cases (1.7%).

DISCUSSION

According to WHO estimates, young adults aged between 15 and 44 years account for 59% of global road traffic deaths and 77% of the victims are men.[2] The most vulnerable victims were in the 31-50 years age group and males were the most commonly involved in road traffic accidents which was consistent with the studies done by Kanchan T *et al*[3] and Goyal M *et al*[4] which concluded that the maximum cases were in the same age group and more common in male sex. Linear fracture or fissured fracture were the commonest type of skull fracture followed by comminuted fracture in rod traffic accidents which was in accordance with the study done by Rupani R *et al*[5] and Jacobsen *et al*[6] and this may be attributed to the fact that the mechanism of most road traffic accidents exposing the fronto-temporal region to risk of trauma than the parieto-occipital region. Subdural hemorrhage was the commonest intracranial hemorrhage encountered followed by subarachnoid hemorrhage which was in accordance with the study done by Jacobsen *et al*[6] and Kumar A *et al*[7] who concluded that the subdural hemorrhage was the commonest hemorrhage encountered in road traffic accidents.

CONCLUSION

From this study, we can conclude that Road traffic accidents causing head injury is the gravest risk to mankind in the coming years ahead due to urbanization for whichnational level registry should take appropriate steps to control the accidents and modifiable risk factors like use of helmet, no mobile usage while driving and strict traffic discipline should be maintained.

Funding: *No funding sources*

Conflict of interest: *None declared*

Ethical approval: The study was approved by the Institutional Ethics Committee

References

1. ***India: Road Accidents in India 2022.*** *Available from: URL: http://morth.nic.in/ writereaddata / mainlink File / File761. pdf. Accessed Jan 25, 2024.*
2. ***Internet source Road traffic injuries, Fact sheet N°358, March 2013.*** *Available from: URL: http://www.who. int/mediacentre/ factsheets /fs358/en. Accessed Jan 25, 2024.*
3. ***Kanchan T, Kulkarni V, Bakkannavar SM, Kumar N, Unnikrishnan B.*** *Analysis of fatal road traffic accidents in a coastal township of South India. J Forensic Leg Med. 2012 Nov;19(8):448-51.*
4. ***Goyal M, Verma R, Kochar S, Asawa S.*** *Correlation of CT Scan with Postmortem findings of Acute Head Trauma cases at SMS Hospital, Jaipur. J Indian Acad Forensic Med, 32(3):208- 211.*
5. ***Rupani R, Verma A, Rathore S.*** *Pattern of Skull Fractures in Cases of Head Injury by Blunt Force. JIAFM; Oct-Dec 2013: Vol-35, No- 4, 336- 338.*
6. ***Jacobsen C, Lynnerup N.*** *Cranial fracture caused by blunt trauma to the skull - A retrospective analysis of medico-legal autopsies in Denmark 1999-2004.*
7. ***Kumar A, Lalwani S, Agrawal D, Rautji R, Dogra R.*** *Fatal Road Traffic Accidents and Their Relationship with Head Injuries: An Epidemiological Survey of Five Years. Ind. J. Neurotrauma; 2008: Vol-5, No-2, 63-67.*

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.7

Pattern of Suicidal Deaths and Most Affected Section of Society during Covid-19 Pandemic Time in Bhopal Region

Drishti Patel[1], Ashish Jain[2], Sahajad Khilji[3], Rajendra Baraw[4]

How to cite this article:

Drishti Patel, Ashish Jain, Sahajad Khilji *et al*. Pattern of suicidal Deaths and Most Affected Section of Society during Covid-19 Pandemic time in Bhopal Region. Indian J Forensic Med Pathol.2024;17(2):113-120.

ABSTRACT

Globally, the COVID-19 pandemic presented previously unheard-of difficulties that affected a number of aspects of daily life. This study aims to illustrate the most impacted segments of the population during the COVID-19 pandemic and investigates the suicide trend in Madhya Pradesh's central area, providing insight into the possible effects of the crisis on mental health. India is a country with a large population and a wide range of socioeconomic backgrounds, and it has been severely affected by the pandemic. People's stress levels increased as a result of the nation's widespread lockdowns, economic downturns, pressure on the healthcare system, and social unrest. These elements have added to an increased psychological pressure, as have the worries of being sick, being alone, and losing loved ones. Anecdotal data and preliminary research point to a concerning spike in suicide rates in India during the pandemic. Frontline healthcare professionals, migrants, and vulnerable people are just a few of the demographic groups that have been affected. Aside from this the groups with the highest suicide rates are married people, lower middle economic class, nuclear families, jobless people, and students. Probable reason behind that according to our study is hopelessness and guilt of not able to meet family expectations due to unemployment or loss of job during covid era. Things get worse when stigma, lack of awareness, and restricted access to mental health resources are combined.

To create successful treatments and support networks, it is essential to comprehend the complex relationships that exist between the COVID-19 pandemic and suicide rates in India. To address the mental health issues brought on by the epidemic in India and other comparable settings, more study is needed to determine the long-term effects and create focused mitigation mechanisms. This research demonstrates the most impacted segment of the population and the suicide trends during the COVID-19 pandemic reported to the mortuary of a tertiary care center of central region of Madhya Pradesh.

Keywords: COVID-19; Suicide; Society; Pandemic; Post mortem.

Author's Credentials: *[1]Senior Resident, Department of Forensic Medicine and Toxicology, Atal Bihari Vajpayee Institute of Medical Sciences and Dr. Ram Manohar Lohia Hospital, New Delhi 110001, [2,4]Associate Professor, [3]Assistant Professor, Department of Forensic Medicine and Toxicology, Chirayu Medical College & Hospital, Bhopal 462030, Madhya Pradesh, India.*

Corresponding Author: ***Rajendra Baraw,*** *Associate Professor, Department of Forensic Medicine and Toxicology, Gandhi Medical College, Bhopal 462001, Madhya Pradesh, India.*

Email: *drrajendrabaraw@gmail.com*

Received on: *04-03-2024*

Accepted on: *01-07-2024*

Introduction

Suicide is not a recent phenomenon in human history; in fact, its roots may be found all the way back to the beginning of human civilization. Suicide is as old as mankind itself. Any animal can get sick and die, or being killed by another animal, but only humans have the capacity to kill themselves, as far as we know. It must have come to man's attention during his evolutionary process that he could commit suicide. That is the most intimate action one can take. In India, there are many different factors that are associated with suicide: low income, low literacy, unemployment, family violence, breakdown of the joint family system, unfulfilled romantic ideals, conflicts between generations, crop failure, rising cultivation costs, heavy debt, unhappy marriages, harassment from husbands and in-laws, dowry disputes, depression, physical illness that persists over time, alcoholism/drug addiction, and easy access to guns, Anticipated anxiety about not being able to handle things and fear of doing badly in class or on tests.

Suicide is a very common occurrence in today's world. In 2015, 828,000 people died by suicide around the world.[1] Suicides in India surged to 230,314 in 2016, accounting for 17% of all suicides worldwide. In both the 15–29 and 15–39 years age group, suicide was the most common cause of death.[2]

In India, over 46,000 suicides occurred in the 15–29 and 30–44 age ranges in 2012, accounting for about 34% of all suicides. In India the National crime research Bureau (NCRB), 2010, in their annual report on Incidence and Rate of Suicides during the Decade (2000-2010) have reported that, more than one lakh persons (1,34,599) in the country lost their lives by committing suicide during the year 2010.[3]

At 120 deaths per million populations, the rate of deaths by suicide across India in 2021 soared to the highest level ever recorded, rising 6.1% from the previous year, new data from National Crime Records Bureau (NCRB) shows, highlighting the toll the pandemic appears to have taken on the emotional well-being of Indians. In contrast, the trend in the rates of crime as well as accidental deaths has started moving towards pre-pandemic levels. Data shows that a total of 164,033 people died from suicide in 2021, an increase of 7.2% from 2020, when 153,052 people died from suicide, data shows. In 2019, this figure was around 139,000. At 120 deaths per million population, 2021 also saw the highest rate of deaths from suicide since 1967, the earliest year for which this data is available. The second highest rate of suicide ever reported in the country was in 2010, when it was 113.5 deaths per million population. The data also shows that those in the lowest income group (people earning less than ₹1 lakh per annum), who make up around two-thirds of deaths by suicide, registered the biggest increase in deaths by suicide in 2021. Among professions, people who are self-employed and those who are engaged as daily wagers registered the biggest increase in deaths by suicide, followed by salaried workers and students. To be sure, students had registered a much bigger increase than salaried persons in 2020. The increase in 2021 compared to 2019 is bigger among students than salaried persons. Among farmers of different kinds, deaths by suicide increased only among agricultural labourers, which was also the case in 2020. [4]

Recognizing the pattern of suicide in certain location not only aids in the early care of such cases, but also proposes implementing preventative actions at an earlier stage. Law enforcement officials are not the only ones responsible for preventing violence in our society; public health and other human care agencies can also help to avoid primary violence in order to minimize other main causes of illness and mortality. Death investigators must be familiar with the most typical scenario, risk factors, methodologies, and victims, as well as any potential problems.

Developing suicide prevention programs requires determining the cause(s) of suicide and the factor(s) that caused the suicidal behavior. In India, community based preventive programs must be established with an awareness of the region's economic and cultural norms, with a focus on primary and secondary prevention of factors linked to suicide risk. Help agencies in society should be enhanced to support persons in interpersonal crisis, and mechanisms to limit access to pesticides and other suicide techniques must be developed.

The view that suicide cannot be prevented is commonly held view among health professionals. In light of these facts, and the severity of the problem and the lack of recent data, the current study attempted to conduct a complete and detailed analysis of suicides in terms of many epidemiological factors.

Materials and Methods

A descriptive, observational, prospective study was conducted from January 2020 to September

2021, during the current COVID-19 Pandemic which includes first wave (March 2020 - Nov 2020) and second wave (Feb 2021 - May 2021) phase with the goal of looking into numerous epidemiological factors. Prior

approval from the ethical committee of Gandhi Medical College, Bhopal was undertaken. All established cases of suicidal deaths with prominent autopsy findings and relevant history, brought for autopsy, included in the study. Gender, age, marital status, living place, type of family, socioeconomic level, and co-morbidities problems were among the parameters included in the study. During the research period, 4478 cases were subjected to autopsy, with 686 of them being confirmed as suicidal deaths. All accompanying individuals and attendants in such situations were questioned for any relevant details that could be acquired regarding the motivation for suicide, any past medical or psychiatric history, or any prior attempts at suicide. Study aims to determine the overall number of suicides occurred throughout the time period, the sex ratio, and to know methods adopted to commit suicide. Data were collected and compiled in MS Excel 2021 and analyzed by SPSS software.

Result

The study revealed that during the period from January 2020 to September 2021 (21 months) a total of 686 cases were reported as suicidal deaths which were studied. Suicidal deaths constituted 15.3% of the total autopsies 4478 conducted during the study period in the department of forensic medicine and toxicology, Bhopal. Males predominated the study with the gender ratio of 2.2:1 showing that males are more prone to suicidal deaths. The maximum incidence of cases was seen in the third decade of life closely followed by fourth decade of life mainly younger age group was affected.

Data showed that there was an increased number of incidences of suicide during the months of April (25.7%), May (24.1%), and March (18.8%). This coincides with the time period of the 1st and 2nd waves of COVID-19 in India. The fewest incidences were noted during the month of September 2021, *i.e.* 1.5%. In present study majority of people committing suicide were belongs to lower middle socio-economic class. Majority of the deceased had education up to High school followed by those who had Immediate/Diploma Least proportion of deceased were postgraduates *i.e.*, 0.9%. In present study majority of deceased who committed suicide were living in nuclear family type 501 (73.03%), followed by joint family 148 (21.57%) and least number of them were those who were living alone 37 (5%). In present study majority of the cases that committed suicide were unemployed (67.6%), followed by students (19.5%), then followed by Farmers (3.8%), who were employed by private companies (3.8%), government employees (3.1%) and least proportion were labor (2.2%) by occupation. Maximum proportion of cases were married 490 (71.4%), followed by cases who were unmarried *i.e.*, 187 (27.3%). Least proportion was comprised by cases that were separated *i.e.*, 1(0.1%). Most common mode of committing suicide was hanging 306 (44.61%), followed by poisoning 283 (41.25%). Least proportion *i.e.*, 1 (0.15%) of deceased chooses firearms as mode of committing suicide. April was the month with a greater number of mortality cases. Majority of the deceased did not leave suicide note *i.e.*, 646 (94.16%). Majority proportion (80.6%) did not have any history of long-term illness. Main risk factors for committing suicide in males were unemployment followed by poverty/debt, exam pressure. Main risk factors for committing suicide in females were family problem, abuse, dowry issues. Love affair was equally seen in both genders.

Substance abuse, hopelessness, guilt, despair of life, panic attacks were most common symptoms associated with males which also shows statistical significance. The most common symptoms associated with females were emotional instability and regret to be born.

Discussion

Suicide is a serious public health concern, despite varying trends of increases or declines in suicide rates throughout the world. The present study was conducted over a period of 21 months from January 2020 to September 2021 to assess the load of suicide related deaths. Suicide has a wide range of reasons and conditions that are difficult to classify and categories. The common methods used in India include poisoning, hanging, and drowning. Others include leaping from a great height, jumping in front of a moving train, etc. Suicide trends vary greatly depending on period, place, age group, sex, and race.

In present study, the age group which is affected

Table 1: Distribution of cases according to age

Age (in years)	Frequency	Percentage
<10	7	1.0
11-20	134	19.5
21-30	243	35.3
31-40	160	23.3
41-50	68	9.9
51-60	50	7.3
61-70	13	1.9
71-80	10	1.5
81-90	3	0.4
TOTAL	**686**	**100.0**

Meanage ±SD of the cases instudy 32 ± 13.9

is mainly 21 to 30 years of age group and Mean age ± SD of the cases in study 32± 13.9. Highest proportions of cases 243 (35.3%) were in their third decade of life, implying that suicide is most common in younger age group, followed by people in their fourth decade of life 160 (23.3%). which is similar to other studies like Rastogi and kocher *et al.*,[5] SC Gupta[6] (Table 1) (Fig. 1).

In our study majority of cases were Male 472

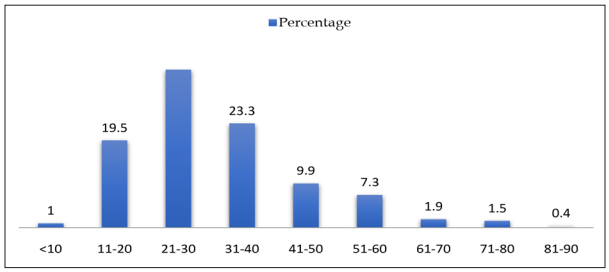

Fig. 1: Distribution of cases according to age

(68.6%) implying male have higher tendency to commit suicide. Female proportion was comparatively less *i.e.*, 214 (31.1%). This is similar to studies of Suneet *et al*[7], P.N. Suresh *et al.*[8] From the present study the highest proportion of deceased belong to lower middle socio economic class *i.e.*, 536 (78.13%), followed by Lower class 98 (14.29%) including both Lower class and Upper Lower class (Table 2) (Fig. 2).

Least proportion of deceased was from Upper-middle

Table 2: Distribution of deceased according to their Socio-economic status

SES	Frequency	Percentage
Lower class	50	7.29
Upper Lower	48	7.00
Lower middle	536	78.13
Upper Middle	23	3.35
High Class	29	4.23
Total	**686**	**100**

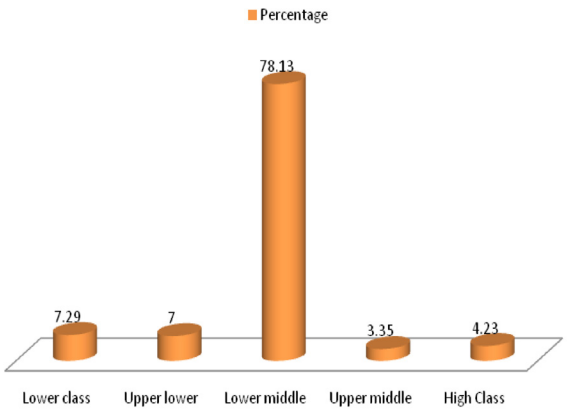

Fig. 2: Distribution of deceased according to their Socio-economic status

class *i.e.*, 23 (3.35%). The findings are different from studies like, Anil Rane *et al*[9], Sachidananda Mohanty *et al*[3] were highest proportion of deceased belong to lower socio-economic status. The socioeconomic disadvantage includes low income, unmanageable debt, lack of good housing conditions, lack of educational qualifications, unemployment, and living in a socioeconomically deprived area. In present study majority *i.e.*, 36.9% of the deceased had education up to High school followed by those who had Immediate/Diploma (24.1%). Least proportion of deceased were post graduates *i.e.*, 0.9%. The findings was identical with the studies done by Ashish Srivastava *et al*[10] and Sachidananda Mohanty *et al.*[3] Majority of deceased who committed suicide were living in nuclear family type 501 (73.03%), followed by joint family 148 (21.57%) and least number of them were those who were living alone 37 (5%) (Table 3) (Fig. 3).

Table 3: Distribution of cases according to the family type

Type of family	Frequency	Percentage
Joint	148	21.57
Nuclear	501	73.03
Single	37	5.39
Total	**686**	**100.00**

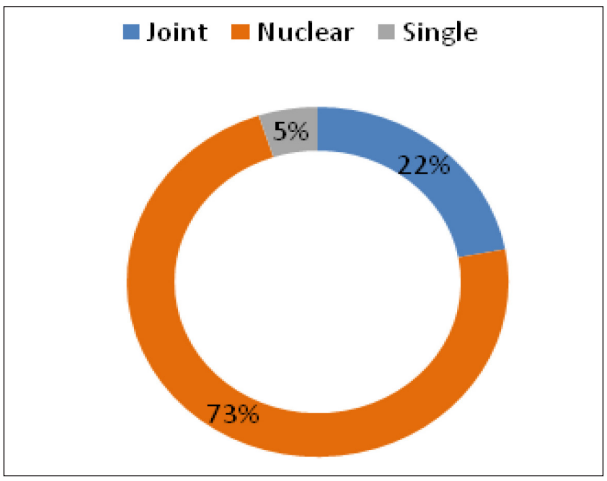

Fig. 3: Distribution of cases according to the family type

Majority of the cases that committed suicide were unemployed (67.6%), followed by students (19.5%), then followed by Farmers (3.8%), who were employed by private companies (3.8%), government employees (3.1%) and least proportion were labor (2.2%) by occupation (Table 4) (Fig 4).

Table 4: Proportional distribution according to Occupation.

Occupation	Frequency	Percentage
Unemployed	464	67.6
Student	134	19.5
Private	26	3.8
Government	21	3.1
Labor	15	2.2
Farmer	26	3.8
Total	**686**	**100.0**

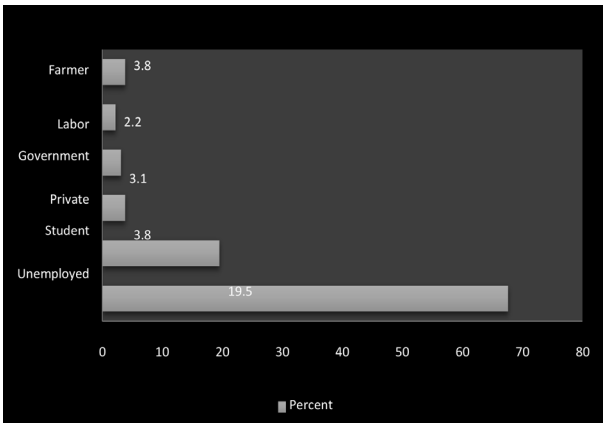

Fig. 4: Proportional distribution according to Occupation

Table 5: Distribution of cases according to means adopted for committing suicide

Means adopted for committing suicide	Frequency	Percentage
Burn	51	7.43
Poisoning	283	41.25
Hanging	306	44.61
Fall from Height	2	0.29
Firearm	1	0.15
Railway	31	4.52
Drowning	12	1.75
Total	**686**	**100.00**

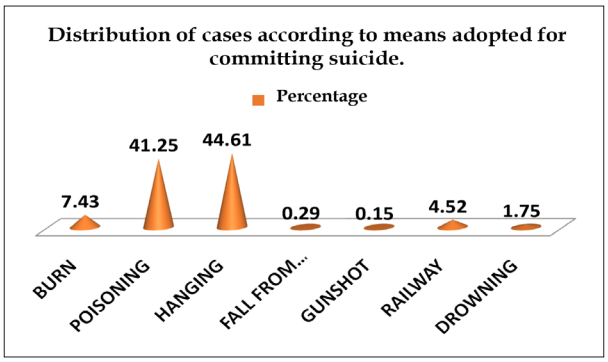

Fig. 5: Distribution of cases according to means adopted for committing suicide

My results are consistent with the studies done by Suneet *et al*[7], P.N. Suresh *et al*[8], Binaya K Bastia *et al*[11] in which unemployed males and students mainly commits suicide. Students mainly because of the stress of competitive exams nowadays and due to the rat race.

In my study maximum proportion of cases were married 490 (71.4%), followed by cases who were unmarried *i.e.*, 187 (27.3%). Least proportion was comprised by cases that were separated *i.e.*, 1 (0.1%). 490 cases out of 686 cases were married that is similar to studies conducted in other parts of India.[18,23,24] In Fatal deliberate self-harm married people outnumbered unmarried people in studies done by Rastogi *et al*[5], Suneet *et al*[7] , P.N. Suresh *et al*[8] Charan K Shetty *et al.*[12] According to study done by Binaya K Bastia *et al*[11] married females and unmarried males are more prone for suicide. The two main reasons for this are marital disharmony and financial burden. In western studies there is high incidence of suicide in unmarried people. According to our study highest proportion comprised of people who choose mode of committing suicide as hanging 306 (44.61%), which was closely followed by people who committed suicide by poisoning 283 (41.25%). Least proportion *i.e.*, 1 (0.15%) of deceased chooses firearms as mode of committing suicide (Table 5) (Fig. 5).

J Prasad *et al*[13], Anil Rane *et al*[9], Sachidananda Mohanty *et al.*[3] According to our study there was increased number of incidences of suicide during moths of April (25.7%), May (24.1%) and March (18.8%) this coincides with the time period of 1st and 2nd wave of Covid-19 in India. Least incidences were noted during the month of September *i.e.*, 1.5%. The COVID-19 epidemic has resulted in the imposition of severe restrictions that are having a significant impact on the global economy, including a rise in the global unemployment rate, and isolation. The month of April and May are post harvesting period and make it more prone for farmers and also exams in India are mainly held in these months. In our study cause of death due to unemployment (66.7% among males and 3.7% in females), poverty/debt (65.2% among males and 10.2% in females) and exam pressure (13.3% among males and 20.5% in females) were mainly seen in the males which shows statistically significant association. Family problems (14.6% among males and 44.8% in females), Victim of abuse (1.2% in males and 33.1% among females) and Dowry issues (0% males and 21.0% Females) were mainly the risk factors of suicide in Females that shows statistically significant association. (Table 6)

Table 6: Correlation between Gender and causes of suicide.

Cause of attempting suicide		Male	Female	Total	Chi-square	p-value
Unemployment	No	157	206	363	234.551a	.000*
	Yes	315	8	323		
Poverty/Debt	No	164	192	356	178.250a	.000*
	Yes	308	22	330		
Love affairs	No	431	192	623	.449a	.503
	Yes	41	22	63		
Family problems	No	403	118	521	73.715a	.000*
	Yes	69	96	165		
Victim of violence/abuse	NO	466	143	609	150.427a	.000*
	Yes	6	71	77		
Exam pressure	No	409	170	579	5.819a	.016*
	Yes	63	44	107		
Dowry issues	No	472	169	641	106.220a	.000*
	Yes	0	45	45		

*p-value<0.05 shows statistical significance.

Table 7: correlation between Gender and symptoms of deceased before committing suicide

Symptoms		Male	Female	Total	Chi square	p-value
Substance abuse	No	332	214	546	79.750a	.000*
	Yes	140	0	140		
Hopelessness	No	93	212	305	375.561a	.000*
	Yes	379	2	381		
Emotional instability	No	472	98	570	307.918a	.000*
	Yes	0	116	116		
Guilt	No	124	212	336	312.224a	.000*
	Yes	348	2	350		
Panic attacks	No	438	214	652	16.219a	.000*
	Yes	34	0	34		
Isolation	No	262	130	392	1.650a	0.199
	Yes	210	84	294		
Talking about dying	No	424	196	620	.524a	0.469
	Yes	48	18	66		
Despair with life	No	253	148	401	14.674a	.000*
	Yes	219	66	285		
Self-criticism	No	417	183	600	1.078a	0.299
	Yes	55	31	86		
Regret about being born	No	419	157	576	25.959a	.000*
	Yes	53	57	110		

Whereas, love affair was equally seen in both genders hence do not show any statistical significance. Unemployment is main reason in males for suicide this is similar to study done by Binya K Bastia *et al*.[11] Intense competition among school children, high expectation from parents and teachers, and inability to attain their goals are the main reasons for such suicides.[14] It may be due to ignorance of parents related to the problems of their child or may be due to lack of good communication with their children.

According to our study we found there is substance abuse (29.6% among males and 0% in females), hopelessness (80.2% among males and 0.9% in females), guilt (73.7% among males and 0.9% in females), panic attack (7.2% among males and 0% in females) and despair with life (46.3% among males and 30.8% in females) was the most common symptoms associated with males which also shows statistical significance. The most common symptoms associated with females were emotional instability (0% males and 54.2% among females) and regret to be born (11.2% among males and 26.6% in females).Whereas symptoms like isolation, self-criticism and talking about dying was equally seen in both the genders (Table 7).

Substance abuse is a slow methods and chronic method of self-intoxication and suicide. Substance abusers want to escape the reality. Drug abuse and drinking is more in males mainly because it is considered as male masculinity in our society. It is looked like a masculine role coping mechanism.

Conclusion

A significant percentage of the population in developing countries like ours works as a daily wage worker or farmers. This group of people is particularly affected by the pandemic, and living in a nuclear family without family support is even worse. Unemployed people, married people, farmers, and students are the groups that commit suicide at higher rates. In the hypothetical case scenario, these factors are all connected.

Unemployed (No earning source)/Farmers---> Married people (Burden of responsibility)---> Nuclear Family (No side support of other family members)--->Leads to hopelessness and guilt.

Reducing the number of such tragic deaths would be a major step towards a healthy society, as would having a sense of social responsibility and empathy towards understanding the mental makeup of such people, especially those who are known to the family, close friends, and society at large to be struggling from such a disease. Suicide is regarded as a public health concern that needs to be addressed right away in terms of prevention and more research into the psychological and social elements. Suicide prevention multisite intervention research on suicidal behavior (SUPRE-MISS) conducted by the World Health Organization (WHO) has shown that it is possible to prevent suicidal behavior and reduce the number of suicide deaths by utilizing a rapid, low-cost intervention in developing countries. Suicide prevention initiatives ought to be complex, given the complexity of the suicide problem. Collaboration, coordination, cooperation, and commitment are needed to create and carry out a national plan that is affordable, appropriate, and pertinent to community needs. In India, preventing suicide is not so much a mental health norm as it is a social and public health objective.

Funding: ***No funding sources***

Conflict of interest: ***None declared***

Ethical approval: The study was approved by the Institutional Ethics Committee

Reference

1. ***Wang H, Naghavi M, Allen C, Barber RM, Bhutta ZA, Carter A, Casey DC,Charlson FJ, Chen AZ,Coates MM,Coggeshall M.***
Global, regional, and national life expectancy, all-cause mortality, and cause-specificmortality for 249 causes of death,1980–2015:a systematic analysis for the Global Burden of Disease Study 2015. The lancet. 2016 Oct 8;388 (10053):1459-544.

2. ***Dandona R, Kumar GA, Dhaliwal RS, Naghavi M, Vos T, Shukla DK, Vijayakumar L, Gururaj G, Thakur JS, Ambekar A, Sagar R.***
Gender differentials and state variations in suicide deaths in India: the Global Burden of Disease Study 1990–2016. The Lancet Public Health. 2018 Oct 1;3(10):e478-89.

3. ***Mohanty S, Sahu G, Mohanty MK, Patnaik M.***
Suicide in India–A four year retrospective study. Journal of forensic and legal medicine. 2007 May1;14(4):185-9.

4. *Deaths by suicide at their highest rate in 2021, shows NCRB data, https://www.hindustantimes.com/india-news/suicide-rate-soars-to-highest-ever-in-2021-crimes-accidents-close-in-on-2019-levels-101661711716349.html*

5. ***Pooja R, Kochar SR.***
Suicide in youth: Shifting paradigm. Governing Council 2010-2012. 2010 Jan;32:45.

6. ***Gupta SC, Singh H.***
Psychiatric illness in suicide attempters. Indian journal of psychiatry.1981Jan;23(1):69.

7. ***Upadhyaya SK, Nijhawan M, Sharma DK.***
Study of Sociodemographicand Family Factors in Suicide Attempters in Kota. Journal of MedicalScienceandResearch.2012;3(1):6.

8. ***Kumar PS.***

Ananalysis of suicide attempters versus completers in Kerala.Indian journal of psychiatry.2004Apr;46(2):144.

9. ***Anil RA, Nadkarni A.***
Suicide in India: a systematic review. Shanghai archives of psychiatry. 2014Apr;26(2):69.

10. ***Srivastava A.***
Psychological attributes and socio-demographic profile of hundred completed suicide victims in the state of Goa, India. Indian journal of psychiatry. 2013 Jul;55(3):268.

11. ***Bastia BK, Kar N.***
A psychological autopsy study of suicidal hangingfrom Cuttack, India:Focus on stressful life situations. Archives of Suicide Research.2009 Jan 9;13(1):100-4.

12. ***Shetty CK.***
Suicide cases in Manipal, South India: an autopsy study. Int J Forensic Sci Pathol. 2014 Aug 19;2(7):50-6.

13. ***Prasad J, AbrahamVJ, Minz S, Abraham S, Joseph A, Muliyil JP, George K, Jacob KS.***
Rates and factors associated with suicide in Kaniyambadi block, Tamil Nadu, South India, 2000–2002. International Journal of Social Psychiatry. 2006 Jan;52(1):65-71.

14. ***Vijaya kumari N.***
Suicidal hanging: a prospective study. Journal of Indian Academy of Forensic Medicine.2011;33(4):353-5.

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.8

A Retrospective Study on Profile of Death due to Poison

Haresh J. Parmar[1], Rahul A. Mehta[2], Viral K. Chaniyara[3], Kuldip N. Teraiya[4]

How to cite this article:

Haresh J. Parmar, Rahul A. Mehta, Viral K. Chaniyara *et al*. A Retrospective Study on Profile of Death due to Poison. Indian J Forensic Med Pathol.2024;17(2):121-124.

ABSTRACT

Death due to poisoning is one of the commonest medico-legal cases encountered by forensic experts. Committing suicide by ingestion of poison is one of the common method adopted. So in order to know the burden of this, a retrospective study was carried out in Forensic Medicine and Toxicology Department, Shri M P Shah Government Medical College and Guru Gobindsingh Government Hospital, Jamnagar. Study was conducted for 1 year from December 2021 to January 2021. The data is collected by analysing various epidemiological parameters. According to this study, 168 people died due to poisoning out of 1062 autopsy performed in the Forensic Medicine and Toxicology Department, Jamnagar. Male predominance is seen in this study which includes 63.09% male and 36.91% female. Organophosphorus compound was main compound followed by Aluminium phosphide for death due to poison. And among this 88.09% was suicidal in nature. Death due poisoning is a major public health related issue. Death due the poisoning is a partially preventable situation. Therefore by proper identification and knowledge of trend of the poisoning, early management can be given to prevent morbidity and mortality.

Keywords: Poison; Suicide; Male Predominance; Epidemiological parameters.

Introduction

More than 2/3rd of the Indians are connected to agriculture field and there is widely use of pesticides, insecticide and rodenticide compound throughout the whole country and this components are cheaper in rates.[1] Therefore due to easy availability and cheaper rates of this compounds people often use this compounds to commit suicide.

Poisoning is one of the most common method adopted to commit suicide worldwide and in the India only second to hanging. As per NCRB (National Crime Reports Bureau) report 2021, the incidence of the death due to poisoning is 25% in 2020 which is 38,336 in number of death. And 25.1% in 2021 which is 41,197 in number.[2] According WHO (World Health Organisation) approximately 20% of all suicide are the result of ingestion of pesticides, particularly in rural agriculture region of the world.[3]

Poisoning can be suicidal, accidental and homicidal. Suicidal nature is more common than the accidental and homicidal. There are various

Author's Credentials: *[1,3,4]Resident Doctor, [2]Associate Professor & HOD, Department of Forensic Medicine, Shri M. P. Shah Government Medical College, Jamnagar, Gujarat 361008, India.*

Corresponding Author: ***Kuldip N. Teraiya,*** *Resident Doctor, Department of Forensic Medicine, Shri M. P. Shah Government Medical College, Jamnagar, Gujarat 361008, India.*

Email: *phj8198055@gmail.com*

Received on: *03-04-2024*

Accepted on: *29-06-2024*

factors affecting poisoning like age, sex, religion, culture, availability of substance, socio-economic status, education and mental status of particular person. Accidental poisoning commonly occurs in factory worker and farmers during their work in the field.

Mode of poisoning and the profile of poisoning is different in different regions of the world. Thus to know for the specific profile of the poisoning in specific region of the world is the demand of society for wellbeing of society and people. This problem of poisoning cannot be fully controlled by advanced medicine and awareness of people about it. However data of profile of poisoning of particular region can be useful for the strengthening of the health care system and infrastructure for administrative purpose to make preventive strategy and policies.

Aims and Objectives

This Retrospective Study on Profile of Death due to Poison is carried out with aim to find out the trend of poisoning and considering various factor affecting it. Proper identification of poison and knowledge of trend of poisoning is useful to give early management and to lower the morbidity and mortality by using proper administrative policies.

Materials and Methods

This Retrospective study was conducted in the Forensic Medicine and Toxicology Department, Shri M P Shah Government Medical College and Guru Gobindsingh Government Hospital, Jamnagar. All the cases brought to the mortuary of Guru Gobindsingh Government Hospital, Jamnagar for the post mortem examination with alleged history of poisoning and post mortem finding suggestive of poisoning are included in this study. This study was conducted for 1 year period of December 2021 to January 2021.

All the data are obtained from the post mortem examination report, crime scene report, requesting letter of police for post mortem examination, marnottar letter and forensic science laboratory reports. All the data like age, sex, religion, culture, availability of substance, socio-economic status, education and mental status of particular person was studied, analysed and plotted in the table and figure to compare with the studies of the other authors.

Result and Observations

Total no of 168 poisoning cases are studied in this study out of total 1062 autopsied performed in the Forensic Medicine and Toxicology Department, Shri MP Shah Government Medical College, Jamnagar during 1 year period from December 2021 to January 2021.

Out of 168 cases of poisoning 106 cases (63.09% of total cases) were male out of it 86 were married (Fig. 1).

Male female ratio was 1.71:1. Most commonly involved age group was 21- 30 years which is 25.60% of total cases followed by 31-40 age group which is 22.62% of total cases (Table 1). Study shows out of total cases 139 cases were from Hindu religion (Fig 2).

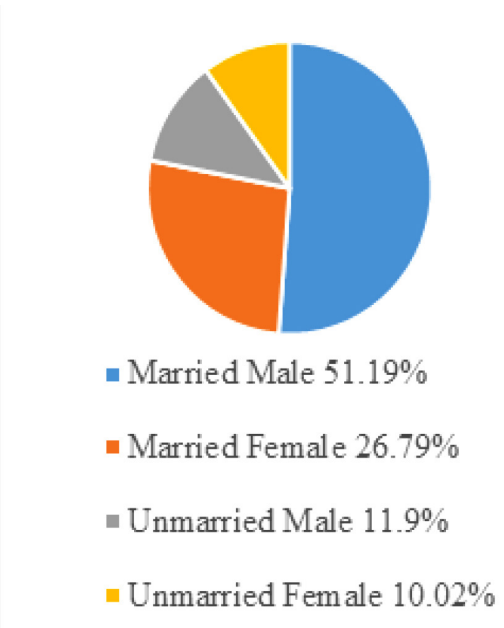

Fig. 1: Gender and Marital Status

The commonest manner of death observe was suicidal in nature which were 148 cases (88.10% of total cases) followed by accidental which were 19 cases (11.31% of

Table 1: Age wise distribution

Age	No. of cases
1- 20 years	21
21-30 years	43
31-40 years	38
41-50 years	23
51-60 years	21
Above 60 years	22
Total no. of cases	**168**

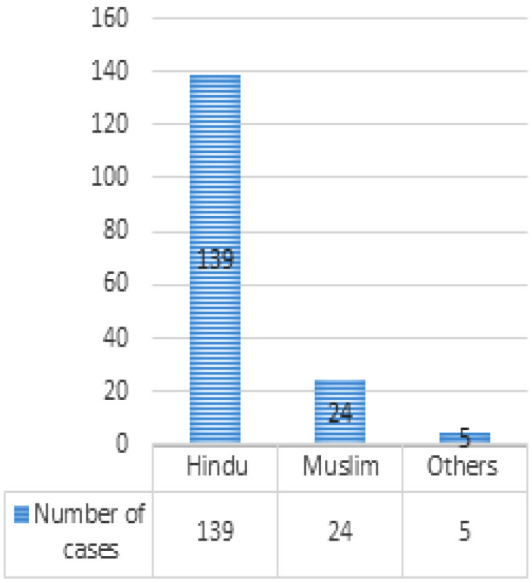

Fig 2: Religion wise distribution

total cases). Among accidental cases 11 deaths was due to snake venom, rest 8 cases was due to accidental exposure or consumption of poisonous compound. There was one case of alleged homicide (Fig. 3).

This study with help of the forensic science laboratory report revealed organophosphorus compound is most common poison involved for death due to poisoning

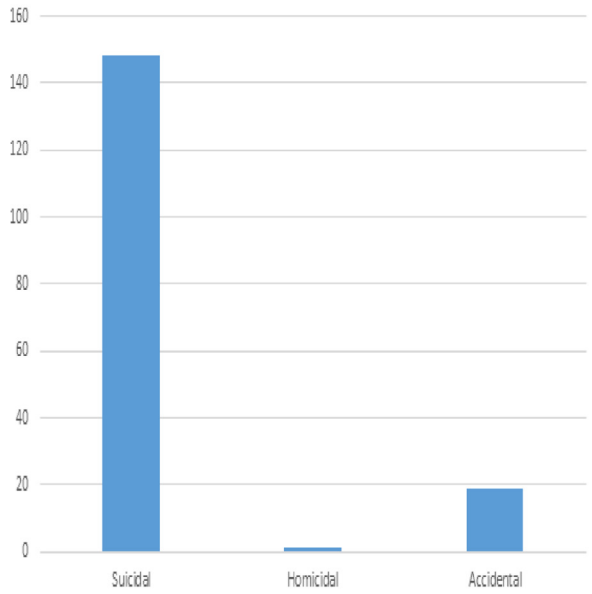

Fig 3: Manner of Death

which accounted for 91 cases (54.17% of total cases). Followed by aluminium phosphide – 20 cases (11.90% of total cases) then acid poisoning which is 19 cases (11.31% of total cases) (Table 2).

Table 2: Type of Poison used

Poisonous compound	No. of cases
Organophosphorus	91
Aluminium Phosphide	20
Organocloride	7
Acid	19
Snake Venom	11
Sleeping Pill	1
Alcohol	1
Phenol	2
Others	4
Undetected	12
Total No. Cases	**168**

Among 148 suicide cases 43 cases (25.60% of total suicide cases) were due to financial crisis followed by marital or family conflict which is 39 case (23.21% of total suicide cases). Reasons for committing suicide for 27 case (18.24% of total suicide cases) was not known (Table 3).

Table 3: Reasons for Suicide

Reasons	No. of Suicide
Financial	43
Marital/Family Conflict	39
Health Issues	25
Love Failure	9
Educational Issues	5
Not Known	27
Total No. of Suicide	**148**

Discussion

This study was carried out with aim to know profile of poisoning which include; chemical compounds responsible for death due to poisoning, common age group involved, reason for committing suicide and manner of death due to poisoning.

Present study shows male predominance as 63.09% of total cases of death due to poisoning involves male. Male predominance found in this study shows similarity with other study done by other authors.[4-8]

Most common age group involve in this study was

21-30 years followed by 31-40 years which is similar with other studies.[4-9] 131 victim out of total cases were married which is similar with other author's study.[9,10]

Maximum cases showed suicidal manner of poisoning which is 88.01% of total cases which is similar with other study.[4,5,7,9,10] Financial issues were most common reason for the suicide was observed in this study which is similar with study of author K. S. Lad et al.[7] In this study there was 19 accidental cases which includes 11 cases of snake bite.

The forensic science laboratory report revealed most commonly used compound was organophosphorus which is accounted for death of 91 victims. This result shows similarity with other study.[4,7,9,10]

Conclusion

Jamnagar region has a large rural area and as many of people are doing agriculture works. There is widely use of insecticides, fungicides and pesticides which commonly has organophosphorus compound. Due to easily availability, cheaper in rate, lower literacy and stressful life people uses this chemical compound to commit suicide. Young adults and married are commonly victims of the suicide maybe be because of financial crisis, commitments, familial conflict and career stress. Poisoning is preventable health related issue. Patient with history of suicide attempt should undergo counselling and psychiatrist therapy to prevent future attempt.

Therefore proper guidance, proper awareness and precaution about the usage of pesticides, use of safety kit and personal hygiene can minimize the risk of accidental poisoning. Specific trend of poisoning in specific area should be used to strengthen the health services which will help to give early management and minimize the morbidity and mortality due to effect of poisoning.

References

1. ***Aaron R, Joseph A, Abraham S, Muliyil J, George K, Prasad J et al.*** *Suicides in young people in rural southern India. Lancet. 2004; 363: 1117-1118.*
2. *Accidental Deaths & Suicides in India 2021 (online). [cited in NOV 2021]: Available from: https://ncrb.gov.in/sites/default/files/ADSI-2021/adsi2021_Chapter-2-Suicides.pdf*
3. ***World Health Organisation.*** *Suicide: key facts. Geneva: World Health Organisation; 2021 [cited 2021 July 20]. Available from: https://www.who.int/news-room/fact-sheets/detail/suicide*
4. ***V Saxena, DK Atal, S Das.*** *Retrospective analysis of pattern of poisoning in uttarakhand, JIAFM, 2014; 36(3), 230-233.*
5. ***Siddaramanna T C, Dileep KR, Rudramurthy S.*** *Deaths due to Organophosphorus Poisoning – A Retrospective Study, JIAFM, 2016; 38(3), 278-279.*
6. ***CK Pawar, G Rai, A Chanana et al.*** *analysis of deaths due to poisoning: A two year Retrospective study, JIAFM, 2017; 39(3), 298-302.*
7. ***K. S. Lad, V. C. Patel, P Parmar.*** *Profile study of organophosphorus poisoning at valsad: A 2 year Study, JIAFM, 2017; 39(3), 235-238.*
8. ***Siddamsetty AK, Kumar A, Aggarwal NK, Kumar A.*** *Poisoning death trends in North east Delhi- A retrospective study, JIAFM, 2016; 38(2), 213-216.*
9. ***DD Barman, VK Nair. G, R. Karnaboopathy.*** *Study of the trend of Poisoning in a Tertiary care hospital in Chidambaram, Tamilnadu, JIAFM, 2017; 39(1), 20-24.*
10. ***S Ninave, S Patond, S Verma, S Ninave.*** *Profile of deaths due to poisoning at tertiary care hospital of central India,JIAFM, 2020; 42(4), 288-291.*

ORIGINAL ARTICLE

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.9

Spectrum of Pathology in Neonatal Deaths: An Autopsy Study

Swati R. Ingale[1], Varsha O. Bhatia[2], Harish S. Tatya[3], Kalpana K. Kulkarni[4]

How to cite this article:

Swati R. Ingale, Varsha O. Bhatia, Harish S. Tatya *et al*. Spectrum of Pathology in Neonatal Deaths: An Autopsy Study. Indian J Forensic Med Pathol.2024;17(2):125-128

ABSTRACT

Background: The neonatal period (<28 days) is most vulnerable for child survival. Globally among all the deaths under five years in 2018, 47% are neonatal deaths. Most of these deaths are due to preventable and treatable causes like infections and intra-partum injury. It is important to understand underlying causes of neonatal death. The role of autopsy is very crucial in establishing the facts about death which helps to plan national and global health strategies.

Aims: To evaluate the spectrum of neonatal pathology, estimate frequency of neonatal pathology and to address the most common neonatal pathology.

Material and Methods: A retrospective observational study of neonatal medicolegal autopsy cases received from January 2022 to December 2022 in autopsy section at Tertiary health care centre, Pune. Gross and microscopic examination was done. All the results were tabulated and analysed.

Results: 93 cases were studied, out of which 73 early neonates (<= 7 days), 20 late neonates (>7 days), M:F = 1.06:1. The most common cause of death was lung pathology 96.7% cases, pulmonary haemorrhage (24.44%) and meconium aspiration (24.44%) were predominant lesion, pulmonary oedema (17.77%) and pneumonia (15.55%). Central nervous system (CNS) manifestations 10.75% and Liver Pathology 6.45%. Rare pathologies include Congenital Heart Disease (1.07%) and Renal pathology (1.07%).

Conclusions: It is vital to study the spectrum of histopathological features in neonatal deaths as it provides adequate diagnosis which helps to plan appropriate resource and management strategies in tertiary health care centre.

Keywords: Neonates; Lung pathology; Haemorrhage.

INTRODUCTION

The neonatal period that is first 28 days of life is most vulnerable time for child survival.[1] Globally among all the deaths under five years in 2018, 47% are neonatal deaths.[2-3] India accounted for largest number of under 5 years deaths around 0.9 million in 2018 and 55% of these were neonatal deaths. Government of India adopted a target of less than 10 neonatal deaths per 1000 live birth by 2030 to achieve global Sustainable Development Goal (SDG) target as a part of India newborn action plan (INAP).[4] Most of these deaths are due to preventable and treatable causes like infections and intra-partum injury.[5,6] It is important to understand trends in neonatal mortality and underlying causes of neonatal death. The role of autopsy is very crucial in establishing the facts about death which helps to plan national and global health strategies.[7-8] The purpose of this study is to evaluate the spectrum of neonatal pathology, estimate frequency of various neonatal pathology and to address

Author's Credentials: *[1]Junior Resident, [2,3]Assistant Professor, [4]Associate Professor, Department of Pathology, B. J. Medical College Pune 411001, Maharashtra, India.*

Corresponding Author: ***Varsha Bhatia O,*** *Assistant Professor, Pathology, B. J. Medical College Pune 411001, Maharashtra, India.*

Email: *drvarshabhatia@gmail.com*

Received on: *26-03-2024* ***Accepted on:*** *01-07-2024*

the most common neonatal pathology.

MATERIALS AND METHODS

We carried out a retrospective observational study at tertiary health care centre from January 2022 to December 2022. A total number of 93 neonatal medicolegal autopsy cases received in autopsy section were included in this study. Gross examination was done and histopathological examination done on H & E stain by two pathologists and reviewed. All the results were tabulated and analysed.

RESULTS

Total 93 cases were studied, out of which 73 were early neonates (<= 7 days) and 20 were late neonates (>7 days). Male deaths exceed female deaths with Male to Female ratio was 1.06:1.

The most common cause of death was seen in lung in 96.7% cases of which pulmonary haemorrhage and meconium aspiration were predominant lesion in 24.44% cases followed by pulmonary oedema-17.77% and pneumonia-15.55%. CNS manifestations were seen in 10.75% (meningitis & subarachnoid haemorrhage) and Liver Pathology was seen in 6.45% cases. Congenital malformations were seen in 2.14% cases, which mainly involve Cardiovascular System (CVS) like Congenital Heart Disease (1.07%) and Renal system (1.07%).

Note: *Figures do not match as many cases had multiple organ involvement.*

Table 1: Age and Sex wise distribution of cases

Early	Neonate Late	Neonate	Total
Male	38	10	48
Female	35	10	45
Total	73	20	93

Table 2: System wise distribution of Neonatal Pathology. (N=93)

No. of cases		Percentage
Pulmonary Pathology	90	96.7%
CNS Pathology	10	10.75%
Liver Pathology	06	6.45%
CVS Pathology	01	1.07%
Renal Pathology	01	1.07%
Other (Prematurity)	04	4.30%

In present study, delivery history is available in 30 cases, out of which 18 were home delivery and 12 were hospital delivery which indicates poor utilization of health facilities during antenatal and peripartum period. Extramedullary haematopoiesis present in 30 cases. Multiple organ involvements were seen in many cases.

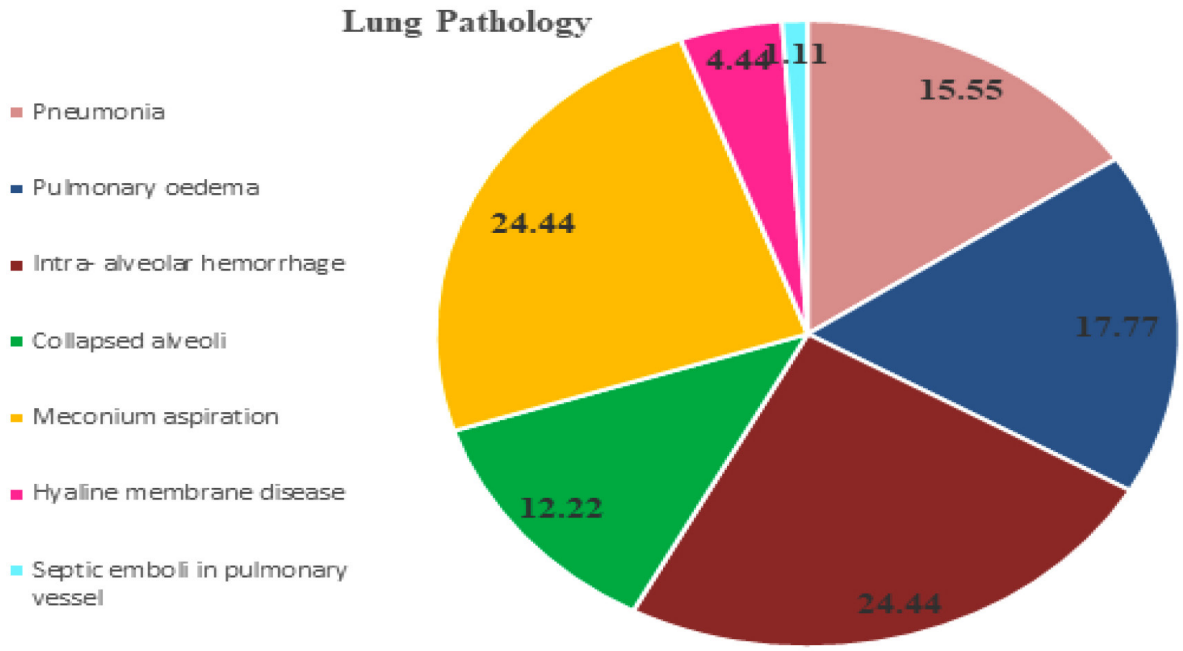

Fig. 1: Spectrum of Pulmonary Pathology in (%)

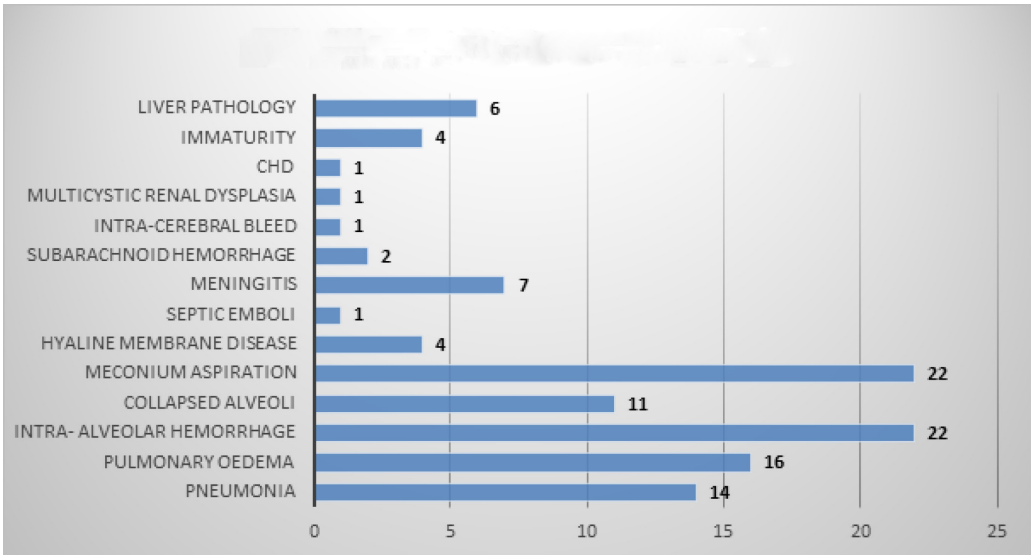

Fig 2: Spectrum of Neonatal Pathology in (Numbers)

DISCUSSION

The Neonatal period that is <28 days of life is most critical for survival. Neonate carries highest risk of death, most of these deaths are due to infections and intrapartum injury which can be prevented with early identification and timely appropriate interventions. It is important to understand underlying causes of neonatal death and autopsy plays a valuable role in establishing the facts about death which helps to plan national and global health strategies.

In present study early neonatal deaths were seen in approximately 80% cases, majority of these deaths occurred in first 48 hours after delivery. This finding correlates with WHO report[9] that newborns face highest risk of death during neonatal period and many of these deaths occur in first week of life. These findings suggest that focussing on antenatal care and postnatal care immediately following birth is crucial for saving more newborn lives. This study found that neonatal deaths were more common in male than females. Male accounted for 52% of neonatal deaths which correlates with study done by Kurdukar M.D *et al*[10] and similar findings also documented in some other studies, stating biological difference might be possible factor for this gender variation in neonatal deaths.[11]

In this study, pulmonary pathology was the commonest autopsy finding in neonatal deaths. These pulmonary lesions varied with intra-alveolar haemorrhage (IAH) and Meconium aspiration being the commonest lesion each found in 24.44% cases. This finding correlates with study done by Grace D'costa *et al*.[8] IAH ranged from focal to diffuse lesion. Pulmonary oedema (17.77%) and pneumonia (15.55%) were the second most common findings observed in present study, which is comparable with the study done by Odejimi *et al*.[5] Most of these pulmonary lesions occur as a manifestation of obstetric complications. This highlights the need to strengthen the obstetric care. Scrupulous perinatal care will help in reducing neonatal deaths due to these causes.

CNS pathology was found in 10.75% cases of which meningitis was predominant lesion seen in 7% cases, majority of them were bacterial meningitis. This finding correlates with study done by Odejimi *et al*[5] and Kurdukar M.D *et al*.[10] Acute bacterial meningitis may lead to sudden unexpected death particularly in neonates following exposure to pathogen in birth canal or amniotic fluid. Prematurity, prolonged rupture of membranes and very low birth weight are risk factors for neonatal meningitis. Early diagnosis and timely management with appropriate antibiotic therapy help to improve clinical outcomes of neonatal meningitis. Two cases of subarachnoid haemorrhage and one case of intracerebral bleed were seen.

Liver pathology was found in 6.45% cases which includes 5 cases of fatty change and 1 case of hepatocyte necrosis. Fatty change commonly seen incidentally at autopsy and it may occur secondary to sepsis, on exposure to drugs or following total parenteral nutrition.[12] Hepatocyte necrosis may be confused with autolysis. However, in hepatocyte necrosis there is patchy loss whereas diffuse loss often seen in autolyzed tissue. Extramedullary haematopoiesis (EMH) was present in 30 cases. EMH is a common incidental finding in the liver of neonates and is often seen with increased physiologic stress.[13]

This study found congenital malformations in the newborns in 2.14% of the cases which correlates with the study done by Chaturvedi P.[14] The incidence of congenital malformations reported in other studies from different parts of India is varies from 0.3% to 3.6%.[15-16] The systems involved in congenital malformations in present study were Cardiovascular system (CVS) and Renal system with congenital heart disease (1.07%) and Multicystic Renal dysplasia (1.07%) seen respectively. The neonatal autopsy plays vital role in identification and confirmation of congenital malformations and provide valuable information to clinician which help them for genetic counselling of the parents and to prevent these malformations in successive pregnancies.

In present study, delivery history is available in 30 cases, where majority of women were delivered at home which indicates poor utilization of health facilities during antenatal and peripartum period. This highlights the need to educate pregnant females to access the specialized care for the newborn as required.

Overall, neonatal infections (pneumonia/ meningitis) and intrapartum injury were the leading causes of neonatal deaths. Similar findings were reported in other studies.[17-18] This highlights need to promote antenatal care services (ANC) and postnatal care services (PNC) as a strategy to reduce neonatal deaths.

This study had certain limitations as there was lack of adequate clinical details, it was difficult to find out the concordance between antemortem and post-mortem diagnosis. Hence the police authorities and ancillary health care workers should also be trained for verbal autopsy.[18]

CONCLUSION

Despite of the recent advances in clinical care and imaging studies, it is vital to study the spectrum of histopathological features in neonatal deaths as it provides adequate diagnosis which helps to plan appropriate resources and management strategies in tertiary health care centre.

REFERENCES

1. ***World Health Organization. World health statistics 2020.***
2. *UNICEF, World Health Organization, World Bank Group, UN Population Division. Levels and trends in child mortality: Report 2019.*
3. ***World Health Organization, UNICEF.*** *Ending preventable newborn deaths and still births by 2030.*
4. *Ministry of Health and Family Welfare, Government of India. INAP: India Newborn Action Plan. New Delhi: Government of India; 2014.*
5. ***Odejimi, A., Quinley, J., Eluwa, G.I.et al.*** *Causes of deaths in neonates and children aged 1–59 months in Nigeria: verbal autopsy findings of 2019 Verbal and Social Autopsy study. BMC Public Health 2022:22:1130.*
6. ***Dandona R, Kumar GA, Bhattacharya D, Akbar M, Atmavilas Y, Nanda P, Dandona L.*** *Distinct mortality patterns at 0–2 days versus the remaining neonatal period: results from population-based assessment in the Indian state of Bihar. BMC medicine. 2019;17:1-9.*
7. ***Mathew M, Lewis L, Sreenivas A, Purkayastha J.*** *Cause of death in neonates with neurological insults in the neonatal intensive care unit: insights from A MITS pilot study. Clinical Infectious Diseases. 2021 15;73:S408-14.*
8. ***8. D'costa GF, Chincholikar M, Patil Y.*** *Trends in Neonatal Lung Pathology. Bombay hospital Journal. 2006:1-8.*
9. ***World Health Organization.*** *Postnatal care for mothers and newborns: Highlights from the World Health Organization 2013 Guidelines. Postnatal Care Guidelines. 2015;4.*
10. ***Kurdukar MD, Gadgil PA, Patil M, Pandit GA.*** *An Autopsy Study of Neonatal Deaths. International Journal of Recent Scientific Research. 2020;11:39387-390.*
11. ***Alkema L, Chao F, You D, Pedersen J, Sawyer CC.*** *National, regional, and global sex ratios of infant, child, and under-5 mortality and identification of countries with outlying ratios: a systematic assessment. The Lancet Global Health. 2014 1;2:e521-30.*
12. ***Ozturk Y, Soylu OB.*** *Fatty liver in childhood. World journal of hepatology. 2014 1;6:33.*
13. ***D'Arcy C, Hazrati LN, Chiasson DA.*** *Histopathologic analysis in sudden infant and child deaths: a practical approach. Academic Forensic Pathology. 2018;8:492-538.*
14. ***Chaturvedi P, Banerjee KS.*** *Spectrum of congenital malformations in the newborns from rural Maharashtra. The Indian Journal of Pediatrics. 1989;56:501-7.*
15. ***Tibrewala NS, Pai PM.*** *Congenital malformations in the newborn period. Indian Pediatr. 1974.*
16. ***Verma M, Chhatwal J, Singh D.*** *Congenital malformations—a retrospective study of 10,000 cases. The Indian Journal of Pediatrics. 1991;58:245-52.*
17. ***Campbell O, Gipson R, Mohandes AE, Issa AH, Matta N, Mansour E, Mohsen L.*** *The Egypt national perinatal/neonatal mortality study 2000. Journal of Perinatology. 2004;24:284-9.*
18. ***Soofi SB, Ariff S, Khan U, Turab A, Khan GN, Bhal R et al.*** *Diagnostic accuracy of WHO verbal autopsy tool for ascertaining causes of neonatal deaths in the urban setting of Pakistan: a hospital-based prospective study. BMC pediatrics. 2015;15:1-9.*

Case Report

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.10

AML's Hidden Footprint: Autopsy Pathology Uncovers Extensive Extramedullary Involvement

Seema A Umarji[1], Akanksha Hegde[2], Nidhi Radhakrishnan[3], Sudha HM[4]

How to cite this article:

Seema A Umarji, Akanksha Hegde, Nidhi Radhakrishnan *et al*. AML's Hidden Footprint: Autopsy Pathology Uncovers Extensive Extramedullary Involvement. Indian J Forensic Med Pathol.2024;17(2):129-133.

ABSTRACT

Background: Extramedullary Involvement (EMI) in acute leukemia refers to the infiltration of leukemic cells into organs or tissues outside of the blood or bone marrow compartments. This phenomenon manifests in various locations such as the skin, bones, and lymph nodes.

Case report: We present an uncommon occurrence involving a 46-year-old male, wherein extensive myeloid infiltrates were identified during autopsy examination.

Literature review: EMI is believed to manifest in approximately 3-8% of adults diagnosed with Acute Myeloid Leukemia (AML).[1]

Clinical relevance: It highlights the diagnostic complexity of AML and emphasizes the need for meticulous gross and microscopic examination during autopsy with clinicopathological correlation and utilization of special tests like immunohistochemistry in diagnosing such rare entities.

Keywords: Extramedullary Involvement; Autopsy; Acute myeloid leukemia; Myeloid sarcoma.

Introduction

Myeloid neoplasms originate from hematopoietic progenitor cells and predominantly affect the bone marrow, as well as secondary hematopoietic organs such as the spleen, liver, and lymph nodes. These neoplasms are broadly categorized into three main groups: acute myelogenous leukemias, myelodysplastic syndromes, and chronic myeloproliferative disorders.[2]

Extramedullary Involvement (EMI) in leukemia denotes the infiltration of leukemic cells into organs or tissues beyond the blood or bone marrow compartments. This phenomenon is estimated to arise in 3-8% of adults diagnosed with AML. Myeloid sarcomas, also known as granulocytic sarcomas, according to WHO classification, represent extramedullary tumors comprised of myeloid blasts, forming masses that disrupt normal tissue architecture in AML patients. Extramedullary disease, in a broader sense, encompasses leukemic manifestations outside the bone marrow and peripheral blood.[3]

Author's Credentials: *[1]Senior Resident, [2,3]Postgraduate, [4]Professor, Department of Pathology, Ramaiah Medical College, Bengaluru 560054, Karnataka, India.*

Corresponding Author: ***Nidhi Radhakrishnan,*** *Postgraduate Department of Pathology, Ramaiah Medical College, Bengaluru 560054, Karnataka, India.*

Email: *phj8198055@gmail.com*

Received on: *23-03-2024*

Accepted on: *29-06-2024*

The prevalent locations for EMI include bones, periosteum, and internal organs such as the peritoneum, pericardium, mediastinum, kidneys, and lungs. In the head and neck region, common sites encompass the soft palate, nasopharynx, orbit, scalp, and face.[2]

It can manifest concurrently, after, or preceding bone marrow involvement. EMI is often linked with specific molecular mutations such as MLL rearrangement and FLT3 mutations, as well as distinctive flow cytometry markers like CD56, CD2, CD4, and CD7. Additionally, it exhibits characteristic myelomonocytic or monocytic morphology.

Factors contributing to the risk of EMI encompass subtypes M4 or M5 according to the French–American–British classification, presence of myeloblasts expressing specific T-cell markers CD13 and CD14, elevated peripheral total leukocyte count, and the occurrence of chromosomal abnormalities such as t(8;21) or inv(16).[4]

The prognosis for individuals with isolated or synchronous EMI in AML remains a topic of debate. Initial evaluations suggested that EMI could be associated with poorer outcomes, but larger studies have presented conflicting findings. Additionally, emerging data suggest potential variability in prognosis based on the specific organ site affected by EMI.[5]

This case report highlights the intricate diagnostic hurdles encountered in AML, elucidated through the presentation of a rare instance involving extensive myeloid infiltrates in a 46-year-old male.

Case report

We present a case involving a 46-year-old male patient discovered deceased in a bathroom. The brain, both lungs, part of liver, spleen, both kidneys and heart were sent to the pathology department for autopsy examination.

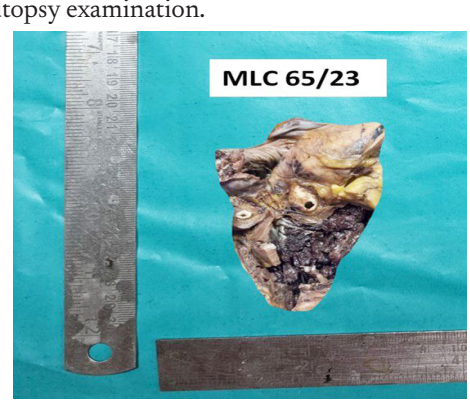

Fig. 1: Heart showing mural clot in the left ventricular cavity

Gross examination: Spleen was enlarged with red pulp expansion (fig. 2). The heart appeared hypertrophied with a visible mural clot in the left ventricular cavity (fig. 1). Cerebrum, cerebellum, bilateral lungs, kidneys, and liver were unremarkable grossly.

Fig. 2: Splenomegaly

Microscopy: Multiple sections from different organs - cerebrum and cerebellum, lungs, liver, spleen, kidneys, myocardium and epicardial vessels showed neoplastic infiltration by large cells resembling immature myeloid precursors (fig. 3,4,5,7,8,9). The blastoid cells were 1.5 to 2 times the size of small lymphocytes and exhibited cleaved nuclei, clumped chromatin, and moderate cytoplasm (fig. 6).

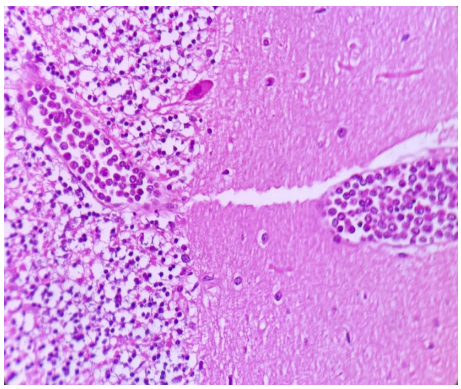

Fig. 3: Cerebellum with neoplastic cells in the blood vessels (H&E,10X)

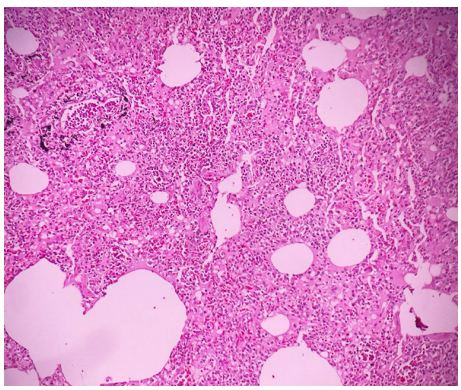

Fig. 4: Lung interstitial infiltrates of neoplastic cells (H&E, 10X)

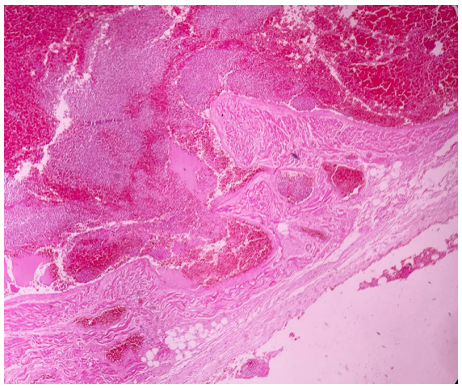

Fig. 5: Mural thrombus with adjacent myocardium (H&E, 40X)

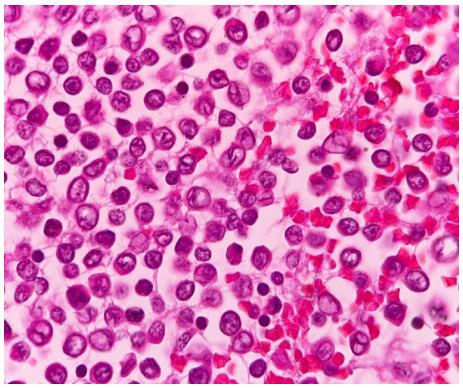

Fig. 6: Blastoid cells exhibiting cleaved nuclei and clumped chromatin (H&E, 100X)

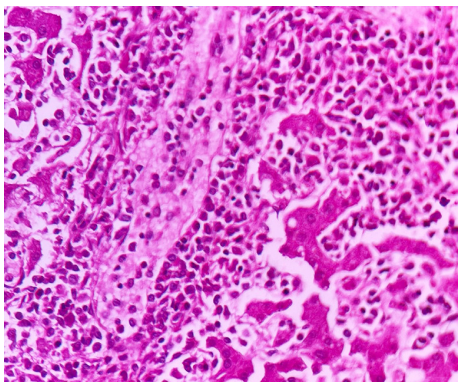

Fig. 7: Liver sinusoids distended and filled with neoplastic cells (H&E,40X)

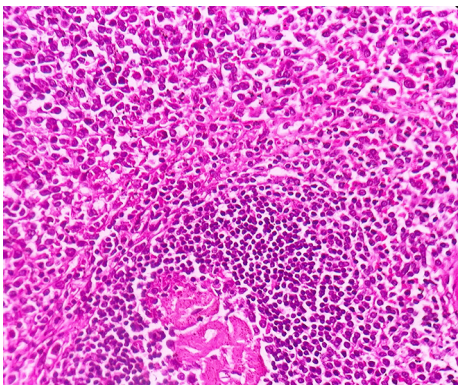

Fig. 8: Spleen with white pulp compressed by surrounding neoplastic infiltrates (H&E, 40X)

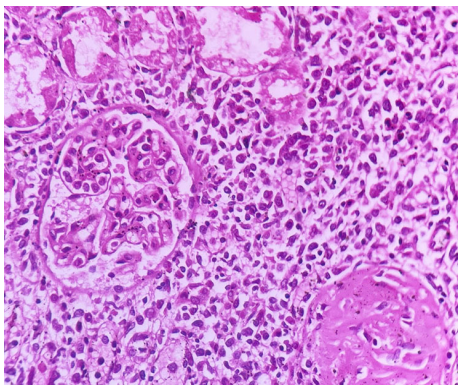

Fig. 9: Kidney showing interstitial neoplastic infiltrate (H&E, 40X)

After identifying the neoplastic infiltration, a detailed history was obtained. This revealed that the deceased had a recent history of fever, elevated WBC count (1.4 Lakh/cumm), marked thrombocytopenia (20 thousand/cumm) and he was provisionally diagnosed to have acute leukemia. Correlating histopathology with clinical details a provisional diagnosis of Hematolymphoid malignancy with extensive extramedullary involvement was made. IHC was performed with MPO, CD20 and CD3. The neoplastic cells showed diffuse strong granular cytoplasmic positivity for MPO (fig. 10) and were negative for CD20 and CD3, confirming the diagnosis of Acute Myeloid Leukemia with extensive extramedullary involvement.

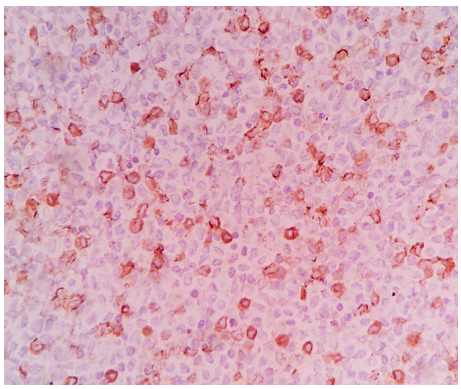

Fig. 10: Neoplastic cells showing diffuse strong granular cytoplasmic positivity for MPO (H&E, 40X)

Discussion

Leukemic cell infiltration to extramedullary sites is encountered in both acute and chronic leukemia with presentation at the diagnosis or during illness, after complete bone marrow remission or as an incidental autopsy finding. In acute leukemias, although commonly seen in ALL, EMI in AML accounts to an incidence of 2.5-9.1%.[6] The incidence of hematolymphoid malignancies at autopsy is 0.98%, with AML cases

being 14% of it and those with diffuse EMI to multiple organs is 2-10%, marking its incidence as low as 0.02-0.1%.[7] Primary diagnosis of AML with EMI made at the autopsy is highly unusual and this enlightens the role of pathologists and diagnostic autopsy.

Association of EMI with numerous factors like chromosomal abnormalities [trisomy 8, t(8,21), inv 16], expression of cell surface markers (CD56+ & CD117-), subtypes (Myelomonoblastic and monoblastic), total leukocyte counts are in the scope of study in recent years.[1] No organ or tissue is exempted from infiltration and the cases usually present with a single or dual organ involvement with a higher incidence among males in the age group of 30-50 years.[1,8] Concomitant multi organ involvement by leukemic infiltrates has an extremely rare incidence. Reviewing the literature from the available multiple online data bases, only a single case report with similar presentation in an adolescent girl is found to be reported previously.[9]

Leukemic infiltrates to myocardium in AML are often encountered. Arson SF and Lewy E, in their study on ECG changes in acute leukemia found 34% of cases with myocardial infiltrates at autopsy, clinically misdiagnosed and treated as RHD, coronary disease, AV block and CHF.[10] In our case, the representative bits from left ventricular wall myocardium showed leukemic blasts, which could have attributed to a conduction block, but no previous ECG to substantiate the same was available.

Angiocentric and angiodestructive infiltrative pattern observed commonly in CD56 positive AML cases results in microscopic and clinical changes in organs like lungs, kidneys and brain.[11] Previous studies show perivascular, alveolar and interstitial infiltrates of leukemic cells and the resultant pulmonary edema as the common lung findings and are concordant with the findings in our case.[12] Similarly, peritubular and glomerular capillary occlusion by the large blast cells account to the changes in renal parenchyma as observed in the current case. Although renal involvement is commonly presented as nephromegaly and AKI with a variable incidence of 4-47%, no such changes were present in this case.[13] Thrombosis of small cerebral and cerebellar vessels by blast cells along with leukemic infiltrates are the common CNS findings, although the latter was absent in our case.[14]

As observed by Waghmare TP et al in the autopsy study of hematolymphoid malignancies, 61.2% cases had hepatosplenomegaly at autopsy. Diffuse red pulp expansion with the leukemic cells is the common finding in spleen as observed in our case.[7] In 41% of AML cases solitary or concomitant involvement of liver is seen along with other organs with a cholestatic picture microscopically.[15]

Immunohistochemistry has aided in the final definitive diagnosis as NHL was a close morphologic diagnosis and the most common hematolymphoid malignancy presenting with diffuse multiorgan infiltrates (48.9%).[7] High total leukocyte count, low platelet count, thrombosis of small vessels by blast cells and leukemic infiltrates in all the vital organs substantiates the fulminant clinical course and early demise of the patient.

Conclusion

This case exemplifies the unforeseen consequences of AML. It underscores the invaluable role of clinicopathological correlation, autopsy examination and IHC in deciphering diagnostic enigmas and expanding our understanding of this exceptionally rare entity.

References

1. ***Fianchi L., Quattrone M., Criscuolo M., Bellesi S., Dragonetti G., Maraglino A.M.E., Bonanni M., Chiusolo P.1, Sica S., Pagano L.***
Extramedullary involvement in acute myeloid leukemia. A single center ten years' experience. Mediterr J Hematol Infect Dis 2021, 13(1).

2. ***Ramakrishnan BP, Krishnapillai R, Thomas P.***
Chloroma: A Diagnostic Dilemma. Oral MaxillofacPathol J. 2019;10(1):1159.

3. ***Zorn, K.E.; Cunningham, A.M., Meyer, A.E., Carlson, K.S.; Rao,S.***
Pediatric Myeloid Sarcoma, More than Just a Chloroma: A Review of Clinical Presentations, Significance, and Biology. Cancers 2023, 15, 1443.

4. ***Singh A, Kumar P, Chandrashekhara SH, Kumar A.***
Unravelling chloroma: review of imaging findings. Br J Radiol 2017; 90: 20160710.

5. ***Shallis RM, Gale RP, Lazarus HM, Roberts KB, Xu ML, Seropian SE, Gore SD, Podoltsev NA.***
Myeloid sarcoma, chloroma, or extramedullary acute myeloid leukemia tumor: A tale of misnomers, controversy and the unresolved. Blood Rev. 2021; 47:100773.

6. ***Bakst RL, Tallman MS, Douer D, Yahalom J.***
How I treat extramedullary acute myeloid leukemia. Blood [Internet]. 2011;118(14):3785–93

7. ***7. Waghmare TP, Prabhat DP, Keshan P, Vaideeswar P.***
An autopsy study of hematolymphoid malignancies. Int J Res Med Sci [Internet]. 2019 [cited 2024 Feb 10];7(4):1079.

8. ***Roberts WC, Bodey GP, Wertlat PT.***
The heart in acute leukemia A study of 420 autopsy cases. Am J Cardiol [Internet]. 1968;21(3):388–412.

9. ***Gupta AK, Radhakrishnan N, Sachdeva A.***
Disseminated myeloid sarcomas—A rare presentation of acute myeloid leukemia. PediatrHematol Oncol [Internet]. 2014;31(2):140–2.

10. ***Aronson SF, Leroy E.***
Electrocardiographic findings in leukemia. Blood [Internet]. 1947;2(4):356–62.

11. ***11. Chang H, Brandwein J, Yi Q-L, Chun K, Patterson B, Brien B.***
Extramedullary infiltrates of AML are associated with CD56 expression, 11q23 abnormalities and inferior clinical outcome. Leuk Res [Internet]. 2004;28(10):1007–11.

12. ***Kradin RL.***
Lymphoid Lesions. In: Understanding Pulmonary Pathology. Elsevier; 2017. p. 271–7.

13. ***Ramanathan S, Prakash M, Khandelwal N.***
Concurrent pancreatic and renal leukemic cell infiltration. Indian J Hematol Blood Transfus [Internet]. 2014 [cited 2024 Feb 10];30(S1):57–9.

14. ***Giustina A, Frara S, Spina A, Mortini P.***
The Hypothalamus. In: The Pituitary. Elsevier; 2017. p. 291–327.

15. ***Mathews E, Laurie T, O'Riordan K, Nabhan C.***
Liver involvement with acute myeloid leukemia. Case Rep Gastroenterol [Internet]. 2008;2(1):121–4.

Case Report

Indian Journal of Forensic Medicine and Pathology
Volume 17, Number 2, April-June 2024
DOI: https://dx.doi.org/10.21088/ijfmp.0974.3383.17224.11

Psychological Autopsy: A case report unraveling the complex factors surrounding a sudden Death

Satrajit Roy[1], Surankita Sukul[2], Chandan Bandyopadhyay[3], Biswajit Sukul[4]

How to cite this article:

Satrajit Roy, Surankita Sukul, Chandan Bandyopadhyay, *et al*. Psychological Autopsy: A case report unraveling the Complex factors surrounding a sudden Death. Indian J Forensic Med Pathol.2024;17(2):135-138.

ABSTRACT

The psychological autopsy aims to provide a comprehensive analysis of the psychological, emotional, and behavioural history of the deceased before death, shedding light on potential factors contributing to the untimely demise. This case report delves into the application of a psychological autopsy in understanding the circumstances and psychological factors leading to the unnatural death of a 29-year-old male who was found dead under mysterious circumstances. This report examines the methodology involved in conducting a psychological autopsy, emphasizing the importance of gathering information from various sources, including medical records, interviews with family and friends, and exploration of the individual's past mental health issues, stressors, and life events, which helped in shedding light as to the manner of death and guiding the forensic pathologist to send for the necessary ancillary biochemical investigations.

Keywords: Psychological Autopsy; Sudden Death; Manner of death; Forensic Pathology.

Introduction

The human brain is a marvel of evolution, comprising billions of neurons and trillions of connections. It is this intricate structure that gives rise not only to a wide range of cognitive abilities but also to various pathologies, including structural balance and neurohormonal abnormalities that has opened a new domain in the field of forensic medicine- Psychological Autopsy.[1] A psychological autopsy is an investigative tool that aims to provide a thorough understanding of the psychological and emotional factors contributing to an individual's death, particularly in cases of suicide or death under suspicious circumstances.[2] The method involves a multidisciplinary approach, combining information from various sources to paint a comprehensive picture of the individual's psychological history.[3] By piecing together these multifaceted aspects, a psychological autopsy aids in gaining insights into the person's state of mind, thus contributing to a deeper comprehension of the complex interplay of psychological factors leading up to the tragic event. This approach proves valuable for researchers, clinicians, and law enforcement agencies in identifying potential preventive measures and addressing mental health challenges.[4]

Author's Credentials: *[1]Junior Resident, [2]Assistant Professor, Department of Biochemistry, Burdwan Medical College and Hospital, Kolkata 713104, [3]Associate Professor, [4]Professor and Head, Department of Forensic and State Medicine, Medical College, Kolkata 700073, West Bengal, India.*

Corresponding Author: ***Satrajit Roy,*** *Junior Resident Department of Forensic and State Medicine, Medical College, Kolkata 700073, West Bengal, India.*

Email: *ursatrajit98@gmail.com*

Received on: *13-09-2023*

Accepted on: *20-06-2024*

Case History

A 29-year-old male was found to be lying unconscious in his room which was bolted from

inside. He was recovered and brought to the emergency department of a medical college where he was declared "Brought Dead."

Autopsy Findings

General findings are that of an average-built and nourished male subject having rigor mortis over the lower portion of the body, hypostasis of bluish-purplecolor over the front, of the trunk, upper limbs, and, lower limbs, which was fixed and more prominent over the right half of the body. Bluish discoloration of fingertips, nail beds of both sides, the tip of the tongue, and ear lobules was noted:

Injuries

1. One lacerated wound measuring 1" x 0.5" over the inner aspect of the midportion of the lower lip.
2. One bruise measuring 1" x 0.5" over the outer aspect of the midportion of the upper lip.
3. One abrasion measuring 2.3" x 0.5", was placed obliquely over the right side of the face; the upper end of which was 4" from the midline and 2.5" vertically above the right angle of the mandible, and, the lower end was 3.5" from midline.
4. Internal examination: - Stomach contained 100 grams of bluish turbid fluid with a fair number of flakes of mucous with evidence of patchy erosion of mucosa and submucosal hemorrhage. Both lungs were oedematous with evidence of subpleural petechial hemorrhage at places. The heart weighed 286 grams with evidence of Grade-II and Grade-III atheroma at the root of the aorta. All the valve cusps were sclerosed, thickened, and calcified. The rest of the organs were unremarkable other than being congested. Routine viscera, clotted blood (10 ml), blotting paper with soaked blood, nail scrapings, and cuttings, a tuft of scalp hairs (plucked), and wearing apparel were preserved.
5. Spectrophotometric analysis of the samples that were sent for chemical examination including toxicological screening revealed a significant quantity of cyanide as given in the following table:

Exhibit No	Specimen	Quantity of Cyanide (in ppm)
A	Peripheral blood	266
B	Stomach contents	274

The place of Occurrence

1. The deceased was found to be lying in a prone position.
2. Several pieces of evidence were recovered from the crime scene, including the mobile phone of the deceased, one empty glass, and a four-page hand-written suicide note.
3. The mobile phone contained a ten-minute recording, in which the deceased was seen to be grieving about the various incidents that happened in his life, suggestive of his depressive state.
4. The letter that was recovered contained a pen picture of his past life, his family members, and the tension in his relationship all culminating in emotional distress and mental health challenges.
5. In one section of the letter, he appealed to both the judiciary and the forensic department not to investigate the cause of his death as it would lead them to a dead end only.

Information from medical records, personal diaries, and interviews with family, friends, and co-workers

The medical history of the deceased was reviewed, and personal interviews were conducted with family members, friends, and co-workers. The results were as follows:

1. The subject was a BSc Physiology student in one of the reputed institutions of the city.
2. His family owned their medical diagnostic laboratory setup, which was non-functioning for the last few months.
3. He was living alone in a rented apartment, preparing for competitive examinations, even after several failed attempts.
4. He was a well-spoken and thoroughly read person having complex insight into the aspects of life and death.
5. He was eccentric, suffering from intense mental agony, a smoker, non-alcoholic, and was in debt of a big sum of money.
6. The estimated time since death was calculated to be four hours approximately preceding the recovery, which implied that he had expired around 4 p.m. of the fateful day. However, one of his friends informed the police that he had received one e-mail from the deceased at around 9:39 p.m. This piece

of information suggested that the deceased was quite tech-savvy, and had proficient knowledge of "Message scheduling" and the use of modern technology

7. Inquiry into the past medical history reveals, he had juvenile Nasopharyngeal Angiofibroma which was operated and he had been on anti-depressant medications for a long duration.
8. The laboratory workers forwarded the information that the deceased had been visiting the laboratory quite often in the past few months, the reason for that was not known to them. A list of chemical reagents and containers was sought from the laboratory-in-charge and it was found that a container of Drabkin's reagent, containing approximately one liter of the solution, was missing for a few days.

Discussion

In medico-legal autopsies, the history is often scanty, absent, or misleading. Even when a story is given in good faith by relatives, the medical facts often get distorted because of incomplete knowledge and understanding.[5] However, just like a final diagnosis of a diseased condition is reached with good history taking, appropriate elicitation of clinical signs, and advising required investigations; the same approach goes for making of opinion after conducting an autopsy if initial post-mortem findings are confusing. In this case, poisoning due to intake of cyanide-containing Drabkin's solution was theorized from the history given by the deceased's friends and relatives and also further investigations by the police. Drabkin's reagent (named after the American hematologist Samuel Drabkin) is a laboratory solution used for the quantification of hemoglobin in blood samples. When mixed with a blood sample, the reagent converts hemoglobin into cyanmethemoglobin, a stable compound, which absorbs light at a specific wavelength. However, it is important to note that the reagent contains potentially hazardous substances. These are as follows: Potassium ferricyanide 0.1% (w/v), Potassium cyanide 0.1% (w/v), Potassium dihydrogen phosphate 0.015 M.

The reagent has been shown to manifest symptoms of acute toxicity if swallowed, fatal in contact with the skin, and harmful if inhaled.[6] Cyanide is an asphyxiant, having an average lethal dose of 250 mg,[6] which can lead to generalized convulsions, often leading to accidental falls and resulting injuries. Post-mortem findings of acute cyanide poisoning, through the oral route, are erosions of oral and gastric mucosa, edema of the lungs, well-developed pinkish hypostasis, and well-demarcated signs of asphyxial death.[7] However, based on the past medical history of the deceased, a high probability of some fatal disease condition in the individual could not be ruled out, which might have caused sudden death. It was revealed that the subject had a history of depression and had experienced several recent life stressors, including job loss and relationship difficulties. The interviews highlighted increased social withdrawal and changes in behavior in the months preceding the event. Analysis of personal diaries further corroborated the emotional turmoil and internal conflicts.

CONCLUSION

Following the fundamental approaches of the psychological autopsy, a clear understanding of the individual's psychological state, which most probably culminated in a suspicious death is unveiled. The findings from the psychological autopsy underscore the complex nature of the factors that contributed to the individual's tragic event. The interplay of past mental health issues, recent stressors, and changing behavior patterns painted a nuanced picture of the psychological struggles, emphasizing the importance of a multidisciplinary approach in understanding the multifaceted factors leading to such events.

The role of psychological autopsy thus becomes two-fold in this case, to establish the cause of death and provide an insight into the identification of risk factors like mental illness, substance abuse, or interpersonal conflicts. This can help to inform suicide prevention efforts mental health interventions and awareness programs, which can have an individualized or social approach.[8,9]

CONFLICT OF INTEREST: ***None***

REFERENCES

1. ***Korade Z, Mirnics K.*** *Programmed to be Human? Neuron. 2014 Jan;81(2):224-6*
2. ***Reddy KSN, Murty OP.*** *The Essentials of Forensic Medicine and Toxicology. 34th edition. New Delhi: The Health Sciences Publisher; 2017. pg. 88*
3. ***Yadav A, Manish Kumath, Khanna M, Mishra A, Khakha A, Kumar A.*** *Psychological autopsy-A need of the future. Medico-Legal Update. 2010 Jan 1;10(1):73-6.*

4. ***Cooper J.***
Ethical issues and their practical application in a psychological autopsy study of suicide. Journal of Clinical Nursing. 1999 Jul;8(4):467-75

5. ***Saukko P, Knight B.***
Knight's Forensic pathology. 4th edition. New York: CRC Press; 2016. Pg. 11

6. ***Ruangkanchanasetr S, Wananukul V, Suwanjutha S.***
Cyanide poisoning, 2 cases report and treatment review. Journal of the Medical Association of Thailand = Chotmaihet Thangphaet [Internet]. 1999 Nov 1 [cited 2024 Mar 1];82 Suppl 1:S162-167. Available from: https://pubmed.ncbi.nlm.nih.gov/10730537/

7. ***Aggarwal A.***
Textbook of Forensic Medicine and Toxicology. 1st ed. Avichal Publishing Company; 2016. pg. 724-727

8. ***Jason Payne-James, Anthony Busuttil, and William S. Smock.***
Textbook of forensic medicine clinical and pathological aspects. First edition. London: Greenwich Medical media; 2003. pg. 707-720

9. ***Khan FA, Anand B, Devi MG, Murthy KK.***
Psychological autopsy of suicide-a cross-sectional study. Indian Journal of Psychiatry [Internet]. 2005 [cited 2021 Aug 22];47(2):73-8. Available from: https://www.ncbi.nih.gov/pmc/articles/PMC2918303/.

Guidelines for Authors

Manuscripts must be prepared in accordance with "Uniform Requirements for Manuscripts submitted to Biomedical Journal" developed by International Committee of Medical Journal Editors.

Types of Manuscripts and Limits:

Original articles: Up to 3000 words excluding references and abstract and up to 10 references.
Review articles: Up to 2500 words excluding references and abstract and up to 10 references.
Case reports: Up to 1000 words excluding references and abstract and up to 10 references.

Online Submission of the Manuscripts:
Articles may also be submitted online at: https://rfppl.co.in/customer_index.php

Title Page: Prepare the title page, covering letter, acknowledgement, etc., using Microsoft Word or compatible software. All information which can reveal your identity should be here.
Article file: The main text of the article, from Abstract to References (including tables) should be in this file. Do not include any information such as acknowledgement, your name, affiliation, email id or contact number etc., in page headers, in this file. Use Word formats such as .docx/.doc/ or .rtf formats accompanied by a .pdf file for reference.
Do not incorporate images in the file. If file size is large, graphs can be submitted as images separately without incorporating them in the article file to reduce the size of the file.
Images: Submit good quality clear images. Each image should be less than 100 Kb in size. Size of the image can be reduced by decreasing the actual height and width of the images (keep up to 400 pixels or 3 inches). Image formats (jpeg, tiff, eps etc.) are acceptable; jpeg is most suitable.
Legends: Legends for the Fig.s/images should be included at the end of the article file.

If the manuscript is submitted online, the Contributors' Form and Copyright Transfer form have to be submitted in original with the signatures of all the contributors within two weeks from the date of submission.
Hard copies of images (3 sets) for articles submitted online, should be sent to the journal office at the time of submission of a revised manuscript.
If the manuscript is submitted online, the Contributors' Form and Copyright Transfer forms have to be submitted in original with the signatures of all the contributors within two weeks from the date of submission.

Article Submission
For full details on Journal information and article submission information, click on the Authors link from the

Home Page and select Article Submission System from the dropdown menu to access complete information on articles and article submission.
To submit articles online, scroll down to the Smart Paper System and click on the bright red button "Go to the System," which will take you to the Registration Page at: https://rfppl.co.in/article_submission_system.php?mid=10, where you can login with your user id and password, to submit your article online.

Journal Guidelines for Authors

1) First Page File: Prepare the title page, covering letter, acknowledgement, etc. using a word processor. All information which can reveal your identity should be here. Save the file either in .docx or .doc format followed by .pdf file format for reference. Do not zip the files.

2) Article file: The main text of the article, beginning from Abstract till References (including tables) should be in this file. Do not include any information (such as acknowledgement, your name in page headers, etc.) in this file. Use text/rtf/doc/PDF files. Do not zip the files. Limit the file size to 400 Kb. Do not incorporate images in the file. If file size is large, graphs can be submitted as images separately without incorporating them in the article file to reduce the size of the file.

3) Images: Submit good quality color images. Each image should be less than 100 Kb in size. Size of the image can be reduced by decreasing the actual height and width of the images (keep up to 400 pixels or 3 inches). All image formats (jpeg, tiff, gif, bmp, png, eps etc.) are acceptable; jpeg is most suitable.

Legends: Legends for the Fig.s/images should be included at the end of the article file.

Preparation of the Manuscript

The text of observational and experimental articles should be divided into sections with the headings: Introduction, Methods, Results, Discussion, and Conclusion. References, tables, Fig.s, legends, and Acknowledgment, Appendices and Abbreviations may be provided after the Abstract page.

Title Page

The title page should carry the following:

1. Type of manuscript (e.g. Original Article, Review Article, Case Report and so on).
2. The Title should be descriptive of the subject
3. A running head of not more than 50 characters (including spaces) should be on top margin and aligned to the centre
4. The name of each contributor is to be provided (Last name, First name and initials of middle name), with their academic degree and institutional affiliation
5. The name of the department(s) and institution(s) to which the work may be attributed;
6. The name, full address, phone numbers, and e-mail address of the corresponding author should be mentioned.
7. The total number of pages, total number of photographs and word count separately for abstract and for the text (excluding the references and appendixes);
8. Source(s) of support in the form of grants, equipment, drugs, or all of these;
9. Acknowledgement, if any; and
10. If the manuscript was presented as part at a meeting, the organization, place, and exact date on which it was read.

Abstract Page:

The second page should carry the full title of the manuscript and an Abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Materials, Statistical analysis used, Results and Conclusions. A minimum of 4 keywords and a maximum of 8 keywords may be provided by the author for indexing.

Introduction

State the background and purpose of the study and summarize the rationale for it. Describe in a few short sentences in simple English, the background and significance of your article in the following format.

Materials and Methods

The Meterials and Methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, study design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and methods.

Reports of randomized clinical trials should be based on the CONSORT Statement. (www.consort-statement.org) When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma.net/e/policy/l 7-c_e.html).

Supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be

Result

Present your results in a logical sequence in the text, tables, and illustrations, describing the most important findings first. Do not repeat the data in the tables or illustrations; emphasize or summarize only important published only in the electronic version of the journal.

Discussions

Include a summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); strengths and limitations of the study (Study question, design, data collection, analysis and interpretation); interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now? What does this study add to the available evidence, effects on patient care and health policy, possible mechanisms). Controversies raised by this study; and future directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other material given in the Introduction or the Results section.

References

References should be listed in alphabetical order and numbered accordingly. Each listed reference should be cited in the text. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines (http://www.nlm.nih.gov/bsd/uniform_ requirements.html) for more examples.

Standard journal article

- Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006; 35: 540-7.
- Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003; 61: 347-55.

Article in supplement or special issue

- Fleischer W, Reimer K. Povidone iodine antisepsis. State of the art. Dermatology 1997; 195 Suppl 2: 3-9.

Corporate (collective) author

- American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000; 71: 1792-801.

Unpublished article

- Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

- Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

- Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O,

No author Listed

- World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

- National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.
- More information about other reference types is available at www.nlm.nih.gov/bsd/uniform_requirements.html, but observes some minor deviations (no full stop after journal title)

Tables

- Tables should be self-explanatory and should not duplicate textual material.
- Tables with more than 10 columns and 25 rows are not acceptable.
- Table numbers should be in Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each.
- Explain in footnotes all non-standard abbreviations that are used in each table.
- For footnotes use the following symbols, in this sequence: *, ¶, †, ‡‡,

Illustrations

- Graphics files are welcome if supplied as Tiff, EPS, or PowerPoint files of minimum 1200x1600 pixel size. The minimum line weight for line art is 0.5 point for optimal printing.
- When possible, please place symbol legends below the Fig. instead of to the side.
- Original color images can be printed in color at the editor and publisher's discretion provided the author agrees to pay.
- Type or print out legends (maximum 40 words, excluding the credit line) for illustrations using double spacing, with Arabic numerals corresponding to the illustrations.

Sending a revised manuscript

While submitting a revised manuscript, contributors are requested to include, along with single copy of the final revised manuscript, a photocopy of the revised manuscript with the changes underlined in red and copy of the comments with the point to point clarification to each comment. The manuscript number should be written on each of these documents. If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks of submission. Hard copies of images should be sent to the office of the journal. There is no need to send printed manuscript for articles submitted online.

Reprints

The publisher does not provide free reprints, however, an author copy is sent to the main author and additional copies are available on payment of a fee.

Copyright

The content of the Article in the journal is protected by copyright laws and cannot be reproduced withoout the prior permission of the publisher.

Declaration

A Declaration should be submitted to the publisher stating that the manuscript contains original work and that neither this manuscript nor any other article with substantially similar content under the present authorship has been published before or is being considered for publication elsewhere, that the authorship of this article will not be contested by any one whose name (s) is/are not listed here, and that the order of authorship as stated in the manuscript is final and agreed upon by all co-authors. Declaration should be duly signed by all authors in the same order in which they are mentioned in the original manuscript. Content appearing in the Journal is governed under copyright laws. To reproduce the publication, prior permission from the publisher is mandatory and whereever applicable due acknowledgment of the source should be made accordingly.

Approval of Ethics Committee

We need the Ethics committee approval letter from an Institutional ethical committee (IEC) or an institutional review board (IRB) to publish your Research article or author should submit a statement that the study does not require ethics approval along with evidence. The evidence could either be consent from patients is available and there are no ethics issues in the paper or a letter from an IRB stating that the study in question does not require ethics approval.

Abbreviations

Standard abbreviations should be used and be spelt out when first used in the text. Abbreviations should not be used in the title or abstract.

Checklist

- Manuscript Title
- Covering letter: Signed by all contributors
- Previous publication/ presentations mentioned, Source of funding mentioned
- Conflicts of interest disclosed

Authors

- Middle name initials provided.
- Author for correspondence, with e-mail address provided.
- Number of contributors restricted as per the instructions.
- dentity not revealed in paper except title page (e.g.name of the institute in Methods, citing previous study as 'our study')

Presentation and Format

- Double spacing
- Margins one inch on all four sides
- Title page contains all the required information. Running title provided (not more than 50 characters)
- Abstract page contains the full title of the manuscript
- Structured abstract provided for an original article

- Key words provided (three or more)
- Introduction of 75-100 words
- Headings in title case (not ALL CAPITALS). References cited in square brackets

References according to the journal's instructions

Language and grammar

- Uniformly British English
- Abbreviations spelt out in full for the first time. Numerals from 1 to 10 spelt out
- Numerals at the beginning of the sentence spelt out

Tables and Fig.s

- No repetition of data in tables and graphs and in text.
- Actual numbers from which graphs drawn, provided.
- Fig.s necessary and of good quality (color)
- Table and Fig. numbers in Arabic letters (not Roman).
- Labels pasted on back of the photographs (no names written)
- Fig. legends provided (not more than 40 words)
- Patients' privacy maintained, (if not permission taken)
- Credit note for borrowed Fig.s/tables provided

Submitting the Manuscript

- Is the journal editor's contact information current?
- Is the cover letter included with the manuscript? Does the letter include:

1. The author's postal address, e-mail address, telephone number, and fax number for future correspondence?
2. State that the manuscript is original, not previously published, and not under concurrent consideration elsewhere?
3. Inform the journal editor of the existence of any similar published manuscripts written by the author?
4. Mention any supplemental material you are submitting for the online version of your article. Contributors' Form (to be modified as applicable and one signed copy attached with the manuscript).

Editorial Office

Red Flower Publication Pvt. Ltd.,
48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I, New Delhi – 110 091, India.
Phone: 91-11-79695648, **Mobile:** 9821671871
E-mail: author@rfppl.co.in, **Website:** www.rfppl.co.in