

January - June 2026

Volume 35

Issue 1

PRINT ISSN: 2277-1867

ONLINE ISSN: 2277-8853



JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW

Official Publication of Medicolegal Association of Maharashtra

Editor-in-chief

Dr Ravindra B Deokar

Associate Editors

Dr Sadanand S Bhise

Dr Sachin S Patil

**MULTISPECIALITY, MULTIDISCIPLINARY, NATIONAL
PEER REVIEWED, OPEN ACCESS, MLAM (SOCIETY) JOURNAL
Indexed with Scopus (Elsevier)**

Editorial Office Address

Department of Forensic Medicine & Toxicology, Third Floor, Mortuary Building, Lokmanya Tilak Municipal Medical College & LTMG Hospital, Sion, Mumbai, Maharashtra, India. Pin-400 022. Email id: mlameditor@gmail.com Phone: 022-68660000/ +91-9423016325.



JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW

(Official Publication of Medicolegal Association of Maharashtra)

Email.id: mlameditor@gmail.com

PRINT ISSN:

2277-1867

ONLINE ISSN:

2277-8853

Original Research Article

Clinicopathological Features of Poisoning in Living and Deceased Individuals: An Observational Study

Ravindra S Honnungara^a, Dhivagar K^{b*}, Manoranjan B^c, Vidya M^d, Hemalatha K^e

^aProfessor & HOD, Department of Forensic Medicine & Toxicology, Jawaharlal Nehru Medical College, KAHER, Belagavi, Karnataka, India. ^bAssistant Professor, Department of Forensic Medicine & Toxicology, Tagore Medical College, Hospital, Chennai, Tamil Nadu, India. ^cAssistant Professor, Department of Forensic Medicine & Toxicology, SUT Academy of Medical Sciences, Thrissur, Kerala, India. ^dSenior Lecturer, Department of Oral Pathology, Tagore Dental College and Hospital, Chennai, India. ^eSenior Resident, Department of Radio-diagnosis, Sri Venkateshwara Medical College Hospital & Research Centre, Ariyur, Puducherry, India.

Article Info

Received on: 18.10.2025

Accepted on: 18.03.2026

Key words

Histopathology,
Autopsy,
Paraquat,
Organophosphorus.

Abstract

Introduction: Poisoning is a major cause of morbidity and mortality worldwide, particularly in low- and middle-income countries. Understanding the clinical and pathological profiles aids in timely diagnosis and effective management. **Objective:** To assess the clinicopathological features of poisoning in living and deceased individuals. **Materials and Methods:** A cross-sectional observational study was conducted over 18 months at KLE Hospital, Belagavi, involving 197 cases (163 living and 34 deceased). Data were collected using a structured proforma. Clinical features and laboratory parameters were analysed for living cases, and histopathological findings of brain, heart, liver, kidneys, and lungs were performed using haematoxylin and eosin staining for deceased cases. Quantitative data were analyzed using descriptive statistics and inferential tests (Chi-square, Fisher's exact test). Statistical significance was set at $p < 0.05$. **Results:** The mean age was 30.75 ± 15.62 years; 61% were males. The mortality rate was 17.3%, with 94% of deaths due to suicide. Paraquat accounted for 44% of fatal cases. Brain (82%) and heart (73.5%) were the most affected organs. Significant associations were observed between type of poison and clinical outcome ($p < 0.01$). **Conclusion:** Laboratory markers such as WBC and platelet counts can predict lethality. Autopsy findings revealed organ-specific damage particularly in paraquat and organophosphate ingestion. Early recognition of such parameters can reduce mortality.

1. Introduction

Poison is defined as any substance capable of causing harmful or fatal effects when introduced into the living body. According to the World Health Organization, poisoning contributes to nearly 0.3

million deaths annually, with most occurring in low- and middle-income countries.¹ In India, suicides account for a large share of poisoning cases, with the National Crime Records

How to cite this article: Honnungar R S, Dhivagar K, Manoranjan B, Vidya M, Hemalatha K. Clinicopathological Features of Poisoning in Living and Deceased Individuals: An Observational Study. J Forensic Med Sci Law. 2026;35(1):16-19. doi: [10.59988/jfmsl.vol.35issue1.4](https://doi.org/10.59988/jfmsl.vol.35issue1.4)

*Corresponding author: Dr Dhivagar K, Assistant Professor, Department of Forensic Medicine & Toxicology, Tagore Medical College, Hospital, Chennai, Tamil Nadu, India. Email- dhivagar.latha@gmail.com

Bureau reporting over 1.6 lakh deaths in 2021.² Common toxic agents include organophosphates, paraquat, rodenticides, and snake venom.³ Diagnosis in living patients depends on clinical findings, laboratory evaluation, and toxicological testing, while in deceased cases, histopathological examination provides crucial evidence.^{4,5} Major target organs include the liver, kidneys, lungs, and brain, as these are involved in metabolism and detoxification.⁶ This study aimed to evaluate the clinical, biochemical, and histopathological features of poisoning cases in living and deceased individuals in the Belagavi region.

2. Materials and Methods

Study Design and Setting: A cross-sectional observational study conducted at Jawaharlal Nehru Medical College and KLE Hospital, Belagavi, from January 2021 to June 2022.

Participants: A total of 197 cases were included (163 living and 34 deceased) using convenience sampling. Inclusion criteria included all poisoning cases within 24 hours of exposure. Exclusion criteria were food poisoning and cases brought dead without proper documentation.

Data Collection: Demographic, clinical, and laboratory data were collected from living patients. For deceased cases, tissue samples from brain, heart, lungs, liver, and kidneys were fixed in 10% buffered formalin, processed, sectioned at 5 μ m, and stained with hematoxylin and eosin. Statistical Analysis: Quantitative data were expressed as mean $\pm$ SD; qualitative data as frequencies and percentages. Associations were assessed using Associations were analyzed using Chi-square and Fisher's Exact tests. Statistical significance was set at $p < 0.05$.

Ethical Considerations: Informed consent was obtained from living participants. Ethical approval was granted by the Institutional Ethical Committee, Jawaharlal Nehru Medical College, KAHER (MDC/DOME/53). Convenience sampling was adopted due to the unpredictable and emergent nature of poisoning cases presenting to the hospital, ensuring inclusion of all eligible cases within the study duration.

3. Results

A total of 197 poisoning cases were analyzed, comprising 163 (82.7%) survivors and 34 (17.3%) deceased. The mean age was 30.75 ± 15.62 years, with most patients aged 21–40 years (53%), followed by those below 20 years (26%). Males accounted for 61% of cases, while 58% were unmarried. Among the deceased, 15% had a prior history of suicidal

attempts. **Table 1** shows that suicide was the leading cause of death (94%), while homicidal and accidental cases each accounted for 3%, indicating that most fatalities were due to intentional self-poisoning.

Table 1: Frequency distribution of intentional exposure of Deceased cases (n=34)

Intentional Accident/ Exposure	Deceased (%)
Suicide	32 (94)
Homicide	01 (03)
Accidental	01 (03)

Table 2: Frequency distribution of study participant's Place of ingestion.

Variable	Frequency (%)
Home	155 (79)
Farm	28 (14)
Hospital	05 (03)
Others	09 (05)

Table 3: Association of Place of Ingestion, clinical features, and compound ingested with poisoning

Variables	Survived (%) (n=163)	Deceased (%) (n=34)	Chi square (χ^2)	p-value
Place of Ingestion of poison				
Home	125 (77)	30 (88)	2.6	0.46
Farm	25 (15)	03 (09)		
Hospital	05 (03)	00 (00)		
Others	08 (05)	01 (03)		
Clinical features*				
Vomiting	46 (28)	13 (38)	34.96	<0.01**
Stomach pain	33 (20)	08 (24)		
Throat pain	14 (09)	10 (29)		
Breathlessness	00 (00)	08 (24)		
Drowsiness	09 (06)	09 (26)		
Defecation	04 (02)	03 (09)		
Others	28 (17)	03 (09)		
Type of Compound Ingested				
Paraquat	09 (05)	15 (44)	46.62	<0.01**
Organophosphorus	16 (10)	06 (18)		
Snake bite	38 (23)	00 (00)		
Unknown	40 (24)	06 (18)		
Component	60 (37)	07 (21)		
Others				

*Multiple responses ** $p < 0.05$, statistically significant

Table 2 shows that most poisonings occurred at home (79%), followed by farms (14%), indicating that domestic settings were the predominant site of ingestion. An association between the place of ingestion, clinical features, and type of compound with outcomes in poisoning cases was evaluated in **Table 3**. The place of ingestion had no significant impact on mortality ($p = 0.46$), whereas clinical features ($p < 0.01$) and compound type ($p < 0.01$) showed significant associations.

Haematological and biochemical parameters further supported these clinical observations. The mean haemoglobin level was 12.6 ± 2.5 g/dL, while

the mean platelet count was markedly lower in deceased cases ($0.71 \times 10^5/\mu\text{L}$). Elevated liver enzymes and serum creatinine values were also noted, indicating hepatic and renal involvement ($p < 0.05$).

Histopathological Findings: Microscopic examination of autopsy samples revealed characteristic multi-organ involvement. The brain showed vascular congestion, interstitial oedema, and focal neuronal necrosis, more prominent in paraquat-related deaths. The heart demonstrated myocardial fibre degeneration, interstitial haemorrhage, and mild lymphocytic infiltration in several cases. The lungs showed extensive alveolar congestion, oedema, and haemorrhage with occasional fibrin deposition. The liver exhibited centrilobular necrosis, fatty changes, and sinusoidal congestion, whereas the kidneys revealed tubular epithelial degeneration, glomerular congestion, and focal necrosis. These features were more severe in paraquat and organophosphorus poisoning.

4. Discussion

The predominance of young, unmarried males in this study is consistent with the psychosocial vulnerability patterns documented in Indian and South Asian populations, where occupational exposure and emotional stress play a significant role in self-poisoning incidents.⁷⁻⁹ Similar demographic trends have been documented across neighbouring countries. Studies from Bangladesh and Sri Lanka also report a predominance of male victims aged 20–40 years, reflecting shared sociocultural stressors, agricultural exposure, and easy access to toxic agents.¹⁰⁻¹² The current study revealed that paraquat and organophosphorus compounds were the most frequent fatal agents, responsible for 44% and 18% of deaths, respectively, whereas unknown compounds, snake bites, and household poisons predominated among survivors. Similar patterns of herbicide and pesticide-related toxicity have been documented across India.¹³⁻¹⁶

Laboratory abnormalities, such as elevated WBC and liver enzyme levels along with reduced platelet counts, reflect systemic toxicity and correlate strongly with fatal outcomes. These markers may serve as early prognostic indicators in triaging and clinical management, especially in resource-limited emergency settings.¹⁷⁻¹⁹ Histopathological evaluation of deceased cases demonstrated multi-organ involvement, predominantly affecting the brain (82%), heart (73.5%), lungs (65%), liver (50%), and

kidneys (15%). Cerebral congestion and hepatic changes observed in the present study correspond to previous autopsy-based findings.^{4,20,21} Recent advances with histopathological examinations facilitate to correlate the changes in tissue due to poisons. It provides insights into genetic susceptibility to environmental toxins and drugs.²²⁻²⁴

Histopathological findings confirmed that paraquat primarily affects pulmonary and cardiac tissues, while organophosphorus compounds show hepatic and renal involvement.^{5,17,25} Such correlations between laboratory and autopsy data highlight the importance of integrating clinical, biochemical, and morphological evaluation for early recognition of systemic toxicity and systemic toxicity and timely intervention.

Limitations: The study was limited by its single-centre scope and convenience sampling method. Some compounds lacked toxicological confirmation, which may have affected classification accuracy. Future multicentre studies with larger cohorts are recommended to validate these findings and develop region-specific clinical management protocols.

5. Conclusion

Laboratory parameters such as platelet and WBC counts are valuable in predicting severity and outcome in poisoning cases. Integrating clinical data with histopathological findings improves prognostic accuracy and guides management. Strengthened regulation of toxic agents, public awareness campaigns, and mental health support systems are vital to reduce suicidal poisonings. Multi-institutional studies should standardize clinicopathological correlations across diverse populations.

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

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. WHO. Suicide and Poisoning Fact Sheet. Geneva: World Health Organization; 2023.
2. National Crime Records Bureau. Accidental Deaths and Suicides in India 2021. New Delhi: NCRB; 2022.
3. Pillay VV. Modern Medical Toxicology. 5th ed. New Delhi: Jaypee Brothers; 2022.
4. Datir SB, Petkar M, Hussaini SN. Autopsy findings in acute poisoning. J Forensic Leg Med. 2021; 24(1):1–5.

5. Sutay SS, Tirpude BH. Histopathological changes in the liver in poisoning. *J Indian Acad Forensic Med.* 2021; 30(2):63–8.
6. Deshmukh CD, Pawar AT. Diagnosis and management of poisoning. *Sch Acad J Pharm.* 2020;9(5):155–62.
7. Aggarwal NK, Aggarwal BBL. Trends of poisoning in Delhi. *J Indian Acad Forensic Med.* 2021; 43(2):135–9.
8. Sharma R, Neelanjana R. Mortality and morbidity associated with acute poisoning in Northeast India: A retrospective study. *J Family Med Prim Care.* 2021; 10(3):120–6.
9. Chaudhari VA, Das S, Devnath GP. Fatal suicidal poisoning: A record-based study in South India. *J Forensic Med Sci Law.* 2022; 11(2):547–52.
10. Srihari C, Ramakrishnan TV. Epidemiological profile of poisoning in South India. *Int J Med Res Rev.* 2020; 5(3):212–22.
11. Rahman F, Chowdhury FR, Rahman A. Demographic profile of acute poisoning cases in Bangladesh: A hospital-based study. *J Forensic Leg Med.* 2021; 78:102122.
12. Hettiarachchi J, Kodithuwakku GC. Pattern of poisoning in rural Sri Lanka. *Int J Epidemiol.* 1989 Jun;18(2):418–22. doi: 10.1093/ije/18.2.418. PMID: 2767856.
13. Gargi J, Rai G. Retrospective autopsy study of poisoning in Punjab. *J Punjab Acad Forensic Med Toxicol.* 2021; 8: 17–9.
14. Celine TM, Antony J. Profile of acute poisonings: A retrospective study. *J Sci Soc.* 2022; 42:156–60.
15. Kumar SV, Venkateswarlu B. A study on poisoning cases in a tertiary care hospital. *J Nat Sci Biol Med.* 2023; 1(1):35–9.
16. Manigandaraj G, Visnu RJ, James RJ. Profile of Deaths due to Poisoning, Autopsied in Chennai – A Cross Sectional Study. *J Forensic Med Sci Law.* 2025; 34(1):10–15. doi: 10.59988/jfmsl.vol.34issue1.3
17. Kumar S, Gupta S, Bansal YS. Pulmonary histopathology in fatal paraquat poisoning. *Autopsy Case Rep.* 2021; 11:24.
18. Ahuja H, Mathai AS, Arora R. Acute poisonings admitted to ICU: A 5-year review. *J Clin Diagn Res.* 2021; 9(10):UC01.
19. Suresh MN, Reddy KY. Clinical profile and outcomes of rodenticide poisoning. *J Med Dent Sci.* 2020; 19(4):51–5.
20. Jain AK, Nigam M. Aluminium phosphide poisoning: Autopsy findings. *J Indian Acad Forensic Med.* 2020; 27(1):35–9.
21. Akhgari M, Mobaraki H. Cardiac lesions in methamphetamine poisoning. *DARU J Pharm Sci.* 2021; 25(1):1–9.
22. Deokar RB, Dere RC, Thube H. Recent Advances in Forensic Toxicology: Metabolomics and Toxicogenomics. *Journal of Indian Academy of Forensic Medicine.* 2025;47(3):223-224.
23. Deokar RB, Patil SS. Avenues in Forensic Medicine. *J Forensic Med Sci Law* 2023;32(2):1-3.
24. Deokar RB, Dere RC, Patil SS. Looking at Recent Evolution in Toxicology Through Legal Lens. *Journal of Indian Academy of Forensic Medicine.* 2025;47(1):7-11. doi:10.1177/09710973251371356
25. Adhikari SK, Chowdhuri S. Histopathological changes in pesticide poisoning. *Indian J Forensic Med Toxicol.* 2021; 15(2):1–5.