

A Comprehensive Autopsy-Based Study of Profile of Poisoning Cases Brought for Postmortem at Tertiary Hospital

Kshitiz Pal Singh¹, Akash Deep Aggarwal², Didar Singh Walia³,
Preetinder Singh⁴, Satinder Pal Singh⁵

¹Junior Resident, ²Professor, ^{3,4}Associate Professor, ⁵Assistant Professor, (Forensic Medicine),
Government Medical College, Patiala, Punjab.

How to cite this article: Kshitiz Pal Singh, Akash Deep Aggarwal, Didar Singh Walia et. al. A Comprehensive Autopsy-Based Study of Profile of Poisoning Cases Brought for Postmortem at Tertiary Hospital. Indian Journal of Forensic Medicine and Toxicology/Volume 20 No. 2, April-June 2026.

Abstract

Introduction: Poisoning is a leading cause of preventable mortality worldwide, with trends shaped by changing societal, environmental, and toxicological factors. This study examines poisoning-related fatalities in Patiala, Punjab, using autopsy data to identify patterns, demographic correlations, and toxicological profiles, aiming to inform preventive and intervention strategies.

Aims and Hypothesis: The study hypothesizes that poisoning trends are shifting due to the increased availability of hazardous substances and changing socio-economic pressures. It aims to analyze these trends and explore innovative approaches to mitigate poisoning-related mortality.

Materials and Methods: A descriptive prospective study was conducted over 1.5 years on 360 autopsy cases with alleged poisoning. Data was analyzed on parameters including demographic profiles, type of poison, route and timing of exposure, and the socio-environmental context of incidents. Statistical analysis, including Fisher's Exact Test, identified significant associations, with $p \leq 0.05$ considered significant.

Results: Among 360 cases, 301 (83.6%) were males, and 59 (16.4%) were females, with the highest incidence in the 21–30 years age group (30.56%). Aluminum phosphide was the most commonly detected poison (21.39%), followed by alcohol (11.11%). Suicide was the predominant manner of death (37.22%), strongly associated with aluminum phosphide, while alcohol was a key factor in accidental and overdose cases.

Innovative findings revealed that 29.44% of cases had pending toxicology reports, underscoring systemic delays that hinder timely legal and preventive interventions. Furthermore, most incidents (77.78%) involved oral ingestion, with 59.17% occurring in domestic settings, highlighting the need for stricter regulation and storage of household toxins. Seasonal analysis identified a significant spike in poisoning cases during the rainy season (43.61%), suggesting the role of agricultural practices and pesticide use during this period.

Conclusion: This study emphasizes the critical need for gender- and age-specific interventions, enhanced mental health services, and stricter regulations on toxic substances, particularly aluminum phosphide. Innovative measures, such as real-time toxicological diagnostics, community-based poison control programs, and educational campaigns targeting rural and urban populations, are essential to reduce the burden of poisoning-related mortality.

Keywords: Autopsy, Post-Mortem, Poisoning, Suicide, Toxicology

Corresponding Author: Preetinder Singh, Associate Professor (Forensic Medicine), Government Medical College, Patiala, Punjab.

E-mail: Preetinder.singh681@punjab.gov.in

Submission date: November 26, 2024

Acceptance date: August 11, 2025

Published date: April 23, 2026

This is an Open Access journal, and articles are distributed under a Creative Commons license- CC BY-NC 4.0 DEED. This license permits the use, distribution, and reproduction of the work in any medium, provided that proper citation is given to the original work and its source. It allows for attribution, non-commercial use, and the creation of derivative work.

Introduction

The term "poison" originates from the Latin word "poison," initially meaning a healthful drink, while "toxicology" derives from the Greek word "toxicon," referring to poisonous substances used on arrowheads. Poisons, whether liquid, solid, or gas, are defined as substances that cause injury or death when introduced to a living body in small amounts. Poisoning has been a known cause of death since ancient times, affecting all age groups and both sexes.^[1] Poisoning remains a significant public health issue worldwide, with an estimated 193,460 deaths occurring annually due to unintentional poisoning, as reported by the World Health Organization (WHO).^[2] In India, poisoning contributes to 20–30% of medico-legal autopsies, with substances such as pesticides, household chemicals, and pharmaceuticals being the most common agents.^[3] Regional variations exist, with rural areas reporting higher cases due to increased agricultural pesticide use, while urban areas see more poisoning from pharmaceuticals and household chemicals.^[4]

Modern poisoning trends have shifted due to the widespread use of insecticides, pesticides, cleaning acids, and hair dyes. Historically, substances like arsenic and copper sulfate were prevalent, but newer agents such as aluminum phosphide, alcohol, and carbamates are now common. Autopsies in suspected poisoning cases are conducted under strict medico-legal guidelines to determine cause of death and legal culpability.^[5, 6]

Poisoning can be categorized as suicidal, homicidal, or accidental, each requiring unique investigative approaches. Understanding regional poisoning trends is essential for improving management and reducing mortality.^[3, 7] This study focuses on poisoning-related fatalities in Patiala, Punjab, utilizing autopsy data to analyze patterns, demographic distributions, and causes, offering critical insights for better prevention and treatment strategies.

Materials & methods

This prospective study was conducted in the mortuary of the Department of Forensic Medicine

& Toxicology over a period of one and a half year. Total 360 cases were brought for autopsy with alleged history of poisoning. After receiving police inquest papers, they were examined to ascertain their inclusion in the study based on the following criteria:

Inclusion Criteria:

- Cases of deaths due to alleged poisoning.
- Cases with clinical / postmortem findings of poisoning were included.

Exclusion Criteria:

- Cases in which there was no alleged history of poisoning
- Cases with no clinical / postmortem findings suggestive of poisoning.

Subsequently the details of the cases were entered into a predetermined proforma and the data was collected. The data was subjected to descriptive statistical analysis and was tabulated as results and observations in tabular form, graphs, and charts. Fisher's Exact Test was used to gauge if there was a statistically significant difference between the proportions of the categories in two group variables. A p-value less than or equal to a predetermined significance level (0.05) indicated a statistically significant result, meaning the observed data provide strong evidence against the null hypothesis.

Results and Discussion

In our study, out of a total of 360 cases, 301 were males (83.6%) and 59 were females (16.4%). The highest incidence of poisoning was observed in the 21-30 years age group, comprising 30.56% of the total cases. The most common poison detected was aluminum phosphide, accounting for 21.39% of cases, followed by alcohol at 11.11%. A significant portion of cases (29.44%) remained pending for poison detection due to delayed receiving of chemical examination reports. Suicide was the leading manner of death, predominantly associated with aluminum phosphide poisoning. Drug overdose cases were largely linked to alcohol.

Table 1: Distribution of poisoning cases in relation to type of poison, age group and gender ($X^2=71.501$, $p=0.022$)

Age Groups (years)	Alcohol		Aluminum Phosphide		No Poison Detected		Oleandrin		OPC		Opium		Paraquet		Phenyl		Snake Bite		Pending	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1-10	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11-20	7	0	1	2	1	0	0	0	1	1	2	1	0	1	1	1	5	0	4	5
21-30	5	1	17	4	11	2	0	0	7	1	8	0	4	1	0	2	9	0	27	11
31-40	12	0	23	3	7	3	0	1	3	1	2	0	1	0	1	1	4	2	27	3
41-50	6	0	13	1	7	2	0	0	1	0	5	0	1	0	3	0	6	1	18	2
51-60	5	0	6	1	7	0	0	0	4	0	1	0	0	0	1	0	2	0	4	1
61-70	3	0	4	1	0	0	0	0	0	0	0	0	2	0	0	0	1	2	3	1
71-80	1	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Total	39	1	65	12	37	7	0	1	16	3	18	1	8	2	6	4	29	5	83	23

Table 2: Shows various parameters studied in the present study

Variables		Total (N=360)	
		n	%
Route of exposure	Bite	37	10.28%
	Inhalation	6	1.67%
	Intravenous	13	3.61%
	Oral	280	77.78%
	Unknown	24	6.67%
Gender	Female	59	16.39%
	Male	301	83.61%
Time of intake	Day Time	173	48.06%
	Evening Time	26	7.22%
	Night Time	161	44.72%
Marital status	Divorced	1	0.28%
	Married	248	68.89%
	Separated	2	0.56%
	Unmarried	106	29.44%
	Widower	1	0.28%
	Unknown	2	0.56%
Manner of death	Accidental	46	12.78%
	Drug Overdose	75	20.83%
	Homicide	10	2.78%
	Insect Bite	4	1.11%
	Snake Bite	33	9.17%
	Suicide	134	37.22%
	Not Know	58	16.11%
Duration of survival	0 Days	134	37.22%
	1-5 Days	213	59.17%
	6-10 Days	10	2.78%
	>10 Days	3	0.83%

Cont.....

Site of Incident	Home	213	59.17%
	Field	72	20%
	Outside	66	18.33%
	Jail	7	1.94%
	Hostel	1	0.28%
	Shop	1	0.28%

Suicide emerged as the most prevalent manner of death, accounting for 37.22% of cases. The study showed a significant gender association with young males being more affected. Seasonally, most cases occurred during the rainy season (43.61%), followed by summer (20.28%). The predominant route of

exposure was oral ingestion, accounting for 77.78% of cases. Daytime ingestion accounted for the majority of cases at 48.06%, followed by night-time incidents at 44.72%, and evening incidents at 7.22%. Most of deaths occurred within 1-5 days of ingestion (59.17%). Site of incident is mostly at home (59.17%).

Study Location	Year	Common poison	Age group (years)	Gender	Marital status	Route	Suicidal
Present study	2022-23	Aluminum phosphide 21.39%	21-30	Male 83.6%	Married 68.9%	Oral 77.78%	37.22%
Chandigarh ^[8]	1999	Aluminum phosphide 65%	14-30	Male	Married 57.5%	Oral 69.21%	46.29
Rohtak,Haryana ^[9]	1995	Aluminum phosphide 67.8%	11-20	Male	Married	Oral 87.91%	91.4%
Amritsar,Punjab ^[10]	2001	Organophosphorus comp 52.7%	21-30	Male	Married	Oral	61.2%
Yavatmal,Maharashtra ^[11]	2003	Aluminum phosphide 55.4%	21-30	Male	Married 63%	Oral 72%	63.4%
Ludhiana,Punjab ^[12]	2015	Organophosphorus comp 34%	21-40	Male	---	Oral 95%	94%
Kota,Rajasthan ^[13]	2016	Organophosphorus comp 17.39%	21-30	Male 61.7%	Married 55.27%	Oral 42%	79.82%
Udaipur,Rajasthan ^[14]	2020	Aluminum phosphide 37.47%	21-30	Males 54.6%	---	Oral 38%	---
Lucknow,Uttar Pradesh ^[15]	2023	Snake bite 26.1%	21-30	Males 63.2%	Married 57.5%	Oral	78%
Chandigarh ^[3]	2002	Aluminum phosphide 18.9%	21-30	Males 69.9%	Married 60.40%	Oral	78.1%
Bengaluru,Karnataka ^[16]	2018	Medications 51.6%	21-30	Females 52.6%	Married 49.6%	Oral 81.2%	69.1%
Linkoping,Sweden ^[17]	2004	Propoxyphene	40-50	Females 51%			44%

The table presents a comparative analysis of poisoning cases across various regions and years, focusing on common poisons, demographics, route and manner of death in poisoning cases. Aluminum phosphide and organophosphorus compounds were the most frequently reported poisons in India, while medications and propoxyphene were significant

in urban and international studies. The 21-30 age group emerged as the most affected in most studies, with males being predominantly impacted, except in Bengaluru and Linkoping, where females' cases were more prevalent. A considerable proportion of cases involved married individuals, and oral ingestion was the predominant route of poisoning in various

studies. The proportion of suicidal cases varied significantly. These findings underscore regional differences and patterns in poisoning incidents, emphasizing the need for tailored prevention and intervention strategies.

Conclusion

This comprehensive study on poisoning cases autopsy reveals critical insights into the patterns and disparities associated with such incidents, underscoring the necessity for targeted interventions and a multifaceted approach to mitigate risks and reduce mortality. The findings indicate a higher incidence of poisoning cases among males and young adults, suggesting the need for gender-specific strategies and focused educational campaigns to raise awareness about the dangers of poisoning and preventive measures. The study also reveals a significant number of cases being suicides, underscoring the urgent need for improved mental health services. Strengthening mental health infrastructure, providing counselling and support services, and implementing stricter regulations on sale of hazardous substances can help prevent such incidents.

Competing interests: The authors declare no competing interests.

Funding Sources: no

Ethical Clearance: Taken vide letter number BFUHS/2K21p/TH/11161 Dated 22.5.2024. from Baba Farid University of health sciences

References

- Vijay V, Kumar P. Socio-demographic profile of deaths due to poisoning at a tertiary care hospital in Bangalore. *Indian J Forensic Med Toxicol.* 2021;15(1):678–83.
- World Health Organization. Poisoning prevention and management [Internet]. WHO; 2021 [cited 2024 Jan 15]. Available from: <https://www.who.int/news-room/fact-sheets/detail/poisoning-and-its-prevention>
- Sharma BR, Harish D, Sharma V, Vij K. Poisoning in Northern India: Changing trends, causes, and prevention measures. *Med Sci Law.* 2002;42(3):251–7.
- Singh B, Unnikrishnan B. A profile of acute poisoning at a tertiary care hospital in coastal Karnataka. *Indian J Community Med.* 2006;31(2):111–4.
- Parikh CK. *Parikh's textbook of medical jurisprudence, forensic medicine, and toxicology for classrooms and courtrooms.* 8th ed. New Delhi: CBS Publishers; 2019.
- Indian Penal Code [Internet]. 1860 [cited 2025 Jan 12]. Available from: <http://indiacode.nic.in/handle/123456789/12850>
- Pillay VV. *Modern medical toxicology.* 4th ed. New Delhi: Jaypee Brothers; 2013.
- Singh D, Jit I, Tyagi S. Changing trends in acute poisoning in Chandigarh zone: a 25-year autopsy experience from a tertiary care hospital in northern India. *Am J Forensic Med Pathol.* 1999;20(2):203–10.
- .Siwach SB, Gupta A. The profile of acute poisonings in Haryana – Rohtak study. *J Assoc Physicians India.* 1995;43(11):756–9.
- Gorea RK, Dalal JS, Gargi J, Rai H. Pattern of poisoning in Punjab. *J Punjab Acad Forensic Med Toxicol.* 2001;1(1):6–8.
- Batra AK, Keoliya AN, Jadhav GU. Poisoning: an unnatural cause of morbidity and mortality in rural India. *J Assoc Physicians India.* 2003;51:955–9.
- Ahuja H, Mathai AS, Pannu A, Arora R. Acute poisonings admitted to a tertiary-level intensive care unit in northern India: patient profile and outcomes. *J Clin Diagn Res.* 2015;9(10):UC01–4.
- Khosya S, Meena SR. Current trends of poisoning: an experience at a tertiary care hospital in the Hadoti region, Rajasthan, India. *J Clin Toxicol.* 2016;6(2):1–7.
- Bhagora LR, Kumar S. Pattern of poisoning cases at a tertiary care center at Geetanjali Medical College & Hospital, Udaipur. *Medico Leg Update.* 2020;20(4):297–300.
- Aggarwal N, Sawlani KK, Chaudhary SC, Usman K, Dandu H, Atam V, et al. Study of pattern and outcome of acute poisoning cases at a tertiary care hospital in North India. *J Fam Med Prim Care.* 2023;12(9):2047–52.
- Revathi D, Reddy S, Prasanna VL, Ramesh AC. Patterns of acute poisoning among patients treated in the emergency wards of a tertiary care hospital: a cross-sectional study. *Asian J Pharm Clin Res.* 2018;11(11):270–5.
- Jönsson A, Holmgren P, Ahlner J. Fatal intoxications in Swedish forensic autopsy material during 1992–2002. *Forensic Sci Int.* 2004;143(1):53–9.