

A Comparative Clinico-Forensic Analysis of Suicidal and Accidental Poisoning in a Tertiary Healthcare Setting

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ABSTRACT

Background: Poisoning is a significant cause of emergency department visits and medico-legal cases, particularly in developing regions where toxic substances are easily accessible. Differentiating between suicidal and accidental poisoning is essential, as intent influences clinical management, prognosis, and legal interpretation.

Objectives: To comparatively evaluate the clinico-forensic profile of suicidal and accidental poisoning cases and to identify key distinguishing factors.

Materials and Methods: This prospective observational study was conducted over one year at a tertiary care centre in Jaipur, including 162 patients presenting with poisoning. Data was collected using a structured format covering demographic details, nature of exposure, toxic agents involved, clinical features, treatment, and outcomes. Classification into suicidal or accidental categories was based on clinical assessment supported by medico-legal findings.

Results: Among the cases, 67.3% were suicidal and 32.7% accidental. Suicidal poisoning was more common in individuals aged 18–40 years, whereas accidental poisoning predominated among children and the elderly. Organophosphorus compounds and drug overdoses were the leading agents in suicidal cases. In contrast, accidental poisoning was mainly associated with household chemicals, hydrocarbons such as kerosene, and carbon monoxide exposure. Delayed hospital presentation and comparatively

poorer outcomes were more frequently observed in suicidal cases.

Conclusion: The study demonstrates clear differences in demographic characteristics, exposure patterns, and outcomes between suicidal and accidental poisoning. Early identification of these distinctions can support timely clinical intervention and accurate medico-legal evaluation. Preventive efforts should focus on restricting access to hazardous substances and promoting public awareness regarding safe handling and storage practices.

Keywords: Poisoning, Suicidal, Accidental, Clinico-Forensic, Organophosphorus, Medico-Legal.

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Article History:

Received: 27-07-2018, Revised: 24-08-2018, Accepted: 23-09-2018

Access this article online

Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.5.096	

INTRODUCTION

Poisoning continues to represent a major challenge for healthcare systems and forensic services worldwide.^{1,2} It contributes substantially to emergency admissions and often requires medico-legal investigation³, particularly in countries where exposure to toxic substances is common. In developing nations such as India, the burden is amplified by factors including widespread use of agricultural chemicals, rapid urbanization, and limited awareness regarding the safe handling and storage of potentially harmful substances.^{4,5}

The clinical spectrum of poisoning is broad, ranging from mild and reversible symptoms to severe, life-threatening complications, thereby necessitating prompt recognition and appropriate management.^{6,7} From a medico-legal perspective, determining the intent behind poisoning is of considerable importance.⁸ Based on

the manner of exposure, poisoning is generally categorized as suicidal, accidental, or, less frequently, homicidal. Among these, intentional self-poisoning constitutes a significant proportion of cases encountered in tertiary care settings.^{9,10} Such cases are often associated with underlying psychosocial stressors, including financial difficulties, academic pressure, mental health disorders, and interpersonal conflicts. In contrast, accidental poisoning typically results from unintended exposure, such as ingestion of household chemicals, occupational hazards, environmental toxins, or inappropriate use of medications.^{11,12}

Accurate differentiation between suicidal and accidental poisoning is essential but can be challenging in clinical practice. Patient history may be incomplete, unreliable, or intentionally misleading, especially in cases involving self-harm. In such situations,

clinicians must rely on a combination of clinical findings, circumstantial evidence, and medico-legal documentation to establish the manner of poisoning. This distinction is crucial, as it influences not only immediate medical management but also decisions regarding psychiatric evaluation, long-term follow-up, and legal proceedings.

The pattern of poisoning varies considerably depending on geographic, socio-economic, and cultural factors. In predominantly agrarian regions, pesticides—particularly organophosphorus compounds—are frequently implicated in cases of intentional poisoning due to their easy availability.^{13,14} Pharmaceutical agents, including sedatives and analgesics, are also increasingly involved, reflecting changing access to medications.¹⁵ On the other hand, accidental poisoning is more commonly associated with substances encountered in domestic environments, such as cleaning agents, hydrocarbons like kerosene, and gases such as carbon monoxide.¹⁶ Children and elderly individuals are especially vulnerable to such exposures due to inadequate supervision, unsafe storage practices, or age-related factors.

Understanding these patterns is important for both clinical and preventive purposes.^{17,18} Early identification of the likely intent behind poisoning can aid in risk stratification, timely intervention, and improved patient outcomes. Additionally, recognizing commonly involved toxic agents can guide regulatory measures and public health strategies aimed at reducing exposure.

Despite the significance of this issue, there is a relative scarcity of studies that directly compare suicidal and accidental poisoning within a single institutional framework using a combined clinical and forensic approach.^{19,20} Many existing studies focus on isolated aspects such as epidemiology or treatment outcomes, without integrating medico-legal considerations. A comprehensive comparative analysis can help identify distinguishing features that facilitate early classification and more effective management. The present study was undertaken at a tertiary care centre in Jaipur to examine the clinico-forensic profile of poisoning cases over a one-year period. By comparing demographic characteristics, types of toxic agents, clinical presentation, and outcomes between suicidal and accidental cases, the study aims to identify key differences that may enhance diagnostic accuracy, improve patient care, and support appropriate medico-legal interpretation.

AIMS AND OBJECTIVES

Aim

To conduct a comparative clinico-forensic analysis of suicidal and accidental poisoning cases presenting to a tertiary healthcare centre.

Objectives

1. To study the demographic profile of patients with poisoning in terms of age, sex, and residence.
2. To classify poisoning cases into suicidal and accidental categories based on clinical and medico-legal assessment.
3. To identify and compare the types of toxic agents involved in both groups.
4. To evaluate the clinical presentation and severity of poisoning in relation to the manner of exposure.
5. To assess the time interval between exposure and hospital presentation and its association with outcome.
6. To compare treatment patterns and clinical outcomes between suicidal and accidental poisoning cases.
7. To determine statistically significant differences between the two groups and identify factors associated with suicidal poisoning.

MATERIALS AND METHODS

Study Design: This was a prospective observational comparative study.

Study Setting: The study was conducted at the National Institute of Medical Sciences (NIMS), Jaipur, a tertiary care teaching hospital, in collaboration with the Departments of Forensic Medicine and Emergency Medicine.

Study Duration: The study was carried out over a period of one year.

Study Population: All patients presenting with alleged or confirmed poisoning to the emergency department during the study period were considered for inclusion.

Sample Size: A total of 162 consecutive cases of poisoning fulfilling the inclusion criteria were included in the study.

Inclusion Criteria: Patients of all age groups and both sexes presenting with history or clinical features suggestive of poisoning and admitted during the study period were included. Cases with adequate clinical and medico-legal documentation were considered.

Exclusion Criteria: Cases of food poisoning and envenomation were excluded. Patients with uncertain diagnosis or incomplete records were not included. Brought-dead cases without reliable history and cases where adequate information could not be obtained were also excluded.

Data Collection: Data was collected using a pre-designed and pre-tested proforma. Information recorded included demographic details such as age, sex, residence, and occupation; circumstances of poisoning including place, time, and alleged manner; type of toxic agent involved; clinical features at presentation; time interval between exposure and hospital arrival; details of treatment administered; and final outcome.

Medico-legal case records were reviewed, and relevant information from police documents was considered wherever available to support the clinical history.

Classification of Cases: Cases were categorized as suicidal or accidental poisoning based on a combination of history provided by the patient or relatives, circumstantial evidence, clinical findings, and medico-legal opinion documented at the time of examination.

Statistical Analysis: Data was entered into Microsoft Excel and analyzed using statistical software such as SPSS. Descriptive statistics were expressed as mean, standard deviation, frequencies, and percentages. Comparative analysis between groups was performed using the chi-square test for categorical variables and Student's t-test for continuous variables where applicable. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Approval of the study was obtained from the Institutional Ethics Committee of NIMS, Jaipur. Confidentiality of patient data was maintained throughout the study. As this was an observational study based on routinely collected clinical information, consent was obtained where required in accordance with institutional guidelines. The study was conducted in accordance with accepted ethical standards for biomedical research involving human participants.

RESULTS

A total of 162 cases of poisoning were included in the study. Of these, 109 cases (67.3%) were suicidal and 53 cases (32.7%) were accidental in nature.

Demographic Profile

The majority of cases were observed in the 18–40 years age group. Suicidal poisoning predominated in young adults, whereas accidental poisoning was more common among children and elderly individuals.

Type of Poison

Organophosphorus compounds were the most common agents in suicidal poisoning, whereas accidental cases were mainly due to household chemicals and hydrocarbons.

Time Interval Between Exposure and Hospital Presentation

Delayed presentation was more frequently observed in suicidal poisoning cases.

Clinical Outcome

Most patients recovered; however, complications and mortality were higher among suicidal poisoning cases.

Summary

Suicidal poisoning was predominantly seen in young adults and was commonly associated with organophosphorus compounds and delayed presentation. Accidental poisoning was more frequent among children and elderly individuals and involved household substances. Although mortality was higher in suicidal cases, the difference was not statistically significant.

Table 1: Age-wise Distribution of Poisoning Cases

Age Group (years)	Suicidal (n=109)	Accidental (n=53)	Total (n=162)	χ^2 value	p-value
<18	12 (11.0%)	18 (34.0%)	30 (18.5%)	18.72	0.0003
18–40	68 (62.4%)	15 (28.3%)	83 (51.2%)		
41–60	22 (20.2%)	12 (22.6%)	34 (21.0%)		
>60	7 (6.4%)	8 (15.1%)	15 (9.3%)		

Table 2: Gender Distribution

Gender	Suicidal (n=109)	Accidental (n=53)	Total	χ^2 value	p-value
Male	61 (56.0%)	34 (64.2%)	95	1.02	0.31
Female	48 (44.0%)	19 (35.8%)	67		

Table 3: Type of Poisoning Agent

Type of Poison	Suicidal (n=109)	Accidental (n=53)	Total	χ^2 value	p-value
Organophosphorus	48 (44.0%)	9 (17.0%)	57	16.85	0.004
Drug overdose	21 (19.3%)	6 (11.3%)	27		
Household chemicals	16 (14.7%)	18 (34.0%)	34		
Kerosene/hydrocarbons	11 (10.1%)	11 (20.8%)	22		
Carbon monoxide	5 (4.6%)	6 (11.3%)	11		
Others	8 (7.3%)	3 (5.6%)	11		

Table 4: Time to Hospital Presentation

Time Interval	Suicidal (n=109)	Accidental (n=53)	Total	χ^2 value	p-value
<2 hours	28 (25.7%)	25 (47.2%)	53	8.96	0.011
2–6 hours	51 (46.8%)	18 (34.0%)	69		
>6 hours	30 (27.5%)	10 (18.8%)	40		

Table 5: Outcome of Poisoning Cases

Outcome	Suicidal (n=109)	Accidental (n=53)	Total	χ^2 value	p-value
Recovered	85 (78.0%)	47 (88.7%)	132	4.62	0.099
Complications	12 (11.0%)	4 (7.5%)	16		
Death	12 (11.0%)	2 (3.8%)	14		

DISCUSSION

The findings of this study reinforce the significant role of poisoning as both a public health issue and a medico-legal concern, particularly in settings where access to toxic substances is relatively unrestricted.^{1,2} A higher proportion of cases in the present study were attributed to intentional self-harm, which aligns with trends observed in hospital-based data from similar regions.^{8,13} This contrasts with patterns reported in more

developed settings, where accidental exposures and drug-related toxicity are more frequently encountered.

Age distribution revealed that young adults constituted the majority of suicidal poisoning cases.^{9,14} This trend may reflect the vulnerability of this age group to psychosocial stressors such as academic challenges, unemployment, and interpersonal conflicts. On the other hand, accidental poisoning was more commonly seen among children and older individuals.^{11,15} In children, unsafe

storage of chemicals plays a major role, whereas in the elderly, factors such as multiple drug use and cognitive decline may increase risk. Gender distribution in the study showed a slight predominance of males, although the difference was not statistically meaningful.^{5,10} This observation may be related to occupational exposure and behavioral factors, though changing social patterns could influence future trends. The type of toxic agents involved differed clearly between the two groups. Substances used in agriculture, particularly organophosphorus compounds^{13,20}, were frequently associated with intentional poisoning, reflecting their accessibility in rural areas. Medication overdose was another notable contributor. In contrast, accidental cases were largely linked to domestic products such as cleaning agents, fuel substances, and exposure to gases, which are commonly encountered in everyday environments.^{16,18}

A notable finding was the delay in seeking medical care among individuals with suicidal poisoning. This delay could be due to intentional concealment or lack of immediate assistance, and it may contribute to worse clinical outcomes.^{17,19} Accidental cases, especially those involving children, were more likely to receive prompt attention, resulting in comparatively better recovery rates.

Although mortality and complication rates were higher in the suicidal group, the statistical significance was limited. Nevertheless, the trend suggests that intentional poisoning often involves more harmful substances or larger quantities, combined with delayed treatment.

Overall, the study highlights the importance of integrating clinical observations with forensic evaluation when assessing poisoning cases. Preventive strategies should include restricting access to highly toxic substances, improving mental health support systems, and promoting awareness about safe storage and handling of potentially harmful agents.¹⁸

CONCLUSION

This study highlights distinct differences between suicidal and accidental poisoning in terms of age distribution, type of toxic agents involved, timing of medical intervention, and clinical outcomes. Intentional poisoning was predominantly seen in young adults and commonly involved agricultural chemicals and medications, often accompanied by delayed presentation and less favorable outcomes. In contrast, accidental poisoning was more frequent among children and older individuals and was mainly linked to household substances and environmental exposures.

Understanding these variations is important for accurate clinical evaluation as well as proper medico-legal classification. The findings emphasize the need for a comprehensive approach that includes improved control over access to hazardous substances, early identification of individuals at risk of self-harm, and increased public education on safe handling and storage practices.

Further research involving multiple centres and larger populations would help validate these findings and support the development of more effective prevention and management strategies.

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Source of Support: Nil.

Conflict of Interest: None Declared.

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Cite this article as: Manish Goyal. A Comparative Clinico-Forensic Analysis of Suicidal and Accidental Poisoning in a Tertiary Healthcare Setting. *Int J Med Res Prof*. 2018 Sept; 4(5): 398–401. DOI:10.21276/ijmrp.2018.4.5.096