

Study on Demographic Patterns and Clinical Outcomes of Acute Poisoning in a Tertiary Hospital Setting

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Abstract:

Introduction: Acute poisoning is a major global health concern, often resulting from exposure to agricultural chemicals, pharmaceuticals, or household agents. Its pattern is shaped by socioeconomic, geographic, and occupational factors. Outcomes depend on the type of poison, time to intervention, and quality of care, emphasizing the need for early diagnosis and effective management.

Material and Methods: This prospective observational study included patients over 12 years with acute poisoning presenting to the emergency or ICU. Detailed histories, clinical assessments, and lab investigations were performed. Management included standard protocols, and outcomes were recorded. Data were analyzed using appropriate statistical methods for clinical correlations.

Results: Out of 120 patients, the highest incidence of acute poisoning was noted in the 21–30 years age group (33.3%), followed closely by the 12–20 years group (32.5%). Males comprised 59.2% (n=71) of cases, while females accounted for 40.8% (n=49). Occupationally, students were the most affected group (34.2%), followed by private jobholders (26.7%) and housewives (20.8%). Among 78 suicidal poisoning cases, the most common reason was unknown (50%), followed by family conflict (31.6%) and psychiatric illness (6.6%). The most frequently consumed poisons were organophosphates (13.3%), insecticides (10.8%), and aluminium phosphide (9.2%). Other agents included herbicides (5.8%), snakebites (7.5%), and drug overdoses (5%). Discharge was the outcome in 84.2% of cases, with a mortality rate of 15.8%. Patients presenting within 2 hours had an 84% discharge rate, while those arriving between 2–4 hours and after 4 hours had slightly lower or similar survival outcomes.

Conclusion: The study underscores the predominance of intentional poisoning among the young population, with agrochemical exposure being a major contributor. Early medical intervention significantly improves survival, emphasizing the need for timely access to emergency care and preventive mental health strategies.

Keywords: Acute poisoning, Organophosphates, Suicidal ingestion, Young adults, Clinical outcome.

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Introduction

Acute poisoning remains a significant public health issue worldwide, contributing to substantial morbidity and mortality across all age groups. [1] It encompasses a wide range of exposures to toxic substances including household chemicals, pharmaceuticals, pesticides, industrial agents, and natural toxins. The clinical presentation of poisoning varies depending on the agent involved, dose, route of exposure, and individual susceptibility, ranging from mild symptoms to life-threatening complications. [2]

In many cases, poisoning is preventable, yet it continues to be a leading cause of emergency department visits and hospital admissions. [3] The pattern of poisoning is influenced by multiple factors such as geographic location, socioeconomic status, occupation, cultural practices, and

accessibility of toxic substances. [4] For instance, in agricultural communities, pesticide exposure may be more prevalent, whereas in urban settings, overdoses involving pharmaceutical drugs or household cleaning agents may be more common. [5] Moreover, the intent behind poisoning—whether accidental, suicidal, or homicidal—plays a critical role in clinical assessment and management.

The outcome of acute poisoning depends largely on the type and quantity of the substance ingested, time to presentation, availability of antidotes, and the adequacy of supportive care. [6] Advances in toxicology, critical care medicine, and decontamination techniques have significantly improved survival rates, yet challenges remain, especially in cases involving mixed drug ingestion

or delayed intervention. Timely diagnosis, risk stratification, and standardized treatment approaches remain pivotal in improving patient outcomes and reducing fatality rates. [7]

Material and Methods

This observational, prospective study was conducted over a defined period among patients presenting with acute poisoning. All individuals presenting to the medical emergency department and intensive care unit (ICU) with a confirmed or suspected history of acute poisoning were enrolled after fulfilling the inclusion and exclusion criteria. Written informed consent was obtained from either the patient or their legally authorized representative. Ethical clearance was obtained from the institutional ethics committee prior to the commencement of the study.

All patients aged above 12 years with a known or suspected history of acute poisoning, confirmed either through history, clinical presentation, or toxicological evidence, were included in the study. Patients with chronic poisoning, snake or scorpion bites, food poisoning, and envenomation were excluded. A detailed clinical history was taken regarding the type of poison, route and time of exposure, possible intent (accidental, suicidal, or homicidal), and any first aid measures received before arrival at the hospital. A thorough clinical examination was performed for each patient, and relevant laboratory investigations including complete blood count, renal and liver function tests, serum electrolytes, arterial blood gas analysis, and toxicology screens were conducted as per the case requirement. The severity of poisoning was assessed using standard clinical scales such as the

Poisoning Severity Score (PSS) or Glasgow Coma Scale (GCS) where applicable. The need for ICU care, ventilatory support, and specific antidotal therapy was also documented.

Patients were managed according to standard treatment protocols, which included gastric lavage, activated charcoal administration, antidotes where indicated, and supportive care. Those with severe presentations were shifted to the intensive care unit for advanced monitoring and intervention. All patients were followed throughout their hospital stay to document the clinical course, complications, length of hospital stay, and final outcome (recovery, discharge, referral, or death).

Data were collected using a structured case record form and later compiled in a master chart for analysis. Descriptive statistics such as mean, median, and standard deviation were used for continuous variables, while proportions and percentages were calculated for categorical data.

Comparative analysis was performed to evaluate correlations between type of poison, mode of exposure, need for ICU care, and clinical outcomes using appropriate statistical tests. A p-value of less than 0.05 was considered statistically significant.

Results

In our study, acute poisoning was most common among young adults, with the highest incidence in the 21–30 years (33.3%) and 12–20 years (32.5%) age groups. (Fig 1) The proportion declined with increasing age. Males were more affected (59.2%) than females (40.8%), indicating a male predominance in poisoning cases.

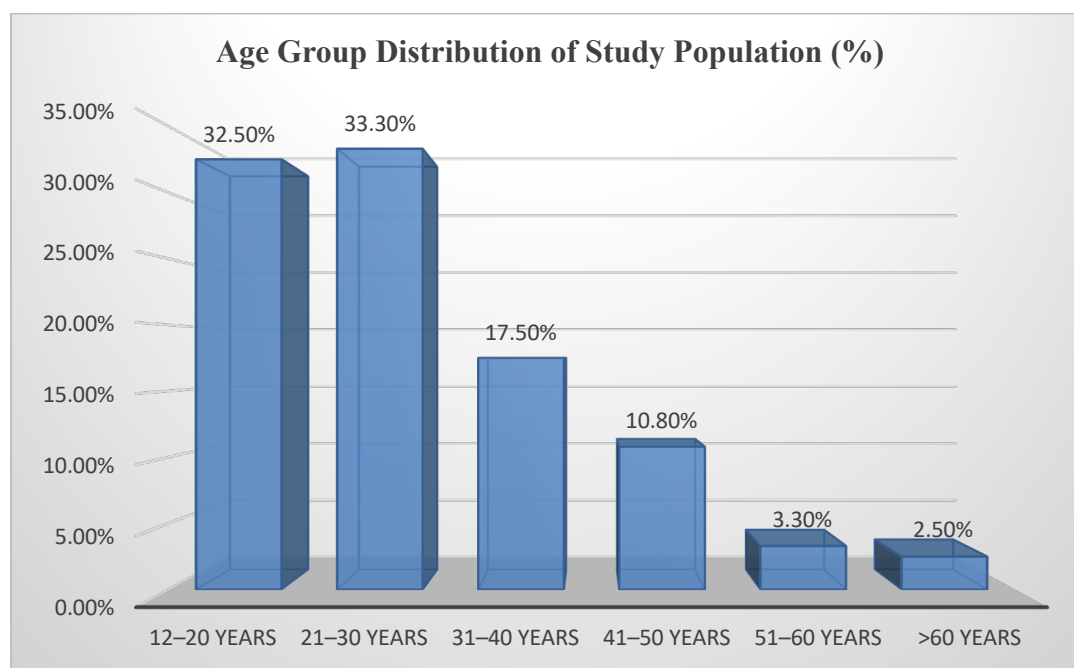


Figure 1: Age Group Distribution of Study Population (%)

In our study, the most common occupation among patients was student, accounting for 34.2% (n=41) of the study population, followed by individuals engaged in private jobs (26.7%, n=32). Housewives formed the next major group, comprising 20.8% (n=25) of the cases. Patients involved in agriculture

constituted 8.3% (n=10), while labourers represented 2.5% (n=3).

A smaller proportion of patients were unemployed (4.2%, n=5), working in government jobs (0.8%, n=1), or belonged to the others category (1.7%, n=2).

Table 1: Reasons for Consuming Poison in Suicidal Cases (n = 78)

Reason for Poisoning	Frequency (n)	Percentage (%)
Unknown	39	50.0%
Family conflict	25	31.6%
Known psychiatric illness	5	6.6%
Financial issues	4	5.1%
Stress related to studies	3	3.8%
Unemployed	3	3.8%
Total	78	100%

In our study, the most commonly consumed poisons were organophosphates (13.3%), insecticides (10.8%), and aluminium phosphide (9.2%), aligning with the agricultural nature of the region. Herbicides (5.8%) and fungicides (4.2%) also contributed notably, reflecting the increased use of mixed agrochemicals in rural poisonings.

Snakebites accounted for 7.5% of cases. Among pharmaceutical exposures, drug overdoses (5%) and sedative-hypnotics (3.3%) were reported. Additionally, poisoning from household cleaners and alcohol represented emerging concerns. (Table 2)

Table 2: Type of Poison Consumed (n = 120)

Type of Poison	Frequency (n)	Percentage (%)
Organophosphate	16	13.3%
Insecticide	13	10.8%
Aluminium phosphide / Celphos	11	9.2%
Herbicides (e.g., Paraquat)	7	5.8%
Fungicides	5	4.2%
Snakebite	9	7.5%
Drug overdose (psychiatric + others)	6	5.0%
Corrosive / Acid / Phenol	6	5.0%
Household cleaning agents	4	3.3%
Sedative-hypnotics	4	3.3%
Alcohol (ethanol)	3	2.5%
Methanol	2	1.7%
Miscellaneous	4	3.3%
Unknown	30	25.0%
Total	120	100%

In our study, discharge was the most frequent outcome, observed in 84.2% (n=101) of the patients, while mortality was reported in 15.8% (n=19). When analyzing the association of time lapse with clinical outcome, it was noted that patients reaching the hospital within 2 hours had

the highest survival rate (84.2%), reinforcing the importance of early medical intervention.

The mortality rates were slightly higher among those presenting after 2 to 4 hours (19.4%) and comparable in patients presenting after 4 hours (15.8%). (Table 3)

Table 3: Association of Time Lapse with Outcome (n = 120)

Time Lapsed in Reaching Hospital	Discharge (n, %)	Expired (n, %)	Total (n)
≤2 hours	63 (84.0%)	12 (16.0%)	75
>2 to 4 hours	15 (78.9%)	4 (21.1%)	19
>4 hours	23 (85.2%)	4 (14.8%)	27
Total	101 (84.2%)	19 (15.8%)	120

Discussion

In our study, acute poisoning was most prevalent among individuals aged 21–30 years (33.3%) and 12–20 years (32.5%), with a male predominance (59.2%). This pattern is consistent with Sharma et al. (2019), who reported that 41.3% of poisoning cases occurred in the 21–30 age group, identifying young adulthood as a critical risk period for toxic exposures. Pannu et al. [8] similarly observed that 63.2% of their cases were male with a median age of 28 years, supporting the notion that younger, predominantly male individuals are more prone to impulsive behavior and occupational exposure to poisons. Rajbanshi et al. [9] also found that the majority of poisoning cases involved young males, suggesting a link between male gender, psychosocial stress, and access to lethal substances. In agreement, Chatterjee et al. [10] noted that male dominance in poisoning may stem from risk-taking behavior and socioeconomic responsibilities, further highlighting the need for targeted awareness campaigns among youth.

In our study, students comprised the largest occupational group (34.2%), followed by private jobholders (26.7%) and housewives (20.8%), a trend reflective of both academic and domestic stress environments. Khan et al. [11] from Karachi highlighted the significant representation of young students and urban working populations in poisoning incidents, especially those involving psychiatric drug overdoses. Sathvika Reddy et al. [12] also reported a predominance of literate, urban, and married individuals, often homemakers and wage workers, aligning with the occupational and sociodemographic pattern seen in our findings. In rural and agrarian regions, poisoning is often linked to pesticide exposure among farmers, but the relatively low percentage of agricultural workers (8.3%) in our study suggests a broadening demographic scope, likely due to increased urbanization. This diversification highlights that prevention strategies should not only target farmers but also students, working professionals, and housewives who may be silently experiencing psychological distress or socio-economic pressures.

Among the 78 suicidal poisoning cases in our study, the most common reasons were unknown (50%) and family conflict (31.6%), followed by psychiatric illness (6.6%) and financial stressors (5.1%). This reflects a common pattern across studies, where many suicidal attempts lack clearly identified motives at the time of hospital admission. Nigussie et al. [13] emphasized that intentional poisoning was significantly associated with worse outcomes and often underreported psychiatric symptoms. Mehrpour et al. [14] reported that over one-third of poisoning cases were suicide attempts, with many linked to undiagnosed mental health disorders. Pannu et al. [8] and Ahuja et al. [15]

both recognized that self-harm and interpersonal conflict were predominant causes of suicidal poisoning, particularly in rural and peri-urban populations. The high rate of unknown reasons in our study may reflect barriers to effective communication, stigma, or altered sensorium on presentation, underscoring the need for improved psychiatric evaluation and counseling integration into emergency toxicology care. Our study identified organophosphates (13.3%), insecticides (10.8%), and aluminium phosphide (9.2%) as the leading agents of poisoning, in keeping with agricultural exposure risks in India. These findings closely parallel those of Sharma et al. [16], where 61.4% of poisonings involved insecticides and pesticides, and Rajbanshi et al. [9], who found organophosphorus compounds to be the dominant toxic agent in ICU admissions. Pannu et al. [8] also found pesticides—especially cholinesterase inhibitors and aluminium phosphide—to be the most common culprits. Interestingly, while snakebites (7.5%) and drug overdoses (5%) were also notable in our study, similar patterns were reported by Chatterjee et al. [10], who documented a high burden of snakebites and corrosive ingestion. Khan et al. [11] highlighted the increasing incidence of drug-related poisonings, especially sedatives and psychiatric medications, in urban populations. Our inclusion of alcohol, sedative-hypnotics, and household chemicals reflects evolving toxic profiles and calls for public health regulation and education on both agricultural and household poisons.

We found a discharge rate of 84.2% and a mortality rate of 15.8%, with early hospital presentation (within 2 hours) strongly associated with better outcomes. This finding supports Sharma et al. [16], who emphasized that timely intervention reduced morbidity and mortality, particularly in pesticide poisoning. Pannu et al. [8] reported a 17.3% case fatality rate, with higher mortality in patients ingesting herbicides and aluminium phosphide, especially when treatment was delayed. Similarly, Rajbanshi et al. [9] demonstrated that late presentation and need for mechanical ventilation significantly increased mortality risk in ICU patients with poisoning. Nigussie et al. [13] confirmed that intentional poisonings and delayed care led to poorer outcomes. Our study reinforces these findings, with the highest survival in those presenting early (≤ 2 hours) and a clear trend showing rising mortality with increasing delays. This underscores the importance of rapid transport, early recognition, and poison-specific protocols at the primary care level. The present study was conducted in a single-center setting, which may limit the generalizability of the findings to broader populations.

Some poisoning cases had incomplete histories, particularly with unknown agents or undocumented reasons for ingestion, which could affect the accuracy of classification. The study relied on hospital records and patient or attendant reporting, which may be subject to recall bias or underreporting, especially in cases involving psychiatric illness or substance abuse. Long-term follow-up and psychiatric evaluations were not included, limiting insight into post-discharge outcomes and recurrence risk.

Conclusion

Based on the observed patterns in our study, acute poisoning primarily affected young adults and was largely intentional in nature, with a significant proportion of cases linked to unknown or psychosocial causes. The predominance of agrochemical agents such as organophosphates, insecticides, and aluminium phosphide reflects the ongoing vulnerability in semi-urban and rural settings, while the emergence of drug overdoses and household agent poisonings points to evolving trends in urban populations.

The study underlines the critical role of early hospital presentation in improving outcomes and highlights the need for integrated approaches involving toxicological preparedness, mental health evaluation, and public health interventions tailored to local poisoning profiles.

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