Journal of Karnali Academy of Health Sciences
An Official Journal of Karnali Academy of Health Sciences

Demographic profile of patients with acute poisoning in the emergency department of a tertiary care center and their outcomes

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ABSTRACT

Introduction: Acute poisoning is a major public health issue in Nepal, driving emergency visits, admissions, and deaths mainly from accessible organophosphorus pesticides. Patterns vary by region, with insecticides dominant in developing areas like Nepal, unlike pharmaceuticals in high-income countries. Limited recent prospective data from Nepalese tertiary centers prompted this study to profile demographics, agents, and outcomes.

Methods: A prospective observational study was conducted at Bir Hospital Emergency Department, wards, and intensive care units from July to December 2025. The study included 238 patients aged 14 years and above with acute poisoning. A structured pro forma was used to collect data on demographic variables, poisoning agents, timing, and outcomes. Data analysis was performed using SPSS version 16, employing descriptive statistics and chi-square tests, with a significance level set at $p<0.05$.

Results: Females constitute133(55.9%) of the population, with a peak incidence in the 15-25 years age group (37.4%). The majority are unmarried (64.7%) and students (38.7%). The prevalence of suicidal behavior is 83.2%, with the primary agents being Dichlorvos (29%) and Cypermethrin (24.4%). The mortality rate stands at 19(8%). Significant associations were observed between age and type ($\chi^2=65.08$, $p<0.001$), gender and type ($\chi^2=25.33$, $p<0.001$), and between arrival time and mortality ($\chi^2=33.2$, $p<0.001$), with a better prognosis when arrival occurred within 2 hours.

Conclusion: Young females are suicidal with organophosphorus; early care is key to survival; urge mental health/pesticide controls.

Keywords: Acute poisoning, Emergency department, Organophosphorus, Mortality

INTRODUCTION

Poisoning is a common and resource-intensive medical emergency worldwide, accounting for substantial hospital admissions each year. Clinical manifestations vary depending on the xenobiotic involved and may include central nervous system depression, miosis, hypothermia, respiratory depression, hypotension, delirium, dysrhythmias, and multi-organ failure.[1,2] Acute poisoning is characterized by a rapid onset of toxic effects, usually within hours of exposure, and remains a significant cause of morbidity and mortality across all age groups. Its incidence varies according to the availability of toxic agents and is influenced by cultural, geographic, and socioeconomic factors.[3]

Patterns of poisoning differ between regions: misuse of prescribed medications is more common in developed countries, whereas insecticide poisoning predominates in developing nations.[4,5] In Iran, most intentional poisonings occur among individuals aged 21–30 years, with mortality rates reported as 8 per 1000 patients in general wards and 109 per 1000 in intensive care units.[6] The World Health Organization (WHO) estimates that chemicals and suicide account for nearly one million deaths annually worldwide, with pesticides contributing substantially.[6,7] Acute poisoning accounts for up to 10% of hospital caseloads and 1–3% of emergency department visits globally. In 2013, poisoning caused more than 300,000 deaths worldwide, and 43.9% of hazardous exposures reported to French poison centers were symptomatic.[1,8]

In low- and middle-income countries, pesticides remain the leading cause of poisoning, particularly in South and Central America and Southern Asia, whereas household products and pharmaceuticals predominate in high-income settings.[1,3,9] Recent WHO data indicate a rising trend in psychotropic medication-related poisoning in industrialized countries, paralleling increased prescription rates.[7] Mortality from unintentional poisoning is higher in low-income countries (2.3 per 100,000) than in high-income countries (0.4 per 100,000) and is more common among males.[3] Age and gender are important determinants in the epidemiology of drug-related poisoning.[3]

Despite the high burden, limited recent prospective data are available from tertiary centers in Nepal. Therefore, this study aimed to determine the demographic profile, poisoning characteristics, and treatment outcomes of acute poisoning cases presenting to a tertiary care hospital.

METHODS

This was a prospective, observational, hospital-based study conducted in the Emergency Department, medical ward, and Intensive Care Unit of Bir Hospital, Kathmandu, over a 6-month period(from July 1st 2025 to December 3st 2025) after ethical approval from the Institutional Review Committee of National Academy of Medical Sciences-Bir Hospital (ref no: 251/2082/83).

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Date of Submission: 18 March, 2026
Date of Acceptance: 20 March, 2026
Date of Publication: 01 April 2026

DOI: https://doi.org/10.61814/jkahs.v9i1.1178

Print ISSN: 2616-0064, Online ISSN: 2676-1327

Patients aged >14 years presenting with acute poisoning who provided informed consent (all the patients above or equal to 18 years and parents of age group 14 to 18 years who were included in the study) and assent from participants aged 14 to 18 years whose parents gave consent for the study. For patients who were unconscious during the study, consent was obtained from the patient's next of kin. Cases with a history of snake or insect bites, food poisoning, or refusal to participate were excluded from the study.

For the calculation of the sample size, the formula for the sample size using proportion was used (i.e. $N=Z^2p(1-p)/d^2$). Using the prevalence of poisoning from a study conducted in Sri Lanka (p)=0.1722,[10] Z=1.96, and d=0.05, the calculated sample size was 217. After accounting for a 10% non-response rate, the final sample size was 238.

Data were collected using a structured Proforma, including socio-demographic variables, type and mode of poisoning, time of arrival, and patient outcome.

Data were entered and analyzed using SPSS version 16. Descriptive statistics were expressed as frequency and percentage. Associations between the categorical variable were analyzed using the chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

The total number of patients included in the study was 238. Among 238 patients, majority were female i.e. 133(55.9%). The most affected age group was 15–25 years (37.4%), followed by 26–35 years (33.6%). The majority were unmarried (64.7%). Students were the most common occupational group (38.7%). Most patients belonged to nuclear families (66.8%). Suicidal poisoning accounted for 198 (83.2%) cases, while 40 (16.8%) were accidental. The detail demographic profile of the patient involved in the study is given in table 1.

The most common agent leading to poisoning in our study was Dichlorvos, at 69 (29%), followed by Cypermethrin, at 58 (24.4%). Organophosphorus compounds were the predominant toxic agents overall. Details of the agent used for poisoning are provided in Table 2.

Among the total patients, 219(92%) had a good recovery, whereas 19(8%) died due to the poison ingested.

A statistically significant association was observed between age group and type of poisoning overall (χ^2 = 65.08, p < 0.0001). When the association between age groups and the mode of poisoning was examined, there was an association among the 26-35, 46-55, and >55 age groups. The association between age group and mode of poisoning is presented in Table 3.

A statistically significant association was found between gender and type of poisoning (χ^2 = 25.33, p < 0.001). Suicidal poisoning was higher among females, while accidental poisoning was more frequent among males.(Table 4)

There was a significant association between time of arrival and mortality (χ^2=33.2, p<0.001). Mortality was highest among patients presenting 2–4 hours after poisoning i.e.11 (17.7%), while early arrival (<2 hours) was associated with better outcomes.(Table 5)

DISCUSSION

Our study showed that the majority of the patients with poisoning were females. This finding appears to be concordant with other studies conducted in Iran-Teheran (55.7%).[11] A study by Khapung et al in the rural setting of Nepal showed a similar finding, having 72.56% of the total participants being female.[12] A retrospective study done in Ethopia showed the male predominance with female to male ratio to be 1:1.06.[13] The distribution different on gender among the poisoining cases in different area might be due to the pattern of engagement in different sectors, economic condition of the people living there.

This study also showed that there is statistical significance between the gender(male and female) and mode of poisoning (suicidal and accidental), with females having a higher proportion of intentional or suicidal poisoning in comparison to males. A study from Ethiopia showed a similar result to ours.[14] A study done in Yemen found a statistically significant difference (p=0.036) where the rate of intentional poisoning in females was higher (14.7% of total cases) compared to males (10.7%).[15] A study from Chitwan Nepal showed that females constituted double the pesticide poisoning cases compared to males (ratio 1.99:1), with the vast majority (89.5%) being deliberate self-harm.[16] In contrast to our study , a record-based study of fatal suicidal poisonings in India found that 61% of cases were male. The researchers noted that suicidal poisoning was more common in males (44.30%) than in females (35.54%) in their review.[17] The difference between males and females in the poisoning can be due to the differences in experience, temptations, challenges, stressors, and strains among the genders in different instances.

Table 1: Demographic profile of patients involved in the study(n=238)

Demographic profile	No. of cases
Gender	
Male	105(55.90%)
Female	133(44.1%)
Age in years	
15-25	89(37.5%)
26-35	80(33.6%)
36-45	40(16.80%)
46- 55	21(8.82%)
≥ 55	8(3.36%)
Marital status	
Married	84(35.29%)
Unmarried	154(64.71%)
Ethnicity	
Chhetri	24(10.08%)
Brahmin	46(19.32%)
Newar	12(5.04%)
Magar	48(20.16%)
Tamang	49(20.58%)
Madhesi	32(13.44%)
Others	27(11.34%)
Education level	
Graduate	32(13.45%)
Higher secondary	88(36.97%)
Lower secondary	74(31.09%)
Primary	23(9.66%)
Illiterate	21(8.82%)
Occupation	
Student	92(38.65%)
Farmer	38(15.97%)
Home maker	56(23.53%)
Business	21(8.82%)
Services	10(4.20%)
Daily wage worker	21(8.82%)
Type of family	
Nuclear	159(66.80%)
Joint	79(33.2%)
Mode of Poisoning	
Intentional/ Suicidal	198(83.19%)
Accidental	40(16.81%)

Table 2: Agent leading to poisoning in the study participants(n=238)

Type of poison	Cases (Percentage)
Dichlorvos	69 (30.53%)
Cypermethrin	58 (25.66%)
Zinc phosphide	32 (14.16%)
Carbon monoxide	18 (7.96%)
Corrosive agents	16 (7.08%)
Hydrocarbon	13 (5.75%)
Parquatthon	9 (3.98%)
Aluminum phosphide	5 (2.21%)
Unknown	6 (2.65%)

Table 3: Association between Age group and mode of poisoning (n=238)

Age in years	Suicidal/intentional	Accidental	p-value
15-25	67(75.3%)	22(24.7%)	0.277*
26-35	76(95%)	4(5%)	0.001**
36-45	35(87.5%)	5(12.5%)	0.201*
46- 55	10(47.6%)	11(52.4%)	0.001*
≥ 55	0	8(100%)	0.001**

***chi-square test, **fischer Exact test**

Table 4: Association between Gender and Mode of Poisoning (n=238)

Gender	No. of cases	Suicidal/ intentional	Accidental	χ^2	p-value
Male	105	74(70.47%)	31(29.53%)	25.33	<0.001
Female	133	124(93.23%)	9(6.77%)		

Table 5: Association between time of arrival to hospital and clinical outcome

Time of arrival	Improved	Death	χ^2	p-value
Less than 2 hours	81(96.4%)	3(3.6%)	33.2	<0.001
2-4 hours	51(82.3%)	11(17.7%)		
4-8 hours	50(92.6%)	4(7.4%)		
More than 8 hours	37(97.4%)	1(2.6%)		

This study shows that the 15-25 age group has the highest number of poisoning cases, followed by the 26-35 age group. Similar to our study, a study conducted in Italy found that the majority of cases (44.5%) were in the 15–25-year age group, with the percentage of poisoning cases decreasing as age increased beyond this bracket.[18] A study from Yemen showed that the 21–30-year age group had the highest percentage of cases (50.3%), followed by the 11–20-year group (25.4%), and also noted that this age range was particularly vulnerable due to high social activity and stress.[15] A study conducted in India showed that cases of poisoning were more frequently observed in the age group (21–30).[19] A study conducted in Kathmandu, Nepal, showed that the prevalence of poisoning was highest in the 20–30 age group (26.5%), followed by the 10–20 age group (23.5%) and the 30–40 age group (19.1%).[20] The majority of the studies have similar findings, suggesting that people between the ages of 15 and 35 are more vulnerable to poisoning. This could be because it marks a peak period for impulsive self-harm triggered by psychosocial stressors (like academic or relationship pressure), combined with a high prevalence of substance experimentation and easy access to medications or chemicals.

Our study demonstrated that organophosphate compounds were the most commonly ingested compounds in poisoning. In this prospective study conducted in India, among 100 patients, various organophosphate compounds were the most commonly consumed, with monocrotophos (23%) and dichlorvos (13%) being the most frequent.[21] A study from Ethiopia reported that organophosphate poisoning was a leading cause across different regions, with data from two hospitals in Ambo City showing that 53.7% of all poisoning cases were linked to organophosphate exposure.[22] One study conducted in China reported that organophosphate poisoning accounts for 17.2% of pesticide-related poisonings.[23] A descriptive cross-sectional study from Bardia, Nepal, found that 47.54% of all acute poisoning cases presenting to the emergency department were due to organophosphorus compounds. [24] Since organophosphate-related chemicals are easily available in the market due to high agricultural-related activities in the country, the ingestion of these compounds tends to be high in our study population.

This study showed that a higher proportion of participants in the study were unmarried. Study from north India reported that a majority of the poisoning victims (56%) were unmarried, noting that the 21–30 age group (which is largely single) was the most vulnerable.[25] Similar finding is shown in the study from South India.[26] In contrast to that, a study done in Jumla, Nepal showed that among the cases of poisoning, married participants were more.[12] Similarly, in contrast to our study, studies by Basnet et al. and Thakali et al. highlight domestic stressors and family conflicts as key factors in poisoning cases.[27,28]

This study showed that there is a significant association between the timing of arrival and survival of the patient with poisoning. A study from southern India showed a statistically significant association between time lag and mortality, as patients who reach the hospital within 2 hours have a much higher survival rate than those arriving after 4 hours.[26] A meta-analysis showed that delayed arrival times [RR: 2.90(95 % CI: 1.45, 5.84)] were identified as predictors of mortality.[29] The delayed presentation led to target organ damage due to the poison compound, which may be the reason for the patient's mortality.

This single-center prospective observational study was carried out at Bir Hospital over six months, which may limit how applicable the findings are to other settings in Nepal or elsewhere. It depends on self-reported data about poisoning agents and routes, risking recall or reporting bias, particularly in suicidal cases. By excluding snake bites, insect bites, and food poisoning, the study focuses solely on chemical and organophosphorus poisoning, possibly overlooking wider poisoning trends.

CONCLUSION

Acute poisoning mainly impacts young women aged 15-35, predominantly due to suicidal intent (83.2%). Organophosphorus compounds such as Dichlorvos and Cypermethrin are the primary agents, with an associated 8% mortality rate. Prompt hospitalization within less than 2 hours significantly enhances survival chances ($p<0.001$), highlighting the importance of rapid access to medical care. Public health initiatives should focus on mental health support for young people, enforce stricter pesticide regulations, and promote awareness campaigns to prevent this avoidable issue.

DECLARATIONS

Author Contribution

MCS conceptualized the research, designed the study, conducted the literature search, performed data collection, analysis, and interpretation; RNN, SPN, SKC, SP and SG contributed to data collection and analysis; SB, SP supported research design, literature search, data interpretation, drafting, and reviewing of the manuscript for important intellectual content; all authors (MCS, RNN, SPN, SKC, SG, SB, SP) gave final approval of the version ready for submission and agreed to be accountable for all aspects of the work

Acknowledgements

None

Ethical Approval

Ethical approval was obtained from the Institutional Review Committee of National Academy of Medical Sciences-Bir hospital(ref no: 251/2082/83) on June 26, 2025.

Consent/Assent

Informed conscent was taken from all the patients above or equal to 18

years and parents of age group 14 to 18 years who were included in the study, and assent from participants aged 14 to 18 years whose parents gave consent for the study

Data Availability Statement

The date of the study will be provided to the editorial team on the request.

Conflicts of Interest

None

Source of Funding

None

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