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Patterns of acute poisoning cases at a high-altitude tertiary hospital in Nepal: a descriptive cross-sectional study

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ABSTRACT

Introduction: Poisoning, whether intentional or accidental, remains a significant public health issue in rural, high-altitude regions, with limited epidemiological data. Nepal, an agriculture-dependent country, sees rising pesticide-related poisonings, especially organophosphates. This study aimed to assess the prevalence, demographics, toxic agents, and intent of poisoning cases admitted to Karnali Institute of Health Sciences' emergency department from 2019 to 2024.

Methods: A retrospective study reviewed five years of poisoning cases from hospital records using census sampling. It collected demographic data, toxic agents, and intent (suicidal or accidental). Incomplete records were excluded. Data were analyzed with SPSS, using descriptive statistics like frequency, percentage, and cross-tabulations.

Results: Out of 164 cases, the majority were young adults aged 15–25 years (45.1%). Females accounted for 72.6% of cases, with married females being the most affected (45.7%). Suicidal poisoning (73.2%) was more frequent than accidental poisoning (26.8%). The most frequent toxic agents were zinc phosphide (42.7%) andorganophosphates (14.6%). Herbal poisonings (including Coriaria nepalensis, Aconitum ferox, and Arisaema spp.) comprised 8.53% of the cases. Suicidal intent was highest among young adults (86.5%) and lowest in children aged 0- 14 years (19.2%).

Conclusion: Young married females are at highest risk of suicidal poisoning in this Nepal region, due to frequent pesticide and herbal toxin exposure. This highlights the need for mental health programs, pesticide regulation, and community education. More studies are needed to assess prevention and long-term outcomes.

Keywords: Accidental, Cross-sectional, High altitude, Karnali, Nepal, Poisoning, Suicidal

INTRODUCTION

Poisoning is the act of deliberate or accidental ingestion, inhalation, or absorption of toxic substances, leading to harmful effects on the body. It is a significant cause of mortality and morbidity worldwide, with pesticides being a leading contributor, especially in agricultural countries like Nepal [1, 2]. According to the World Health Organisation (WHO), approximately 300,000 people die each year from acute poisoning, with a significant number of these deaths linked to agricultural pesticides. This global health crisis is substantial in rural areas of developing countries where pesticides are widely used in farming. In Nepal, organophosphorus pesticide poisoning has become a serious issue in emergency care, reflecting the country's reliance on agriculture and everyday use of these toxic chemicals [2, 3]. WHO further estimates that pesticide self-poisoning accounts for about 20% of global suicides, with rural Asia bearing the majority of the cases. Pesticide poisoning contributes to 60% of self-harm deaths in these regions, with nearly two-thirds of these fatalities attributed to organophosphates [4, 5].

According to the WHO, Nepal has a high suicide rate, with poisoning being the most common cause of suicide, with pesticides being the most important poison. There is a gap in the literature, and no concrete nationwide data on the incidence of acute poisoning and death related to it are available. Additionally, the Ministry of Health and Population (MOHP) collects data on poisoning; however, this data is limited by the grouping of all poisons and forms (intentional, accidental, or occupational) of poisoning, which hinders analysis. Nepal Police records the number of suicides by poisoning, but does not distinguish the agent [6]. The high incidence of organophosphate poisoning underscores the

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need for comprehensive and timely care. Effective treatment supported by strict health regulations and holistic care strategies—including antidote and psychosocial interventions—is essential for improving outcomes [7, 8]. Immediate triage and supportive care, along with post-discharge psychosocial counseling, are crucial in managing these cases [9].

This study aimed to describe the prevalence, demographic distribution, toxic agents, and intent of poisoning cases admitted to Karnali Academy of Health Sciences (KAHS) between 2019 and 2024. Also, our study will fill in the literature gap regarding causes of poisoning and demographics involved, agents used, and their intent in cases admitted to the high altitude tertiary care centre of Nepal.

METHODS

This was a retrospective descriptive study conducted at KAHS. The study involved reviewing medical records of all patients diagnosed with poisoning and admitted between 2019 and 2024. Data were collected on demographic details, type and cause of poisoning, and intent (suicidal or accidental). KAHS was chosen due to its central role as a referral centre in this high altitude region, which often sees a high number of poisoning cases due to the area's agricultural setting and limited health services.

All poisoning cases admitted to the emergency department of KAHS during the study period were included in the study using a census sampling method. A census sampling method was employed. Cases with incomplete or missing records were excluded. Data completeness was checked, and cases with missing demographic or poisoning details were excluded. Data were extracted using a structured form and entered into SPSS for statistical analysis. Diagnoses of poisoning were made on the basis of history, examination and laboratory investigations. Descriptive statistics, including frequency, percentage, and cross-tabulations, were used to analyse the data. Ethical clearance was obtained from the Institutional Review Committee (IRC) of KAHS with IRC Ref no 081/082/04 before commencing the study.

RESULTS

Among the 164 admitted cases, zinc phosphide poisoning was the most prevalent, accounting for 70 cases (42.68%), followed by organophosphates with 24 cases (14.63%). Herbal poisonings from traditional plants such as Coriaria nepalensis(Masino / Machhino), Aconitum ferox (Bikh), and Arisaema spp.(Sapkothi, Sarpagandha) collectively comprised approximately 20 cases (8.53%). Other less common poisons included mushroom poisoning, aluminium phospide poisoning, acetaminophen overdose, carbon monoxide poisoning, sulphuric acid ingestion, as well as isolated instances of benzodiazepine overdose, cannabis, copper sulphate, and multi-drug ingestion, each contributing less than 1% of the total cases (Table 1).

Young adults (15-25 years) were the most affected age group, accounting for 74 cases (45.1%), followed by adults aged 26-40 years, with 38 cases (23.3%) (Figure 1). Also, higher prevalence of poisoning cases was seen among females (119 cases, 72.6%) compared to males (45 cases, 27.4%) .

Females exhibited a higher rate of suicidal poisoning (94 cases), whereas accidental poisonings were more evenly distributed between genders (Figure 3).

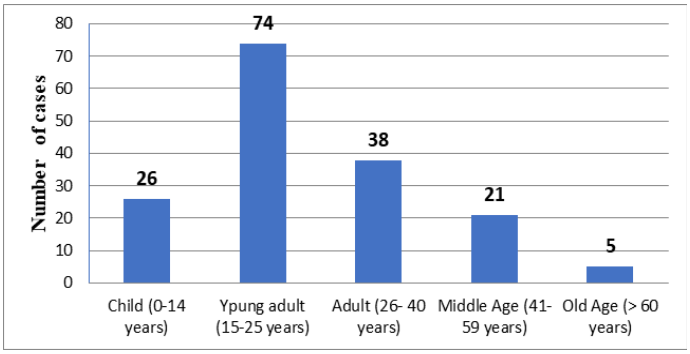

Figure 1: Age- wise distribution of poisoning (n=164)

Table 1: Types of Poisoning (n=164)

Types of poisoning	Number of cases	Percentage %
Zinc Phosphide	70	42.68
Organophosphorous	24	14.63
Herbal poisoning, Coriaria nepalensis (Masino / Machhino)	14	8.53
Mushroom Poisoning	11	6.71
Aluminium phosphide	8	4.88
Acetaminophen overdose	5	3.05
Herbal poisoning Acontium ferox (Bikh)	5	3.05
Unknown poisoning	4	2.44
Sulphuric acid	4	2.44
Herbal poisoning Arisaema spp. (Sapkothi, Sarpagandha)	1	0.61
Carbon monoxide	2	1.22
Multi-drug (Doxycycline, Pantoprazole, Hyosine)	4	2.44
Gamma Benzene Hexachloride	1	0.61
Corrosive Formalin Sulphuric Herpic Phenyl	5	3.05
Benzodiazepine overdose	1	0.61
Cannabis	1	0.61
Copper sulphate	1	0.61
Diesel hydrocarbon poison	1	0.61
Food poisoning	1	0.61
Phenytoin overdose	1	0.61

Table 2: Distribution of poisoning according to marital status (n=164)

Marital status	Number of cases	Percentage (%)
Married male	33	20.1
Unmarried male	17	10.4
Married female	75	45.7
Unmarried Female	39	23.8

Suicidal poisoning cases were highest in the young adult group (64 cases), while accidental poisonings were more common in children aged 0-14 years (21 cases) (Figure 2).

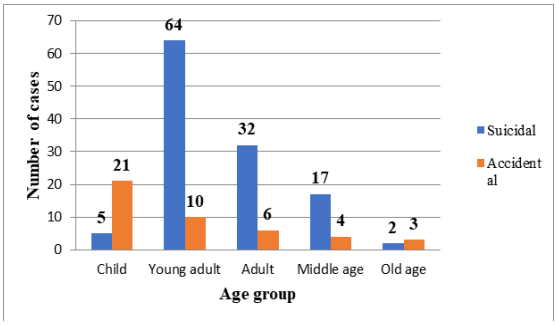

Figure 2: Age-wise distribution of cases based on intent of intake of substance (n=164)

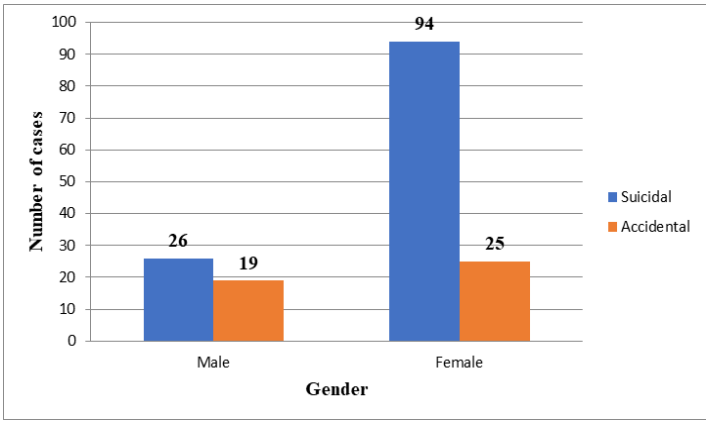

Figure 3: Intent of poisoning and gender distribution (n=164)

DISCUSSION

Over a five-year period, 164 cases were admitted to the emergency department of KAHS. Our study showed that the most frequent toxic agents were zinc phosphide (42.7%), followed by organophosphates (14.6%). Herbal poisonings (including Coriaria nepalensis, Aconitum ferox, and Arisaema spp.) comprised 11.5% of the cases. The majority of the cases were females (72.6%), with the highest number of cases seen in married females (45.7%). Suicidal poisoning (73.2%) was more common in the young adult group, whereas accidental poisoning (26.8%) was more common in children. Suicidal intent was highest among young adults (86.5%).

This study reveals that pesticide poisoning, particularly from zinc phosphide and organophosphates, remains the leading cause of poisoning cases admitted to tertiary care centres in Karnali Province. This finding is consistent with those of Gupta et al., who reported pesticide poisoning as the predominant cause in a similar high-altitude setting in Nepal [10]. The higher prevalence of herbal poisonings in our study, involving Coriaria nepalensis (Masino / Machhino), Aconitum ferox (Bikh), and Arisaema spp. (Sapkothi, Sarpagandha), reflects the traditional use of these plants in the region and local exposure patterns. These poisonous plants have known toxic properties and are commonly involved in accidental or intentional poisonings in rural Nepal [11- 16].

The predominance of young adults in poisoning cases, especially in the 15-25 years group, aligns with studies by Thakali et al. and Gupta et al., highlighting the vulnerability of adolescents and young adults to poisoning, potentially due to psychosocial stressors, academic pressures, and impulsive behaviour [8, 11]. The significant female predominance in poisoning cases corresponds with observations by Thapa et al., suggesting that socio-cultural and psychological factors may increase poisoning risk among women in this region [11].

Marital status also appears to be a significant factor, with married females showing the highest incidence, supporting findings by Basnet et al. and Thakali et al., where domestic stressors and family conflicts were essential contributors to poisoning [8,9].

The intent analysis showed that suicidal poisoning was most common in young adults, whereas accidental poisoning predominated among children. This pattern reflects emotional distress and impulsivity in adolescents and young adults, with unintentional exposures being more common in younger children, as previously noted by Thapa et al. and Gupta et al. [10, 11]. Our study was limited by the retrospective single-centred study design, which does not necessarily imply the prevalence pattern of the whole community. Also, more analytical studies should be carried out to determine the burden of poisoning in the high-altitude regions of Nepal. Overall, these results underscore the importance of focused preventive strategies, including stricter pesticide regulation, community education about the dangers of toxic plants, and enhanced psychosocial support for vulnerable groups.

CONCLUSION

This study, conducted at Karnali Academy of Health Sciences Teaching Hospital, reveals that poisoning, particularly suicidal poisoning, remains a significant public health concern in this high-altitude region of Nepal. Young adults, especially married females, are disproportionately affected, highlighting the intersection of social, psychological, and cultural factors influencing these outcomes. Pesticide poisoning, primarily due to zinc phosphide and organophosphates, continues to dominate the poisoning profile, emphasising the urgent need for stricter pesticide regulation, community awareness programs, and enhanced mental health services.

Preventive strategies should prioritise vulnerable groups, focusing on psychosocial support and education, while healthcare systems must ensure timely and effective management of poisoning cases. Further research exploring the socio-cultural dynamics contributing to these trends will be essential to inform tailored interventions in this and similar rural settings.

DECLARATION

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Author contribution

RK, SB, PKG, RB, JB, ML, KKC, PS, and SB developed the research concept. RK, SB, PKG, RB, JB, ML, and KKC contributed to the design of the research. RK, SB, NT, BL, LD, AT, AP, AA, PKG, RB, JB, SG, PS, and SB performed the literature search. RK, NT, BL, LD, AT, and AA carried out data collection. Data analysis was performed by RK, SB, JB, PSL, SG, ML, and KKC, while RK, SB, JB, PSL, SG, ML, and KKC undertook data interpretation. RK, SB, JB, PSL, and ML drafted the manuscript. RK, SB, NT, BL, PKG, RB, JB, PSL, and ML performed a critical review of the manuscript for important intellectual content. RK, SB, NT, BL, LD, AT, AP, AA, PKG, RB, JB, PSL, SG, ML, KKC, and PS gave final approval of the version to be submitted. All authors, including RK, SB, NT, BL, LD, AT, AP, AA, PKG, RB, JB, PSL, SG, ML, KKC, and PS, agreed to be accountable for all aspects of the work.

Conflict of interest

We have no conflicts of interest to disclose.

Ethical Approval

This research was approved by IRC Karnali Academy Of Health Sciences with the reference number 081/082/04 on 22nd August, 2024.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Consent/Assent

Not applicable

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