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## Spectrum and Outcome of Acute Poisoning at a Tertiary Care Hospital in the Capital of Madhesh Province, Nepal

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### Abstract

**Background:** Acute poisoning with a variety of toxic substances is well-known globally, and is also a major public health concern in Nepal, affecting patients of all age groups. Skilled medical team in emergency department, with skill to perform first aid (ABC management), gastric lavage, administer specific antidote and provide supportive care, can afford with a better prognosis of patients with acute poisoning. Thus, this study was conducted to analyze the spectrum and outcome of acute poisoning cases, brought to the Emergency department (ER) of Janaki Medical College and Teaching Hospital, Janakpur, Nepal, providing tertiary care facilities.

**Method:** This prospective cross-sectional study included data from the emergency records of patients visiting ER department of Janaki Medical College and Teaching Hospital (ER-JMCTH), from July 2022 to October, 2023, with suspected toxicological syndrome following acute history of poisoning. The data were analyzed for association using Chi-square test and  $p < 0.05$  was considered statistically significant.

**Results:** Out of the total 93 acutely poisoned patients brought to the Emergency department, 54.8% were male and 45.2% were female. All patients with suicidal were 68.8%, accidental 19.4% and homicidal 1.1%. Majority of the patients (61.3%) were young adults of age group 16-30 years. Male patients had attempted suicide with poisons,

greater than the females. The most common causes leading to self-poisoning were mental problem (54.8%), followed by poverty (15.1%) and social problems (24.7%), while the most commonly abused substance was organophosphate (41.9% ).

**Conclusions:** The male patients were greater than female had attempted poisoning suicide. Pesticides accounted for nearly 2/3<sup>rd</sup> of the cases. Establishment of suicide prevention center with 24 hours crisis hotline and optimum use of existing poison information center's resources can play significant role in reducing the number of deaths from deliberate self poisoning.

**Keywords:** Acute poisoning, Emergency department, Madhesh, Outcome, Toxicological syndrome

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## Introduction

Acute poisoning is a serious medical emergency that causes significant morbidity and mortality in patients of all age's worldwide [1,2]. World Health Organization (WHO) estimates that 7.4 million people of healthy life are lost annually worldwide due to addiction. Poisoning from pharmaceuticals drugs, industrial chemicals, pesticides, chemical products and natural toxins is a significant global public health problem. WHO seeks to build capacity in countries to deal with these problems, and an important area of activity is promoting the establishment and strengthening of poison centers [3]. The pesticide self-poisoning accounts for about one in five of global suicides [4]. Patients with acute poisoning have highly variable clinical presentations, making diagnosis difficult, especially in resource limited settings [5]. The variability of the clinical presentation is further divided by the fact that substances involved in poisonings vary by age group, intention, geographic region, and level of economic development [6].

In Nepal, narcotic drug control Act 2038 and pesticide Act 2048 prohibits the misuse of narcotics and pesticides. However, improper execution of these has led to such problems [7]. In acute settings, early recognition and appropriate management have been known to improve outcomes of poisoned patients [8]. Delayed recognition and sub-optimal management may lead to increased morbidity and mortality [9]. The case fatality rates vary by poison and region. In Asia and Africa, fatalities have been shown to be highest from pesticides, followed by medications and household products, while paracetamol was found to be a significant cause of poisoning in

other regions of the developing world [10]. The profile of patients with acute poisoning and their choice of agents not only depend upon the socioeconomic, religious and cultural status, but it also greatly varies between different countries. Three-year data of death by suicide obtained from the Nepal police records showed, that the trends of suicide have consistently been on increasing trend. Compared to 5509 deaths in 2018, there were over 6900 deaths in 2020. The increase in trend can be seen in males and females and in all the seven provinces of Nepal [11].

Acutely poisoned patients continue to be a significant issue for doctors in Nepal and around the world. Numerous researches on poisonings and suicides have been conducted in different provinces of Nepal so far. However, a scientific literature about acute poisoning in the Madhesh Province is negligible. Moreover, there is no toxicology or drug information centre in this province in the southern region of Nepal. Therefore, the emphasis of this study was focused on patients presenting to the emergency department of a large public tertiary care hospital with suspected acute poisoning or other toxic exposure, characterizing their presenting signs and symptoms, and reporting on suspected toxicological agents involved.

## Method

### *Study Design*

This prospective cross-sectional study included data from the emergency records of patients visiting ER department of Janaki Medical College Teaching Hospital (ER-JMCTH), from July 2022 to October 2023, with suspected toxicological

syndrome following acute history of poisoning. A structured proforma was used by trained investigators (GP consultants and MDGP residents), to collect data related to age, sex, type of poisoning, season of event, route of poisoning, time between ingestion or exposure and arrival at the emergency ward, mechanism of toxic exposure (unintentional or intentional), level of consciousness, length of stay in the ward, and outcome. The data were analyzed for association using Chi-square test and  $p < 0.05$  was considered statistically significant.

### ***Study setting and population***

The ER-JMCTH established in 2002 AD, receives high insight patients from different district and the surrounding regional and district hospitals and serves large numbers of patients annually. The department is staffed by nationally trained emergency physicians, who provide clinical care, supervision and teaching to interns (fresh graduates from medical school), registrars (generalists) and emergency medicine residents.

### ***Data collection***

The treating physicians screened and enrolled patients successively with support monitoring by one of the study authors (GP). Data collection was done 24 hourly everyday, and 7 days per week. Study variables was used to prospectively collect the study data, including age, sex, occupation and other demographic data, as well as substance(s) suspected, details of exposure, prior psychiatric history, household medications, clinical presentation.

### ***Inclusion criteria***

All patients presenting to ER-JMCTH, with visitors impressions including but not limited to pesticide ingestion, alcohol intoxication, recreational or prescription drug overdose, toxic inhalation, chemical skin exposure, accidental or intentional poisons were included in this study.- Patients treated for food poisoning, snake bites, and wasp stings were excluded.

### ***Ethical consideration:***

Permission was obtained from the hospital IRC to access Emergency department records of acute poisoning cases (Reference no: 005/IRC-JMC/2023/004). Patients were only identified by serial numbers, as recorded in the Emergency department register and all the patient related information was kept confidential.

### ***Data analysis***

The study data recorded in the structured proforma, which was later transferred into an Excel database and SPSS version 20. The association between variables was analyzed using Chi-square test and a  $p$  value  $< 0.05$  was considered statistically significant.

## **Results**

A total of 118 cases of acute poisoning were reported. However, 25 cases were reported incompletely and hence were excluded, resulting in 93 acute poisoning cases. Patient ages ranged from 2 to 65 years old. The highest number of poisoning cases was observed in the 16-30 years age group (61.3%), the rate of poisoning cases in men (54.8%) was higher than in women (45.2%). Pediatric cases younger than 15 years old represented only 3.22% of the total cases. Most cases of poisoning were due to suicidal intention (68.8%), while the most common toxic substances used for suicide purposes were insecticides and rodenticides (Organophosphate: 41.9%, Zinc Phosphate: 28%, and Aluminium Phosphate: 6.5%). Of the investigated cases, 86.0% were exposed to the toxin orally (Table 1).

TABLE: 1 Baseline characteristics of acute poisoning cases (n = 93)

Patient characteristics	Number of patients (%)
<b>Sex</b>	
Male	51 (54.8)
Female	42 (45.2)
<b>Age</b>	
02-15 Years	3(3.2)
16-30 Years	57(61.3)
31- 45 Years	25(26.9)
46 – 60 Years	7(7.5)
> 60 Years	1(1.1)
<b>Residency</b>	
Peri Urban	47(50.5)
Urban	29(31.2)
Rural	17(18.3)
<b>Route of poisoning</b>	
Inhalation	6(6.5)
Oral	80(86)
IV/IM	7(7.5)
<b>Nature of poisoning</b>	
Accidental	6(6.5)
Intentional (Suicidal)	85(91.4)
Unknown	2(2.2)
<b>Type of poisoning agent</b>	
Organophosphate (OP)	39(41.9)
Zinc phosphate	26(28)
Aluminum Phosphate	6(6.5)
Pharmacy drugs ( Sedative)	9(9.7)
Alcohol intoxication	4(4.3)
Paracetamol	3(3.2)
Dhaturo (Belladonna)	2(2.2)
Unknown	4(4.3)
<b>Reason of poisoning</b>	
Mental (Depression)	51(54.8)
Social problem	23(24.7)
Family problem	5(6.5)
Poverty	25(5.4)
<b>Socioeconomic status</b>	
Low	71(76.3)
Medium	18(21.5)
High	2(2.2)
<b>Time of hospital arrival</b>	
< 2hr	15(16.1)
2-4 hrs	46(49.5)
> 4 hrs	32(34.4)
<b>Outcome of poisoning</b>	
Cure	87(93.5)
Death	6 (56.5)

Among the 93 investigated cases of acute poisoning at ER department, majority of intentional (suicide) poisoning cases was seen in the 16 to 30 years age group (p= 0.005). (Table 2).

**TABLE 2: Relation of nature of poisoning with age groups, n=93**

Age	Accidental	Intentional	Unknown	Chi-Square	p -value
<15 years	2(66.7%)	1(33.3%)	0 (0.0%)		
16-30 years	3 (5.3%)	52 (91.2%)	2(3.5%)	21.93a	0.005
31-45 years	0(0.0%)	25 (100.0%)	0 (0.0%)		
46-60 years	1(14.3%)	6 (85.7%)	0(0.0%)		
>60 years	0(0.0%)	1(100%)	0(0.0%)		

Maximum patients 6 (19.4%) died, when there was a delay in admission to hospital by more than 4 hours after ingestion of poisoning agent, while patients admitted within 2 hours of ingestion had

the least mortality 1 (5.3%). Time lapse had a significant role in the mortality of acute poisoning cases ( $X^2= 6.98a$  and  $p= 0.030$ ) as shown in table 3.

**TABLE 3: Relation of time elapsed during hospital arrival and mortality, n=93**

Time	Cure	Death	Chi-Square	p value
< 2 Hours	18 (94.7.0%)	1 (5.3%)		
2-4 hour	42(97.0%)	1(2.3%)	6.98a	0.030
>4 hour	25(80.6%)	6 (19.4%)		
Total	85 (91.4%)	8 (8.6%)		

Seasonal variations of organophosphate poisoning occurred in spring and summer which were

10(25.6%) and 21(53.8%) respectively ( $X^2= 40.461^a$  and  $p= 0.007$ ) as shown in table 4.

**TABLE 4: Relation of poisoning agent with seasons**

Poisoning Agent	Spring	Winter	Autumn	Summer	$X^2$	p-Value
Organophosphate	10 (25.6%)	6 (15.4%)	2 (5.1%)	21 (53.8%)	40.46 <sup>a</sup>	0.007
Zinc phosphate	11 (42.3%)	6 (23.1%)	1 (3.8%)	8 (30.8%)		
Aluminium Phosphate	4(66.7%)	0 (0.0%)	0 (0.0%)	2 (33.3%)		
Sedative	1 11.1%)	0.0%	4 (44.4%)	4- (44.4%)		
Alcoholic	1 (25.0%)	1 (25.0%)	1(25.0%)	1(25.0%)		
Paracetamol	1 (33.3%)	2 (66.7%)	0.0%	0.0%		
Belladonna	0.0%	2 (100.0%)	0.0%	0.0%		
Unknown	1(25.0%)	1 (25.0%)	1 (25.0%)	1(25.0%)		
Total	29 (31.2%)	18 (19.4%)	9 (9.7%)	37 (39.8%)		

(Spring= Sep, Oct, Nov; winter= Dec, Jan, Feb; autumn= March, April, May; summer= Jun, July, August)

Social problem related mortality was highest (9.1%) followed by depression (7.7%) as depicted in table 5.

**TABLE: 5 Relation of reasons of poisoning with outcome (n=93)**

Reason of poisoning	Cure	Death
Mental (Depression)	48(92.3%)	4 (7.7%)
Social problem	20 (90.9%)	2 (9.1)
Family problem	5(100.0%)	0 (0.0%)
Poverty	14 (100.0%)	0 (0.0%)
Total	87 (93.5%)	6 (6.5%)

## Discussion

Morbidity and mortality from acute poisoning are a worldwide problem and have massive medical, legal, and social implications. In early 21<sup>st</sup> century remarkable progress was observed in agriculture, industrial technology, and drugs. These progresses have also been escorted by changes in trends of acute poisoning in developing and developed countries. Self-poisoning is one of the oldest manner of suicide/attempted suicide. There are reports from all over the world, pointing to a variety of substances being abused for acute poisoning. In our surrounding and South East Asia organophosphate, aluminum phosphates and zinc sulphates are the commonest poisoning agent for attempted suicide as compared to western countries wherein sedatives and analgesics are reported as the most frequently abused substances leading to death [12].

In this study, males were more affected (54.8%) than female (45.2%). This finding is similar to that of other studies [13, 14]. The high incidence of poisoning in males may be because of the high exposure to stress and strain and also because occupational poisoning occurs due to inappropriate handling (e.g: spraying with high concentration). The signs and symptoms occur due to exposure duration, spraying against wind or lack of personal protection [14]. In our study, the majority of poisoning cases were admitted during spring (31.2%) and summer(39.8%), which is in concurrence with recent studies conducted in Iran and Patan Hospital, Nepal [15,16]. The seasonal variations of

organophosphate poisoning occurred in spring and summer which was 10(25.6%) and 21(53.8%) respectively ( $X^2= 40.461^a$  and  $p= 0.007$ ). This could be explained on the basis of pre-harvesting season, where farmers need more money to recover from his debt and to start harvesting. The preservation of grains starts from March, which is related directly to the overall use of pesticides and variety of chemicals. Therefore the sudden rise of cases from summer (53.8% in Jun, July, August) to spring (25.6% in Sep, Oct, Nov) is mainly due to this fact, while the afterward months are the time of school, college examination and results followed by admissions in new classes. The failure in any of these things may lead to committing suicide [16].

The present study revealed that self-poisoning (suicidal 68.8%) was the most common manner of acute poisoning, followed by accidental 19.4%, homicidal 1.1%, abuse 8.6% and others 2.2%. Results of a 10-year study in Chandigarh revealed that intention was suicide in 72%, followed by accidental (25%) [17].

There are many studies from different parts of the humankind highlighting the different substances abused in acute poisoning and their toxicity. Mortality and morbidity in each case of acute poisoning depends on many factors, including the type of poison, the amount ingested, the extent of medical facilities available, and the time between ingestion of the poison and arrival at the hospital. Our study results show that a total of 93 patients were hospitalized due to acute poisoning. Of these, 6 (6.5%) patients died due to poisoning.

The results of this study are relatable with various reports from developing and developed countries showing a significant increase in mortality and morbidity due to poisoning [18, 19]. In our study maximum patients 6 (19.6. %) died, when there was a delay in admission to hospital by more than 4 hours after ingestion of poisoning agent. Patients admitted within 2 hours of ingestion had the least mortality 1 (5.3%). Time lapse had a significant role in the mortality of acute poisoning cases ( $X^2= 11.572a$  and  $p= 0.003$ ). Most patients were hospitalized immediately after exposure to the poison. The average length of hospital stay varied depending on the type of poisoning. Patients with organophosphate poisoning had longer hospital stays due to the nature of toxicity, and shorter hospital stays generally resulted in less amount of chemical usage [19].

In our study, the pattern of poison and the predominance of young age (15-30 years) people in working groups with suicidal purpose ( $p= 0.005$ ) are similar to other national and international publications[20]. Pediatric cases younger than 15 years represented only 3.2% of cases. Poisoning cases were predominant in low socioeconomic status (76.3%) with peri-urban area (50.5%) [21, 22] . Poisoning can occur either accidentally or intentionally. Intentional poisoning was the most common mode of poisoning 68.8% in this study, which is in concurrence with the findings of other studies done in Nepal (56.4%) [23], Ethiopia (96.5%), [24] OndokuzMayis University Hospital (68.6%) [25], Rift Valley Provincial General Hospital, Nakuru, Kenya (48.96%). [26]In our study have shown that a high mortality is due to depression (7.7%) leading to suicide [27 ].

### **Limitations:**

This study was a hospital-based study, so these results may not be envoy of the general population. In spite of this weakness, these data still provide important information about the characteristics of poisoning in the southern terai region of Madhesh Province, Nepal. Another possible limitation of this study is that the study did not have a way to follow up on specific cases and screen patients for suicidal ideation to

determine whether they had intentions of self-harm. Future studies could be designed to avoid these limitations by systematically screening for suicidal intent in these poisoning incidents and examining undiagnosed depression and other pre-existing mental illnesses.

### **Conclusion**

Most patients coming to the ED with a toxicological syndrome were adult males with intentional exposures. Majority of the victims of the acute poisoning were from low socio economic status. The least number of pediatric cases were found, while the most frequent cause was suicidal poisoning intentions. Over half of the cases were related to pesticides, and oral poisoning was frequent. Establishment of suicide prevention center with 24 hours crisis hotline and optimum use of existing poison information center's resources can play significant role in reducing number of morbidity and mortality from deliberate self-poisoning.

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