

Original Article

Clinico-Epidemiological Profile and Outcome of Acute Poisoning Patients admitted to Intensive Care Unit in A Tertiary Level Private Hospital in Bangladesh

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Abstract:

Background: Acute poisoning is a prevalent health issue necessitating Intensive Care Unit (ICU) admission in developing countries. This study evaluates the socio-demographic characteristics, clinical parameters, and outcomes of acute poisoning patients admitted to the ICU in a tertiary level private hospital in Bangladesh.

Method: This retrospective cohort study was conducted at tertiary care private hospital in Narayanganj, Bangladesh. Data was collected from ICU medical records from January 2023 to April 2024, enrolling a total of 57 patients aged 18 years or more who presented with acute poisoning. Data analysis was performed using Stata (Statistical Software for Data Science) 17.0 ($p < 0.05$)

Results: Out of 57 patients, 52.63% were females, with mean age of 27.84 years. Suicidal intent accounted for 84.21% of cases, and the primary reasons for poisoning included marital (61.40%) and familial disharmony (15.79%). The predominant type of poisoning was due to sedatives (17.54%) followed by aluminium phosphide (14.04%), and stupefying agents (14.04%). Aluminium phosphide poisoning had a 100% fatality rate, while sedatives and several other agents had 100% recovery rate. Statistical analysis showed a significant association between the type of poison and the final outcome ($\chi^2(15) = 38.7996, p = 0.001$).

Conclusion: The study highlights the prevalence of intentional poisoning among young adults, especially females, with sedatives, aluminium phosphide, and stupefying agents being the most common. The high mortality rate from aluminium phosphide underscores the need for strict regulations and public awareness to control access to these substances.

Key Words: Acute poisoning, Aluminium phosphide, Poisoning, Stupefying agent.

Introduction:

Poisoning, defined as the exposure to a xenobiotic in sufficient dose to cause harm or death, is a significant and resource-intensive medical emergency resulting in numerous

hospital admissions globally.¹ Acute poisoning can present with various clinical symptoms, including central nervous system (CNS) depression, miosis, hypothermia, respiratory depression, hypotension, delirium, dysrhythmias, and multisystem organ failure depending on nature of poison.^{2,3} Poisoning is generally classified into intentional and accidental categories, with intentional poisoning being notably common in developing countries where limited resources contribute to high morbidity and mortality rates.^{4,5}

The prevalence and patterns of acute poisoning are influenced by religious, cultural, and geographical factors, and these patterns can change with the evolving availability of different xenobiotics.⁴ For example, in developed countries, the most common cause of acute poisoning is the misuse of commercially available pharmaceuticals, whereas in developing countries, insecticide poisoning is more prevalent.^{6,7} In Bangladesh, most poisonings are intentional and primarily affect individuals under 30 years of age.^{8,9} The predominant causes vary and include organophosphate compounds (OPCs), stupefying agents, and suicide attempts.^{8,10} A study conducted in medical college hospitals in Bangladesh found that insecticide poisoning was the leading cause, while another study identified transport-related sedative poisoning as the predominant cause.¹¹ According to the World Health Organization (WHO), nearly one million

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deaths annually are attributed to suicide and chemical substances, with pesticides being a major cause.¹² Timely diagnosis and appropriate treatment of poisoning are crucial to prevent morbidity and mortality.

Comprehensive data on poisoning patterns in different geographic regions are essential to effectively address this public health issue. Early diagnosis and rapid treatment in emergency departments (ED) and intensive care units (ICU) are critical for improving outcomes in poisoned patients. Currently, there is limited data on poisoning patterns in Bangladesh, particularly regarding ICU admissions in private hospitals. This study aims to assess the epidemiological characteristics and clinical features of acute poisoning in adult patients admitted to the ICU of a private hospital in Bangladesh, providing insights that can inform better management and educational strategies to reduce the morbidity and mortality associated with acute poisoning.

Objective of the study was to evaluate the socio-demographic, clinical and pathological characteristics and identify treatment outcome of patient presenting at ICU.

Methodology:

Study Design: This study was designed as a retrospective cohort study conducted in Proactive Medical College Hospital Limited (PMCHL), Narayanganj, a 250-bed tertiary care private hospital in Bangladesh. Data was collected from patients’ medical records from ICU of PMCHL for a period ranging from January 2023 to April 2024. A total of 57 patients were enrolled in the study based on inclusion and exclusion criteria. The main outcome variable studied was demographic & clinical profile & treatment outcome of acute poisoning patients admitted at ICU of PMCHL

Participant Selection: After the initial study design data was obtained from ICU database of patient medical record. Patients aged 18 years or older who presented with acute poisoning as their chief complaint were included in the study. Patients having history of chronic diseases such as diabetes mellitus and renal failure, presentation with concomitant acute pathology (e.g., burns, trauma), and incomplete medical records were excluded.

Data Collection & evaluation parameters: Data were collected using a standardized data collection sheet, demographic and clinical information was obtained from patient medical records and interviews with the patients’ guardians. Follow-up on final outcomes was conducted via phone interviews three months’ post-discharge.

Statistical analysis: Data analysis was performed using Stata (Statistical Software for Data Science) 17.0. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were reported. Chi-square and Fisher’s exact tests were employed to analyse qualitative data, with a significance level set at 0.05.

Results:

57 patients with acute poisoning were admitted to the ICU of PMCHL during January 2023 to April 2024. Table I demonstrates most patients were aged 21-30 (45.61%), followed by 18-30 (26.32%), and 31-40 (17.54%). Females

made up 52.63% of the patients, slightly more than males at 47.37%. Regarding education, 36.84% had secondary education, 33.33% had higher secondary education, 14.04% had primary education, and 15.79% had a graduate degree or higher. Occupation-wise, 35.09% were housewives, 31.58% were students, 21.05% were businessmen, 10.53% were employed, and 1.75% were unemployed. The majority were married (75.44%), lived in rural areas (57.89%), and belonged to nuclear families (56.14%).

Table I: Socio-demographic Characteristics of Study Participants

Characteristics	Frequency (n)	Percentage (%)
Age group		
10-20	15	26.32
21-30	26	45.61
31-40	10	17.54
41-50	3	5.26
>50	3	5.26
Gender		
Male	27	47.37
Female	30	52.63
Educational Status		
Primary education	8	14.04
Secondary Education	21	36.84
Higher Secondary Education	19	33.33
Graduation and above	9	15.79
Occupation		
Businessman	12	21.05
Housewife	20	35.09
Service	6	10.53
Student	18	31.58
unemployed	1	1.75
Marital status		
Married	43	75.44
Unmarried	14	24.56
Residence		
Rural	33	57.89
Urban	24	42.11
Type of Family		
Joint	25	43.86
Nuclear	32	56.14

Clinico-epidemiological characteristics of study participants are shown in table II. Figure 1 shows the most prevalent cause

of poisoning included sedatives (17.54%), aluminium phosphide (14.04%), and stupefying agents (14.04%). Notably, alcohol poisoning constituted 7.02% of cases, while organophosphorus compounds and toilet cleaning materials each represented 8.77% and 10.53% of cases, respectively. Figure 2 demonstrates outcomes depended on the type of poison. The overall recovery rate was 78.95%, and the death rate was 21.05%. Some poisons, including anticonvulsants, antiseptics, corrosives, herbicides, OPC, insecticides, kerosene, methanol, TCAs, washing powder, and unknown poisons, had a 100% recovery rate. Sedative poisoning also had a 100% recovery rate, while alcohol had a 75% recovery rate. Paraquat had a 50% recovery rate, and stupefying agents had an 87.5% recovery rate. Aluminium phosphide poisoning resulted in a 100% fatality rate. The Pearson chi-square test showed a significant association between the poison type and outcome ($\chi^2(15) = 38.7996, p = 0.001$).

Table II: Clinico-epidemiological Characteristics of Study Participants

Characteristics	Frequency (n)	Percentage (%)
Motive		
Suicidal	48	84.21
Accidental	9	15.79
Level of Consciousness		
Conscious	14	24.56
Semi-conscious	32	56.14
Unconscious	11	19.30
Route		
Oral	57	100
Time of Presentation since Exposed		
<30 minutes	43	75.44
30-60 minutes	11	19.30
> 60 minutes	3	5.26
Glasgow Score		
Less than 9	10	17.54
9-13	14	24.56
>13	33	57.89
Reason for consumption		
Marital disharmony	35	61.40
Familial disharmony	9	15.79
Mental disorder	4	7.02
Criminal poisoning	8	14.04
Accidental overdose	1	1.75
Hospital Outcome		
Discharged	10	17.54

Discharge Against Medical Advice	37	64.91
Referred	1	1.75
Death	9	15.79
Final Outcome		
Recovery	45	78.95
Death	12	21.05

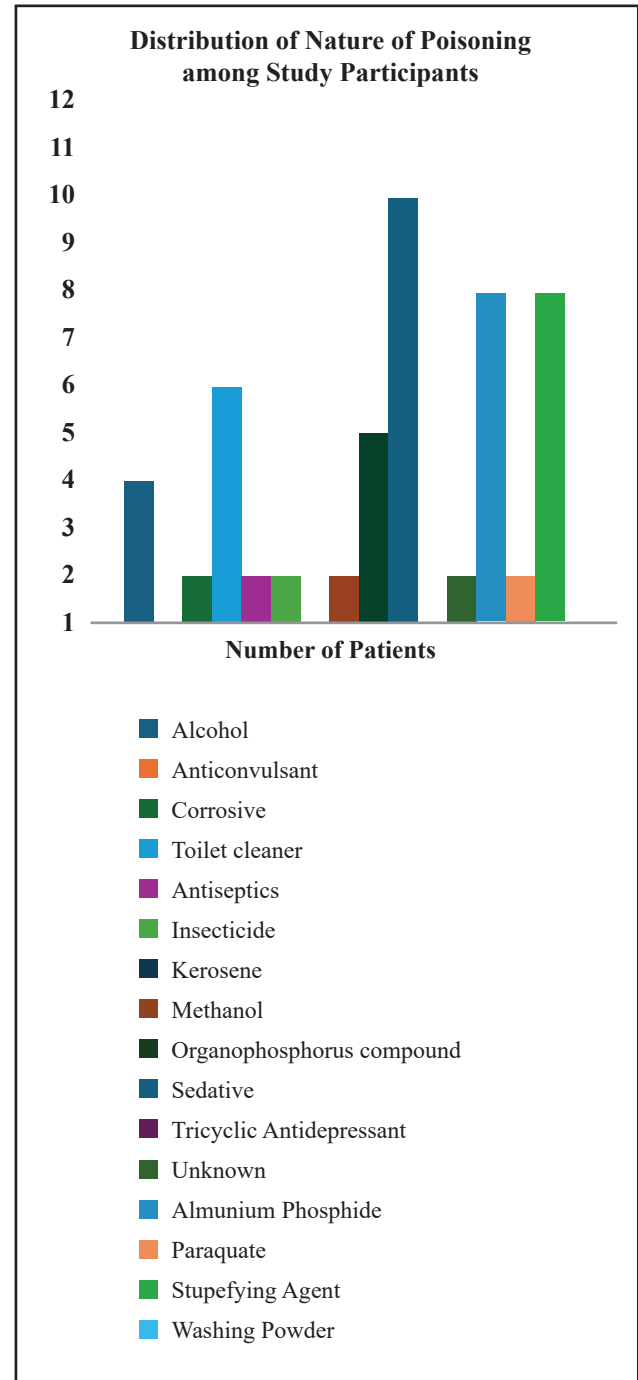


Figure 1: Distribution of Nature of poisoning among Study Participants

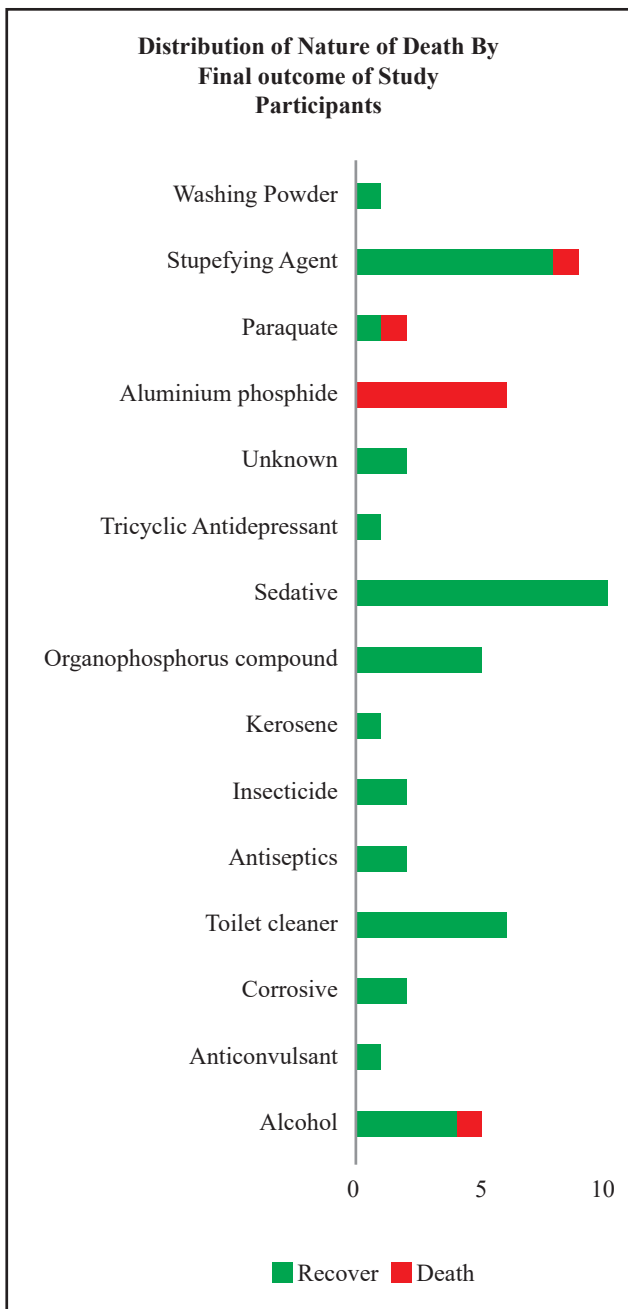


Figure 2: Distribution of Nature of Death by Final outcome of Study Participants

Table III depicts Females demonstrated a significant higher recovery rate (90.00%) compared to males (66.67%), ($\chi^2 = 4.65, p = 0.03$). Married participants exhibited a significantly higher recovery rate (88.37%) than unmarried individuals (50.0%) ($\chi^2 = 9.35, p = 0.01$). Regarding age groups, those aged 31-40 years had the highest recovery rate (90.00%), while individuals aged 41-50 years showed a notable but non-significant trend toward a higher death rate (33.33%). Educational status & Occupation was excluded from analysis. Residence in urban areas showed a trend towards higher recovery rates (87.50%) compared to rural areas (72.73%), albeit non-significant. Lastly, nuclear family structures

trended towards higher recovery rates (87.50%) compared to joint families (68.00%), without statistical significance.

Table III: Association of Final Outcome with Socio-demographic Characteristics of Study Participants (N=57)

Characteristics	Recovery n (%)	Death n (%)	χ^2 Value (P-value)
Age group			
10-20	11(73.33)	4(26.67)	2.15 (0.70)
21-30	20(76.92)	6(23.08)	
31-40	9(90.00)	1(10.00)	
41-50	2(66.67)	1(33.33)	
>50	3(100)	0(0.0)	
Gender			
Male	18(66.67)	9(33.33)	4.65 (0.03*)
Female	27(90.00)	3(10.0)	
Marital status			
Married	38(88.37)	5(11.63)	9.35 (0.01*)
Unmarried	7(50.0)	7(50.0)	
Residence			
Rural	24(72.73)	9(27.27)	1.82 (0.17)
Urban	21(87.50)	3(12.50)	
Type of Family			
Joint	17(68.00)	8(32.00)	3.21 (0.07)
Nuclear	28(87.50)	4(12.50)	

Table IV demonstrates conscious patients upon presentation showed a higher recovery rate (92.86%) compared to semi-conscious (75.00%) and unconscious (72.73%) individuals, although not statistically significant ($\chi^2 = 2.18, p = 0.33$). Glasgow Coma Scale scores <9 were associated with higher mortality (90.00%), contrasting with scores of 9-13 (85.71%) and >13 (96.97%) ($\chi^2 = 35.43, p < 0.01$). Motive (suicidal vs. accidental) and reasons for consumption (e.g., marital disharmony, criminal poisoning) did not significantly influence outcomes. However, hospital outcomes strongly correlated with survival, with a 100% recovery rate for discharged patients compared to higher mortality rates among those discharged against medical advice (91.89%) or deceased (100%) ($\chi^2 = 40.41, p < 0.01$). Time of hospital admission since exposure (<30 minutes: 76.74%, 30-60 minutes: 81.82%, >60 minutes: 100.0%) did not significantly affect outcomes.

Table IV: Association of Final Outcome with Clinico-epidemiological Characteristics of Study Participants

Characteristics	Recovery n (%)	Death n (%)	χ^2 Value (<i>P</i> -value)
Level of Consciousness			
Conscious	13(92.86)	1(7.14)	2.15
Semi-conscious	24(75.00)	8(25.00)	(0.70)
Unconscious	8(72.73)	3(27.27)	
Route			
Motive			
Suicidal	37(77.08)	11(22.92)	0.63
Accidental	8(77.08)	1(11.11)	(0.42)
Reason for consumption			
Marital disharmony	28(80.00)	7(20.00)	4.67 (0.32)
Familial disharmony	5(55.56)	4(44.44)	
Mental disorder	4(100.00)	0(0.00)	
Criminal poisoning	7(87.50)	1(12.50)	
Accidental overdose	1(100.00)	0(0.00)	
Time of Presentation since Exposed			
<30 minutes	33(76.74)	10(23.26)	0.98
30-60 minutes	9(81.82)	2(18.18)	(0.61)
> 60 minutes	3(100.0)	0(0.0)	
Glasgow Score			
<9	1(10.00)	9(90.00)	35.43
9-13	12(85.71)	2(14.29)	(<0.01*)
>13	32(96.97)	1(3.03)	
Hospital Outcome			
Discharged	10(100)	0(0.00)	40.41
Discharge Against Medical Advice	34(91.89)	3(8.11)	(<0.01*)
Referred	1(100.00)	0(0.0)	
Death	0(0.0)	9(100.0)	

Discussion:

This study provides valuable insights into the clinico-epidemiological profiles and outcomes of acute poisoning patients admitted to the ICU of a private medical college hospital in Bangladesh. Most poisoning cases in our study occurred in the age group of 21-30 years, followed by the 18-30 years group. This age distribution indicates that young adults and adolescents are particularly vulnerable to poisoning incidents, possibly due to higher levels of stress, impulsivity, and exposure to harmful substances. Similar findings were reported by Joshi M et al who found that 56% of poisoning cases occurred in individuals aged 20-29 years, followed by 20.8% in the 30-39 years age group.¹³

In our study, females comprised 52.63% of the patients, indicating a slight female predominance. Most patients had secondary or higher secondary education, reflecting the general educational attainment of young adults in the area. Housewives and students were the most affected groups, likely due to household responsibilities and academic pressures. The majority of patients were married, suggesting marital stress as a significant factor in poisoning incidents. Additionally, a higher proportion of patients were from rural areas and nuclear families, indicating limited access to mental health services and social support. Similar study on acute poisoning conducted in urban area of India, found a predominance of male patients, with most being businessmen and having secondary education.¹⁴

The clinical characteristics and outcomes of the patients reveal that a vast majority of poisonings were suicidal, highlighting the urgent need for mental health interventions and suicide prevention strategies. The levels of consciousness at admission varied, with the majority being semi-conscious and unconscious, indicating that many patients were in critical condition upon arrival. The route of exposure was oral in all cases, and most patients' symptoms presented within 30 minutes of exposure, suggesting prompt action and access to medical care. The Glasgow Coma Scale (GCS) revealed that a significant portion of patients had scores greater than 13, indicating a relatively better prognosis, while those with GCS scores less than 9 had a higher risk of poor outcomes. In the study by Taghaddosinejad et al at Baharlou Hospital in Tehran found similar finding.¹⁵

The primary reasons for poisoning in our study were marital disharmony, familial disharmony, and mental disorders, highlighting the necessity of addressing interpersonal conflicts and mental health issues. Hospital outcomes indicated that a majority of patients were discharged against medical advice, potentially reflecting socio-economic constraints or dissatisfaction with medical care. Similarly, a study conducted in Ethiopia identified mental disorders (20.8%), family disharmony (19.2%), and marital disharmony (15.8%) as the major reasons for intentional poisoning.¹⁶

The overall recovery rate was 78.95%, with a death rate of 21.05%, pointing to a significant mortality risk in acute poisoning cases. Studies conducted in, Ethiopia, China and Bangladesh found death rate 16.7% ,1.3% and 10% respectively^{8,16,17.}

The recovery rates varied significantly based on demographics. Females had a higher recovery rate compared to males possibly due to earlier presentation or differences in the types of poison ingested. Married individuals also showed a higher recovery rate compared to unmarried individuals, suggesting that marital status might influence the support systems available to patients.

The age group of 31-40 years had the highest recovery rate, while those aged 41-50 years had a higher death rate, indicating age-related variations in resilience and health status. Occupational analysis revealed that housewives had a higher recovery rate compared to businessmen and service

workers, which could be related to different stress levels and access to resources.

Residence in urban areas showed a trend towards higher recovery rates compared to rural areas, though this was not statistically significant, indicating potential disparities in healthcare access and quality. Nuclear family structures trended towards higher recovery rates compared to joint families, possibly reflecting differences in social support dynamics.

The level of consciousness at presentation significantly influenced recovery rates. Conscious patients had a higher recovery rate compared to semi-conscious and unconscious patients, highlighting the importance of early intervention and the severity of the poisoning. The Glasgow Coma Scale scores also showed a strong correlation with outcomes, with scores less than 9 associated with higher mortality, while scores of 9-13 and greater than 13 indicated better prognosis.

The motive for poisoning (suicidal vs. accidental) and reasons for consumption did not significantly affect outcomes, suggesting that the clinical severity and timely management are more crucial determinants of recovery. Hospital outcomes were strongly correlated with survival, with discharged patients having a 100% recovery rate, while those discharged against medical advice or deceased had significantly higher mortality rates, emphasizing the importance of adherence to medical advice and complete treatment. Suicidal intent was reported as a significant cause of poisoning in Bangladesh, India, Ethiopia and Iran in previous studies.^{9,13,16}

Arrival time at medical facility since exposure did not significantly affect outcomes, indicating that factors such as the type and amount of poison ingested, and the treatment provided play more critical roles in determining the prognosis.

The most prevalent causes of poisoning in our study included sedatives, aluminium phosphide, and stupefying agents. The diversity in the types of poisons used highlights the need for broad-based preventive measures and public awareness campaigns about the dangers of various substances. These findings underscore the importance of regulating access to potentially harmful substances and educating the public about their risks. However, other studies have reported that opioids were the leading cause of poisoning, with significant mortality rates in ICU settings at poison canthers in Tehran, Khoramabad, and Mazandaran, Iran, being 17.7%, 11.6%, and 14.6%, respectively.^{18,19}

The outcomes varied significantly by the nature of the poison ingested. Substances such as anticonvulsants, antiseptics, corrosives, herbicides, organophosphorus compounds, insecticides, kerosene, methanol, TCAs, washing powder, and unknown poisons all demonstrated a 100% recovery rate, indicating that prompt and appropriate medical intervention can lead to positive outcomes.

In contrast, aluminium phosphide poisoning resulted in a 100% fatality rate, highlighting its high lethality and the need for stringent control measures. Aluminium phosphide liberates lethal phosphine gas when it comes in contact either with atmospheric moisture or with hydrochloric acid in the

stomach. The mechanism of toxicity includes cellular hypoxia due to the effect on mitochondria, inhibition of cytochrome C oxidase and formation of highly reactive hydroxyl radicals. Similar to Paraquat there is no antidote for aluminium phosphide poisoning.

Aluminium phosphide tablets are not banned in the country, but their use is restricted. These tablets are basically meant for use in warehouses to protect foodgrains from insects. They should never be used for household pest control. This poisoning, known as Kerry or Rice tablet poisoning, is common in the Comilla region of Bangladesh.²⁰ A recent incident drawn nationwide attention and made newspaper headlines and electronic media coverage when a private pest control agency used aluminium phosphide for pest control in a residential house, as a result two young boys died after inhalation of toxic gas liberated by aluminium phosphide. So besides suicidal intent harm can be done by its deliberate use.²¹

Sedative poisoning yielded a recovery rate of 90.00%, while alcohol poisoning showed a 75.00% recovery rate, reflecting the varying toxicities and treatment challenges associated with different substances. However, Sedative or benzodiazepine poisoning and alcohol toxicities lead to high mortality in dose dependent manner in North America & Europe.²²

Limitations: The small sample size limits generalizability of the study. Conducted in a single private medical college hospital, the findings may not reflect the broader population in Bangladesh or other healthcare settings. Additionally, the study did not account for potential confounding factors like pre-existing medical conditions, the exact quantity of poison ingested, and treatment specifics.

Scopes: This study establishes a foundation for future research on the epidemiology of acute poisoning in Bangladesh. Future research should involve larger, multicentre studies for better generalizability and longitudinal studies to assess long-term outcomes for survivors. Additionally, it should evaluate the effectiveness of intervention strategies, particularly focusing on mental health support and poison education to prevent incidents and improve patient outcomes.

Conclusion:

The majority of poisonings were intentional, with sedatives, aluminium phosphide, and stupefying agents being the most common agents. The high mortality rate, particularly from aluminium phosphide, underscores the need for stringent regulatory measures and public awareness campaigns to control access to these toxic substances. Mental health interventions and targeted support for marital and familial issues are crucial, given the high incidence of suicidal poisonings. Prompt medical intervention and better healthcare access are essential for improving survival rates. Overall, comprehensive strategies focusing on prevention, regulation, and timely treatment are vital to reduce the incidence and improve the outcomes and mitigate burden of acute poisoning cases in Bangladesh.

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