

# Four-Year Study on Acute Poisoning Cases Admitted to a Tertiary Hospital in Bangladesh: Emerging Trend of Poisoning in Commuters

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## Abstract

**Background:** The pattern of poisoning has a regional variability. This study was carried out to describe the epidemiological profile of acute poisoning in northeastern Bangladesh and to evaluate the mortality.

**Methods:** In this retrospective cross-sectional study, medical records of poisoned patients treated at department of medicine of Sylhet M.A.G. Osmani Medical College Hospital, Sylhet, Bangladesh during 1<sup>st</sup> January 2008 to 31<sup>st</sup> December 2011 were reviewed. Patients aged 10 years and above with diagnosis of acute poisoning were included. Data collected were gender, age, place of residence, type of poison and intention of poisoning.

**Results:** A total of 4435 (58.7% men) were included. Patients aged 21 to 30 years were the most common age group involved with poisoning (41.6%). The majority of patients (55.4%) lived in rural areas. Commuter poisoning (43.3%) was the most frequently occurring type of poisoning in both men and women in all 4 years followed by OP poisoning (25.7%). Men were found to be significantly more affected in commuter, organophosphate and alcohol poisoning ( $P < 0.001$ ). Intention of poisoning in the greatest number of patients (54.5%) was suicidal followed by 1919 patients (43.3%) who were poisoned by homicidal/stupefying intents. Among the homicidal cases, men were significantly more victimized (67% vs. 33%,  $P < 0.001$ ). Overall, 224 patients (5.1%) died. The highest number of deaths was due to OP poisoning (46.9%) followed by commuter poisoning (45.5%). Case fatality rate was the highest in the snakebite victims (23.3%) followed by alcohol poisoning (11.4%).

**Conclusion:** Commuter or travel-related poisoning is an emerging public health threat in this part of Bangladesh. Public awareness should be raised and school-based educational programs should be emphasized regarding the commuter poisoning and the consequence of accepting and eating food from strangers.

**Keywords:** Bangladesh; Chemically-Induced Disorders; Epidemiologic Studies; Poisoning; Travel

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## INTRODUCTION

Acute poisoning is a global problem which has steadily increased over the past few years in developing countries and has become as one of the major causes of morbidity and mortality in these countries (1,2). According to the World Health Organization, 99% of the fatal poisoning cases occurred in developing countries (1). Developed countries also face the problem of acute poisoning. In the UK, it accounts for 10-20% of all acute medical admissions (3).

Deliberate self-poisoning has reached epidemic proportions in some parts of the developing world where the toxicity of available poisons and limited medical facilities create a high fatality rate (4). Recent extrapolations of data from a few countries in the Asia suggest that there may be 300,000 suicides by deliberate ingestion of pesticides annually in this region alone (5,6). Poisoning is a serious threat in

Bangladesh as it comprises around 44% of all deaths among adult females and around 8 to 10% of overall mortality in medical wards of tertiary healthcare settings (7). Common types of poisoning in this country are organophosphate (OP) poisoning, poisoning with unknown substances especially in commuter (travel-related) poisoning; poisoning with sedatives, corrosive agents, rodenticides, kerosene/petrol and alcohol, and snakebite (7,8). Of them, poisoning in commuters (commuter poisoning) has become a major toxicological issue in Bangladesh in the recent years (9). Some unusual forms of poisoning, such as copper sulfate and puffer fish poisoning are also occurred in some regions of the country (7,10,11).

The pattern of poisoning varies from one country to another and may vary among different regions of a country. Epidemiological data on this important health issue are, however, scarce in northeastern part of Bangladesh. This

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study was carried out to describe the epidemiological profile of acute poisoning in northeastern Bangladesh and to evaluate the mortality.

## METHODS

### Setting

Sylhet M.A.G. Osmani Medical College Hospital is the main referral 900-bed tertiary care hospital, in the north-eastern part of Bangladesh with around 10 million population. Department of medicine in this hospital consists of 235-bed that provides specialized services of internal medicine for an average of 25000 patients annually. This hospital is the only public hospital in this region that is receptive for acute poisonings.

### Patients and data collection

In this retrospective cross-sectional study medical records of poisoned patients treated at department of medicine during 1<sup>st</sup> January 2008 to 31<sup>st</sup> December 2011 were reviewed. Patients aged 10 years and above with diagnosis of acute poisoning were included. Poisoned patients less than 10 years of age were

admitted to pediatrics ward and excluded from the study. Patients with incomplete information and those who left the hospital against medical advice were also excluded. Data collected were gender, age, place of residence, type of poison and intention of poisoning. Age of patients was categorized into four groups with range of 10 to 20, 21 to 30, 31 to 40 and above 40. The intention of poisoning was categorized to suicidal, homicidal/ stupefying and accidental poisoning.

### Ethics and statistical analysis

The study was approved by the ethics committee of Sylhet M.A.G. Osmani Medical College. Confidentiality of patients' information was maintained when the data were obtained from the medical records.

Statistical analysis was done using SPSS version 16 (SPSS Inc., Chicago, USA) and results are presented as frequency and percentage with charts and tables. Analysis of difference between two categorical variables was done using the chi squared test. A p value less than 0.05 was considered to be statistically significant.

**Table 1.** Socio-demographic features of patients

	Total (n = 4435)	Male (n = 2604)	Female (n = 1831)
Age groups; n (%)			
10-20	1736 (39.1)	962 (55.4)	774 (44.6)
21-30	1844 (41.6)	1176 (63.8)	668 (36.2)
31-40	445 (10.0)	255 (57.3)	190 (42.7)
40 <	410 (9.3)	211 (51.5)	199 (48.5)
Place of residence; n (%)			
Urban	1300 (29.3)	801 (61.7)	499 (38.3)
Semi-urban	680 (15.3)	456 (67)	224 (33)
Rural	2455 (55.4)	1347 (54.9)	1108 (45.1)

**Table 2.** Year-wise distribution of various types of poisoning in northeastern Bangladesh

Study year	Type of poisoning											Total
	Commuter poisoning <sup>1</sup>	OPC <sup>2</sup>	Sedatives	Harpic <sup>3</sup>	Rodenticides <sup>4</sup>	Corrosive agents <sup>5</sup>	Alcohol <sup>6</sup>	Kerosene / Petrol	Paracetamol	Snakebite	Others	
2008	438 (42.9)	260 (25.5)	122 (11.9)	86 (8.4)	35 (3.4)	31 (3.0)	9 (0.8)	6 (0.6)	6 (0.6)	4 (0.4)	25 (2.5)	1022
2009	487 (46.7)	223 (21.4)	113 (10.9)	95 (9.1)	33 (3.2)	25 (2.4)	12 (1.2)	4 (0.4)	9 (0.9)	5 (0.5)	35 (3.3)	1041
2010	451 (39.0)	336 (29.1)	130 (11.2)	65 (5.7)	45 (3.9)	40 (3.5)	12 (1.0)	7 (0.6)	5 (0.4)	15 (1.3)	50 (4.3)	1156
2011	543 (44.6)	321 (26.4)	117 (9.7)	67 (5.5)	60 (5.0)	32 (2.6)	11 (0.9)	6 (0.5)	9 (0.7)	6 (0.5)	44 (3.6)	1216
Total	1919 (43.3)	1140 (25.7)	482 (10.8)	313 (7.1)	173 (3.9)	128 (2.9)	44 (1.0)	23 (0.5)	29 (0.6)	30 (0.7)	154 (3.5)	4435

<sup>1</sup> The majority of commuter poisonings were caused by unknown agents

<sup>2</sup> OPC: organophosphate compounds

<sup>3</sup> Harpic is a cleaning product mainly composed of 10% HCl

<sup>4</sup> Zinc phosphide or aluminum phosphide

<sup>5</sup> Corrosive agents other than harpic

<sup>6</sup> All kinds of alcohol predominantly methanol

**RESULTS**

*Sociodemographic*

During the study period, a total of 4435 cases of acute poisoning with mean age of 24.8 ±12.6 years were treated at the department of medicine. The annual number of admissions due to poisoning slightly increased from 1022 in 2008 to 1216 in 2011. The majority of patients were men (2604, 58.7%) and male to female ratio was 1.4: 1. Patients aged 21 to 30 years were the most common age group involved with poisoning (1844; 41.6%) followed by patients aged 10 to 20 years (1736; 39.1%) (Table 1). The majority of patients (2455, 55.4%) lived in rural areas.

*Types of poisons and circumstances of poisoning*

Commuter poisoning (1919; 43.3%) was the most frequently occurring type of poisoning in both men and women in all 4 years. Poisoning with OP compounds was the second leading type (25.7%) followed by sedatives (10.8%), harpic (7.1%), rodenticides (3.9%) and corrosives other than harpic (2.9%). Incidence of commuter, OP and rodenticides poisoning were found to have an upward trend-line over the study period (Table 2).

Considering the gender distribution, variability existed among the different types of poisons used (Figure 1). Men were significantly more affected in commuter (P < 0.001), OP (P < 0.001) and alcohol poisoning (P < 0.001). In addition, poisoning with sedatives and kerosene/petrol was slightly more common in men. On the other hand, women predominated in poisoning with harpic (P < 0.001), corrosive agents, rodenticides and paracetamol, as well as in snakebite.

Intention of poisoning in the greatest number of patients (2419, 54.5%) was suicidal followed by 1919 patients (43.3%) who were poisoned by homicidal/stupefying intents (Figure 2). Among the homicidal cases, men were significantly more victimized (67% vs. 33%, P < 0.001). Homicidal poisonings

occurred with stupefying agents usually during work-related travels from suburbs to cities or vice versa. Suicidal mode was slightly more common in women (50.7%).

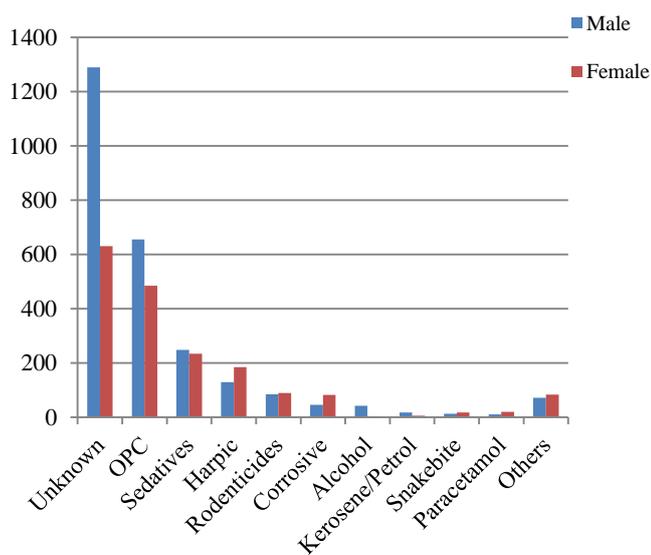
*Outcomes*

Overall, 224 patients (5.1%) died with male to female ratio of 1.42:1. The highest number of deaths was due to OP poisoning (46.9%) followed by commuter poisoning (45.5%). Considering the frequency of each type of poisoning, case fatality rate was the highest in the snakebite victims (23.3%) followed by alcohol poisoning (11.4). No death occurred due to poisoning with sedatives, rodenticides, kerosene/petrol, paracetamol and harpic.

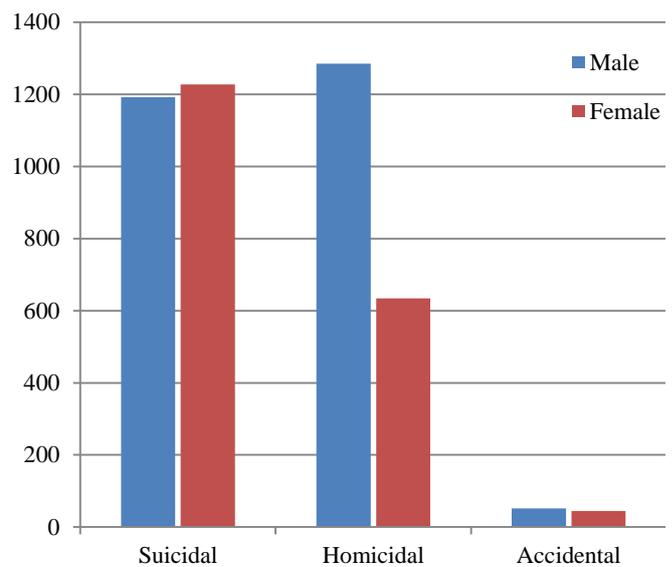
**DISCUSSION**

In this study, a 4-year profile of acute poisoning cases treated at Sylhet M.A.G. Osmani Medical College Hospital, northeastern Bangladesh, was described. Poisoning in men slightly outnumbered women, a finding which was nearly similar to the findings of Sarker et al in Bangladesh, and Prajapati et al and Patil et al in India (12-14). Likewise, two other studies in the country showed that the poisonings are more common in men (15,16). On the other hand, there are findings from some other countries where the woman has a preponderance (17,18). The higher incidence of poisoning in men may be due to the fact that they are more exposed to stress following financial difficulties and work-related pressures. In addition, they are more active outside the house and farms that make them susceptible to outdoor threats (19).

The majority of male patients were from the age group of 21 to 30 years which is similar to a study by Chowdhury et al in Bangladesh (7). Studies in other countries also showed similar pattern of age distribution (12,13,20-22). This shows that young adults are more vulnerable to this health problem which might be due to emotional and social disharmony, occupational problems and risk taking behaviors at these ages.



**Figure 1.** Pattern of different types of poisoning according to gender



**Figure 2.** Intention of poisoning according to gender

**Table 2.** Case fatality rate of poisoning in hospital in northeastern Bangladesh during 2008 to 2011 according to poison type

Toxic agents	Total cases (n = 4435)	Hospital deaths (n = 224)	Case fatality rate (%)
Snakebite	30	7	23.3
Alcohol	44	5	11.4
OPC*	1140	105	9.2
Commuter poisoning	1919	102	5.3
Corrosive	128	3	2.3
Others	154	2	1.3
Sedatives	482	0	0
Rodenticides	173	0	0
Kerosene/Petrol	23	0	0
Paracetamol	29	0	0
Harpic	313	0	0
Total	4435	224	5.1

\* OPC: organophosphate compounds

Majority of the patients consumed the poison with suicidal intention with a female to male ratio of 1.02:1 replicating the findings of a study done in southern part of Bangladesh (7).

In this study, commuter poisoning was revealed to be the leading type of poisoning. People in suburban areas need to travel far distances for work. Unemployment is also a problem in Bangladesh which encourages rural people to migrate into bigger cities to find a job. Moreover, northeastern part of Bangladesh is famous for number of religious places and shrines. So, travel of pilgrims from other parts of the country to this part is quite frequent. Thus, all these factors might collectively be responsible for the recent emerging trend of commuter poisoning especially in this part of Bangladesh. This trend is quite similar to the findings of Majumder et al which showed that between 2004 and 2006, travel-related poisoning increased from 6.1 to 9.5% of all admissions and represented 46.6 to 55.7% of all admitted poisoning cases at Dhaka medical college hospital (DMCH) in Dhaka at the central part of the Bangladesh (9). Other studies by Howlader et al in 2004 and Sarker et al in 2002 showed similar trend (15,23). Travel-related poisoning is a social and public health emergency in Bangladesh (24). This kind of poisoning is also a health concern in India (25). The agents used for travel related poisoning are reported to be cocktail of stupefying agents and or benzodiazepines commonly lorazepam (9,25).

In the present study, we found OP compounds as the second leading toxic agent used for poisoning. This finding is consistent with two previous studies done in northern and southern parts of Bangladesh (26,27). OP poisoning is a common health dilemma in Bangladesh and in Southeast Asian countries in general (5,8). OP compounds are commonly used with suicidal intention by the poor rural people in the tropical countries as they are low-priced and easy available. Different epidemiological studies in Bangladesh showed that pesticide poisonings are responsible for approximately 39% of total admitted poisoning cases in Bangladesh (8).

A country wide pilot survey in Bangladesh reported sedatives as the leading agent (37.1%) after including travel-related poisonings under this group (11). Common sedatives used for poisoning are benzodiazepines which are easily available without prescription in the country. According to our findings, harpic ingestion was the next important type of poisoning in this part of the country which accounted for 7% of all poisoning cases resembling the findings of Howlader et al (16). Harpic is a common house-hold cleaning staff mainly composed of 10% hydrochloric acid with a pH of 0.5 and it is commonly abused by women. Although snakebite constituted less than 1% of cases in this study, it was responsible for the highest case fatality rate (23.3%). This may be due to the fact that the snakebite is still a neglected health issue in Bangladesh and also the common beliefs of the people that seek traditional healers and methods prior to visiting the healthcare facilities (19,28). Alcohol (especially methanol) poisoning was the second in terms of fatality in this study. In addition to high toxicity of methanol, this is probably due to delayed presentation of victims to the equipped healthcare settings and unavailability of specific antidotes (29).

According to the studies from the high-income countries, analgesics, particularly paracetamol, are the most common cause of deliberate poisonings in adults (20,30,31). But the scenario is different in Bangladesh as our findings in northeastern part and a previous study in southern part of the country demonstrated that less than 1% of acute poisonings are due to paracetamol ingestion (7). It is noteworthy that in the northeastern part of the country no cases of copper sulfate and puffer fish (tetrodotoxin) poisoning were observed which were mentionable causes of poisoning in southern part of Bangladesh (32). The overall mortality rate in this study was 5.1% which is similar to a recent study done at Rangpur Medical College Hospital in northern Bangladesh (14), and close to the findings of national statistics (4.1%) (11).

## LIMITATIONS

Since this study was done retrospectively using hospital registry, some of the important parameters including occupation and marital status could not be evaluated. In some cases, mode of poisoning may not have been reported reliably due to concealment of the proper history. Poisoning cases are filed as a police issue in Bangladesh; therefore, people are sometimes afraid of giving proper history. Pediatric cases were not included in this study which may result in missing some important cases of poisoning. Moreover, a facility for toxicological analysis is not available in the catchment area of the study. So, the exact chemical identity of the toxic agents consumed (especially for commuter poisoning cases) could not be identified and the type of poisons reported in this study were solely based on patients' history, police records and bottle labels brought by the patients or their relatives.

## CONCLUSION

Commuter or travel-related poisoning is an emerging public health threat in this part of Bangladesh. Public awareness should be raised and school-based educational programs should be emphasized regarding the commuter poisoning and the consequence of accepting and eating food from strangers.

Legislative measures are required to be strengthened and stringent law enforcement must be ensured on over the counter sale of medications and purchase of poisons in the country. No drugs especially benzodiazepines should be distributed without authorized prescription. Availability of antidotes needs to be ensured in every secondary and tertiary care hospitals of the country. Moreover, prospectively-designed large scale studies are required to provide the evidence-based facts to underpin public health strategies and for implementation of preventive measures.

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