

## ORIGINAL ARTICLE

# Spectrum of Acute Pharmaceutical and Chemical Poisoning in Northern Bangladesh

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## Abstract

**Background:** Acute poisoning is a major public health problem in Bangladesh. It is a common method for suicide. A clear picture regarding clinical presentation, most commonly used toxic agents, background factors and outcome of poisoned patients is necessary in every region. The aim of this study was to investigate frequency and outcome of acute pharmaceutical and chemical poisoning cases in Northern Bangladesh.

**Methods:** This was a retrospective descriptive study on poisoned patients with 18 years of age and above who were admitted to Rangpur Medical College Hospital during 1st December 2011 to 30th November 2012.

**Results:** During the study period, a total of 956 patients were investigated. Males slightly outnumbered females (51.6%). The majority of patients (92%) were in the 18-40 year age-group. Regarding occupation, housewives were the most frequent (33.6%) followed by farmers (31.7%) and students (20.9%). Organophosphate compounds (OPC) were the most commonly used toxic agents (73.5%). Most of poisoning cases occurred following suicidal attempts (88%). Familial disharmony was the main cause of suicidal attempts (92.3%). Univariate Analysis showed that age less than 40 years, being married, living in rural areas and educational attainment below secondary level were significantly associated with an increased risk of poisoning ( $P < 0.001$ ).

**Conclusion:** All tertiary hospitals should be well equipped with antidotes of OPCs and other supportive treatments in Bangladesh. Furthermore, strong rules must be applied to prevent the distribution of benzodiazepines without prescription. In addition, people with age of less than 40 years, housewives and farmers, rural residents and those with less educational attainment should be targeted for prevention and educational programs against deliberate self-poisoning.

**Keywords:** Acute Poisoning; Bangladesh; Pharmaceutical; Chemical; Suicide

## INTRODUCTION

Acute poisoning is a major public health problem in low and middle income countries. Toxic agents used vary from country to country depending on easy availability of substances, socio-economic condition and educational background of people (1). Acute poisoning is a common health problem in Bangladesh causing around 2000 deaths each year (2). Studies have shown that poisoning is a common method of suicide, especially in developing countries (3). Self-poisoning constitutes more than half of total poisoning cases admitted to hospitals in Bangladesh (4). Moreover, it has been ascertained that considerable number of deaths following poisoning in Bangladesh is due to suicidal attempts (5).

In China and Southeast Asia, pesticides are the most commonly used poisons for self-harm accounting for about 300,000 suicides each year (1). Another study showed that annually worldwide, 3 million acute poisoning cases

following ingestion of organophosphate compounds (OPC) occur leading to 220,000 deaths (6). Much of this burden is borne by developing countries where more than 80% of cases are hospitalization due to fatal pesticide poisoning (7).

In emergency departments, clinicians commonly deal with acute poisoning. Therefore, a clear picture regarding clinical presentation, most commonly used toxic agents, background factors and outcome of poisoned patients is necessary in every region. The aim of this study was to investigate frequency and outcome of acute pharmaceutical and chemical poisoning cases in Northern Bangladesh.

## METHODS

This was a retrospective descriptive study on poisoned patients with 18 years of age and above who were admitted to Rangpur Medical College Hospital during 1st December 2011 to 30th November 2012. Data were collected by reviewing medical charts.

Toxic agents were categorized to OPC, corrosive agents

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and pharmaceutical drugs. Intention of poisoning was classified as accidental, homicidal and suicidal (8).

A descriptive analysis was done on all variables to obtain a frequency distribution. Quantitative variables were reported with range, frequency and percentage. Proportions were analyzed with chi-square test or 2-tailed Fisher's exact test whenever appropriate. P value of 0.05 or less was considered as statistically significant. Data were analyzed using Statistical Package of Social Sciences version 16 (SPSS Inc., Chicago, IL, USA).

## RESULTS

### Demographic

During the study period, a total of 956 patients were investigated. Males were slightly higher than females (51.6% vs. 48.4%). Minimum and maximum age of the study population was 18 years and 64 years respectively (Table 1). The majority of patients (92%) were in the 18-40 year age-group. Regarding occupation, housewives were the most frequent (33.6%) followed by farmers (31.7%) and students (20.9%) (Table 1). Moreover, most patients (83.5%) had lower educational levels (primary and secondary) and

**Table 1.** Socio-demographic characteristics of the study population (n=956)

Characteristic	Frequency (%)	P value
<i>Age</i>		
18-40 years	879 (92)	
41-60 years	67 (7)	<0.001
>60 years	10 (1)	
<i>Sex</i>		
Male	493 (51.6)	
Female	463 (48.4)	0.33
<i>Marital status</i>		
Married	682 (71.4)	
Unmarried	274 (28.6)	<0.001
<i>Educational status</i>		
Illiterate	24 (2.5)	
Primary	341 (35.7)	
Secondary	457 (47.8)	<0.001
Higher secondary	103 (10.8)	
Graduate and above	31 (3.2)	
<i>Occupation</i>		
Service worker	31 (3.2)	
Farmer	303 (31.7)	
Student	200 (20.9)	
Housewife	321 (33.6)	<0.001
Businessman	73 (7.7)	
Others	28 (2.9)	
<i>Residence</i>		
Rural	648 (67.8)	
Urban	308 (32.2)	<0.001

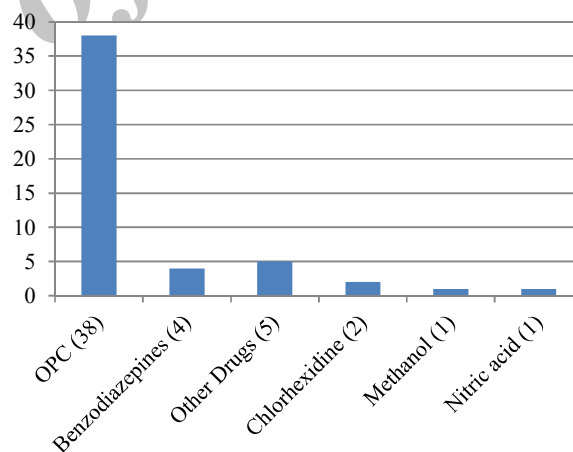
lived in rural areas (67.8%).

### Toxic Agents

OPCs were the most commonly used toxic agents (73.5%) (Table 2). They were used significantly higher than other agents including pharmaceutical drugs (12.3%), unknown agents (7.5%) and corrosive agents (5.5%) (P<0.001). Corrosive agents which were used included chlorhexidine, nitric acid and hair dye. Among pharmaceutical agents, sedatives, antipsychotics, tricyclic antidepressants, paracetamol and cetirizine were the most common drugs taken by patients. The most commonly used sedatives were benzodiazepines including diazepam, bromazepam, midazolam and clonazepam. The most common poison which caused death was OPC (Figure 1), while, no patient died due to ingestion of detergents.

### Intention of poisoning

Most of poisoning cases occurred following suicidal attempts (88%) (Table 3). Suicidal tendency was greater in males (53%) than females (47%). The majority of suicides (81%) occurred in the 18-40 years age group. Familial disharmony was the main cause of suicidal attempts (92.3%) (Table 4). Accidental poisoning cases occurred during spraying in the field, taking poison bottle mistakenly as the medicine syrup, using lice killer on hair and taking medications inappropriately and excessively in patients who suffer from psychiatric illnesses.



**Figure 1.** Distribution of type of poisons used in deceased cases.

**Table 2.** Distribution of toxic agents used

Toxic agent	Frequency (%)	P value*
OPC	703 (73.5)	
Pharmaceutical Drugs	118 (12.3)	<0.001
Corrosive	53 (5.5)	
Undetermined	82 (8.5)	

\*Chi-square test was used.

**Table 3.** Distribution of poisoned patients according to intention of poisoning

Intention of poisoning	Frequency (%)	P value*
Suicidal	843 (88.2)	
Homicidal	10 (1)	<0.001
Accidental	103 (10.8)	

\*Chi-square test was used.

**Table 4.** Reported causes of suicidal attempts

Cause of suicide	Frequency	P value*
Familial disharmony	883 (92.3)	
Failed in examination	19 (2.0)	
Economical loss	16 (1.7)	<0.001
Chronic illness	35 (3.7)	
Undetermined	3 (0.3)	

\*Chi-square test was used.

#### *Treatments and outcomes*

The most common pre-hospital treatment for poisoned patients was inducing vomiting by applying bitter items in mouth. Gastric lavage was performed in all patients during admission. In hospital, most patients received supportive treatments while OPC poisoned cases received atropine and/or pralidoxime. 51 patients (5.34%) died which among them, 27 cases were male, 38 cases were from rural areas and 38 cases ingested OPCs.

#### *Risk of Poisoning*

Univariate Analysis showed that age less than 40 years, being married, living in rural areas and educational attainment below secondary level were significantly associated with an increased risk of poisoning ( $P < 0.001$ ). Moreover, it was found that familial disharmony was the most significant predisposing factor of suicide ( $P < 0.001$ ).

## DISCUSSION

Incidence of acute poisoning in Bangladesh is gradually increasing (2). Since, there is no wide-organized poisoning database or national poison information center, the exact picture of poisoning in Bangladesh is unknown. A 3-year study which was conducted in western Bangladesh at Rajshahi Medical College Hospital revealed that 4.13% of admitted patients were due to poisoning. Similarly a study in 1998, in Rangpur Medical College Hospital showed that 3.9% of all admissions were poisoning cases (5). These data show an alarming picture of poisoning in this country.

Management of poisoned patients will be greatly improved if common causes and risk factors of poisoning in each region are properly defined (9). In this study, males slightly outnumbered females (1.06:1). Likewise, 2 studies in India showed that males were marginally higher than

females (10,11). However, in a study in Karnataka, India, males highly dominated as male to female ratio was 3 to 1 (12).

In this study, younger patients were more significantly involved, as majority of cases was between 18 and 40 years old. Similarly, Das in a study in 2007 and Dash et al. in 2005 showed that most poisoned patients in India were less than 40 years of age (10,13).

In this study, most cases were married. Correspondingly, a study which was conducted in rural India in 2003 showed that majority of poisoned patients were married (14). In addition, we found that suicidal intention was significantly associated with familial disharmony. Hence, it could be explained that changing lifestyle and family disharmony may trigger high proportion of suicidal attempts among married individuals. According to patients' occupation, housewives, farmers and students were the most common, replicating previous findings in Chittagong, Southeastern Bangladesh (15).

Bangladesh economy is primarily based on agriculture. 80% of population is dependent on agriculture directly or indirectly. Pesticides are easily available in Bangladesh which among them, OPCs are widely used to control insect vectors. Therefore, OPC poisoning is very common (2,7). In this study we found that OPCs were the most commonly used poisons. This is consistent with previous findings which showed that poisoning with OPCs is a common method of suicide in Southeast Asia (1,7). Nevertheless, pesticide poisoning is also a common health problem in other parts of the world. One study in Brazil showed that over half of self-poisoned patients used pesticides (16). In this regard, World Health Organization (WHO) reported that using pesticides is the most common method of suicide throughout the world (17).

In this study, second toxic agent used for poisoning was pharmaceutical drugs. Patients were poisoned with medications following unintentional overdose or abusing for self-harm. Among them benzodiazepines were the most common. This is because in Bangladesh, most medications are cheap and easily available in markets. In a similar study by Nag et al. in Bangladesh, diazepam was the second cause of poisoning after OPC (5). However, mortality rate in the mentioned study was higher (16.4%) than this study (5.3%). Lower mortality rate in this study could be due to increase of public awareness, improved facilities and quicker transport of patients to hospitals.

## LIMITATIONS

In this study, patients with less than 18 years were not evaluated. Poisoning with natural toxins were not included in this study. Since this was a retrospective study, reported causes of suicide might be biased with inaccurate documentation. Moreover, interviewed persons might have answered to questions based on their personal interests.

## CONCLUSION

Poisonings in Bangladesh are mostly due to OPCs. Hence, all tertiary hospitals should be well equipped with antidotes of OPCs and other supportive treatments. The

second substance used for poisoning was benzodiazepines in Bangladesh. Thus, strong rules must be applied to prevent the distribution of these medications without prescription. In addition, in this study, it was ascertained that age less than 40 years, being housewife or farmer, living in rural areas and less educational attainment were significantly correlated to poisoning. People with these characteristics should be targeted for prevention and educational programs against deliberate self-poisoning.

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