Clinico-epidemiological Study on Self-induced Poisoning Caused by Substances Other than Organophosphorus Compound

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Abstract

Background: Though Organophosphorus Compounds (OPC) are mostly used for self-induced poisoning, non-OPC poisoning cases are increasing day by day. This study was done to describe clinical pattern and outcome of poisoning other than OPC.

Materials and methods: This observational study was conducted in the Medicine Ward of Chittagong Medical College Hospital. Data were collected in structured case record forms. Total 204 patients (n=204) were included in the study after fulfilling the inclusion criteria. Data were analyzed with SPSS and expressed as percentage, mean with standard deviation as appropriate.

Results: Out of 204 patients, most were female (60.8%). Most of the patients were young, 56.9% patients were unmarried, 60.8% poisoned patients resided in metropolitan area, most were with low educational level, 57.4% patients came from the middle class socio-economic group, 82.4% patients were poisoned by a single agent and 17.6% by multiple agents. Offending agents were identified in 96.6% cases. Poisoning by drugs was the highest (47.1%) followed by rat killer poisoning (22.5%) poisoning by non-OPC insecticides (6.9%) corrosive poisoning (6.4%) chemical poisoning (3.9%) and alcohol poisoning (1%). Family disharmony was the underlying cause of self-harm in 47.1% cases, financial constraints in 8.3%, social crisis in 7.8%, failure in love affairs in 6.4% and academic failure in 2.5% patients. 14.7% patients poisoned themselves to gain some benefit by the act of self-harm. 81.4% patients were discharged with advice, 2.9% died.

Conclusion: Burden of Non-OPC poisoning is high. Outcome is not so fatal as OPC, but the problem has to be addressed in large scale.

Key words: Epidemiology; Non-OPC (Organophosphorus Compounds); Self-induced Poisoning.

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Introduction

Self-harm is a major public health challenge in many countries worldwide. The Global Burden of Disease Study 2019 reported that in adolescents aged 10-24 years, three injuries were reported within top ten causes of DALYs (Disability-Adjusted Life Year) which are road traffic injuries (Ranked first), self-harm (Third), and interpersonal violence (Fifth).[1]

Deliberate self-harm has been defined as "an act with non-fatal outcome in which an individual deliberately initiates a non-habitual behavior, that without intervention from others will cause self harm, or deliberately ingests a substance in excess of the prescribed or generally recognized dosage and which is aimed at realizing changes that the person desires via the actual or expected physical consequences".[2] It is clear from many studies that not all people who die following acts of self-harm wish to die.[3-6] Instead, the acts are used to express rage or hostility or to gain revenge by causing distress to another person. Modes of deliberate self-harm have been found to vary, self-poisoning, however, being the most common mode.

Poisoning is a major problem worldwide, although its type and the associated morbidity and mortality vary from country to country. Deliberate self-poisoning has reached epidemic proportions in parts of the developing world, where the toxicity of available poisons and sparse medical facilities ensure a high fatality rate.[7] In Bangladesh, reports published from the DGHS in 2020 recorded approximate annual admission of 64,000 cases, 2% of all admissions and 9% of deaths among hospitalized cases are related to injury and poisoning.[8] A 2016 report from the Multi-centre Study of Self-harm in England shows more than 2,00,000 episodes of self-harm every year.[9] Over 75% of self-harm episodes were due to self-poisoning, mainly with drugs (Analgesics, antidepressants and benzodiazepines). Rates of self-harm were strongly correlated with suicide rates.

A retrospective analysis in a large regional teaching hospital in the UK from April 2006 to March 2007 shows that 70.7% presented to the emergency department within 4 hours of ingestion; females to males ratio was 1.45:1. Paracetamol and Ibuprofen were the two most commonly ingested drugs involved in 42.5% and 17.3% of all overdoses, respectively.[10]

A baseline survey conducted in Dhaka Medical College Hospital (DMCH) Chittagong Medical College Hospital (CMCH) Jhenaidah General Hospital, Cox's Bazar General Hospital and 7 primary care level health centres from 1st September, 2006 to 28th February 2007 shows that 14.5% of total admissions were due to poisoning. The nature of the poisoning revealed that 45.9% were due to deliberate self-harm, 20.3% due to accidental poisoning, 1.4% due to homicidal purpose, others were mainly victims of stupefying agents while on travel (Commuter) which was much higher in DMCH than other study areas. Total 29.0% poisoning occurred due to pesticide, 37.1% by sedative (After including travel-related poisoning under this group) 9.5% by snake bite, 3.0% by kerosene, and rest 22.5% were due to methanol, copper sulphate, 'potka' fish, harpic, drugs except sedative, naphthalene, nail polish, datura, chlorine gas, depilatory cream, mortein, rat killer, anti-louse, anti-scabies, acids etc. Out of the total admitted cases, 95.9% patients survived, 4.1% patients died. Among the death cases, pesticide (88.6%) was the most common cause of death by poisoning.[11]

In one adult medicine unit of Chittagong Medical College Hospital, from October to December 2010, a total of 3484 patients were admitted, out of which 266 admissions were due to acute poisoning. Out of these, 88 cases were OPC poisoning, 68 cases due to drugs, 24 transport poisoning, 24 rat killer poisoning, 13 cases of corrosive poisoning, 9 cases of chemical poisoning, 7 cases of alcohol intoxication, and 33 cases were due to unknown poisoning. These data shows that 7.6% of total admission was due to poisoning; out of poisoning cases, 33% were OPC cases, and 66.9% cases were due to non-OPC poisoning, which is more than double of that due to OPC (Unpublished results of Medicine Unit-III, Chittagong Medical College Hospital).

The concern with acute intoxications are the increment of cases in number and the changing profile of acute poisoning.[12,13] The common patterns of poisoning in our country are suicidal, homicidal/criminal, commuter and accidental. The incidence, nature, etiology, age group affected, and the outcome of poisoning in our country is different from that of the western world.[12,14] The poisoning agents involved in our country are different because the social structure, economic status, educational level, awareness of our people and availability of drugs are different from Western countries.[15] Few studies done previously in our country shows that the causes of poisoning in our country are lack of education, frustration, familial disharmony, failure of love affairs, failure in the examination and the availability of the poison. Common poisoning in our country are organophosphorus compound, and commuter poisoning with ultra short-acting sedative-hypnotics.[16,17] However pattern of poisoning and motive behind poisoning have changed over the years, which needs further study.

Materials and methods

This observational study was carried out in one adult Medicine Unit of Chittagong Medical College Hospital, Bangladesh, from April 2011 to August 2011. Ethical clearance was obtained from the Ethical Review Committee of Chittagong Medical College. All (Total 204) patients admitted in the specified Medicine unit with a history of self-induced poisoning caused by substances other than Organophosphorus Compounds (OPC) were included in the study. OPC poisoning was excluded by clinical history and toxidromic findings. Informed written consent was obtained from the patient. In case of any unconsciousness or drowsiness, consent was initially taken from the attendants and then from the patient whenever they became oriented. A pre-formed structured Case Record Form (CRF) was used to collect data from each patient. Privacy and confidentiality were followed strictly. There was no extra-economic burden or unnecessary physical and mental suffering and injury to the patient/attendant for the study. Planned laboratory investigations were done from available hospital facilities, and those not available were done from locally available private laboratories at lower/free of cost. The treatment provided was mainly supportive,

and a specific antidote was used rationally only in very few cases when available or necessary. Patients were followed up regularly; emotional and psychological support to the patients and attendants was provided by proper counseling. The outcome was recorded as total recovery, disability, discharged with advice, discharged on risk bond, absconded or death. All discharged patients were referred to the psychiatry outpatient department for further psychological assessment. The SPSS v15 software was used to analyze the data. Quantitative variables were expressed as mean, percentile etc. and categorical variables were expressed in range.

Results

Total 6009 patients were admitted over 5 months during the study period, from April 2011 to August 2011 in the specified Medicine unit of CMCH. Out of these, 456 (7.6%) admissions were due to different poisonings. Out of total poisoning cases, OPC cases were 167 (36.6%) and the remaining 289 (63.4%) cases were poisoned by agents other than OPC. Out of 289 non-OPC cases, 204 were self-induced poisoning (Study population) and 85 were due to other modes (Commuter, criminal, accidental inhalation/contact etc).

Out of 204, 80 (39.2%) were male, 124 (60.8%) were female including 3 pregnants. Male to female ratio was 1:1.55. Sociodemographic data are tabulated in Table-I. Most of the patients were young, incidence decreasing with age. The mean ± SD was 22.84 ± 8.12 years with a range of 13–60 years. 63.7% patients didn't cross secondary school for their education, students (34.8%) and housewives (23%) were two groups that lead the occupational status, most cases were unmarried (56.9%) residents of metropolitan area were affected most (60.8%) (Table I).

Table I Sociodemographic character of the patients admitted under this study (n=204)

Variables	Frequency (Percentage)
Age (years)	
<20	87 (42.6)
20 - 29	82 (40.2)
30 – 39	24 (11.8)
≥40	11 (5.4)
Educational qualification	
Illiterate	17 (8.3)
Below Primary	29 (14.2)
Below Secondary	84 (41.2)
SSC	33 (16.2)
HSC	32 (15.7)
Graduate	6 (2.9)
Post Graduate	3 (1.5)
Occupation	
Student	71 (34.8)
Housewife	47 (23.0)
Service holder	26 (12.7)
Unemployed	17 (8.3)
Businessman	16 (7.8)
Others	27 (13.2)
Marital status	
Unmarried	116 (56.9)
Married	83 (40.7)
Separated	4 (2.0)
Widowed	1 (0.5)
Residence	
Metropolitan area	124 (60.8)
Municipality area	12 (5.9)
Upazila headquarter	17 (8.3)
Rural area	51 (25.0)

Based on monthly family expenditure, 79 (38.7%) patients came from the lower socio-economic group, 117 (57.4%) from the middle class and only 8 (3.9%) from affluent families. Most of the patients (187, 91.7%) were found to live with their families. Most patients (190, 93.1%) were brought to the hospital by their family members. Time interval between poisoning and arrival at the first health care centre was variable ranging from 15 minutes to 60 hours. Only 24 patients received health care service before reaching the tertiary care hospital in terms of stomach wash (8, 3.9%), I/V fluid (6, 2.9%), antibiotics (4, 2.0%) etc. 168 (82.4%) patients were poisoned by single agent and 36 (17.6%) by multiple agents. Offending agents were identified in 197 (96.6%) cases. Poisoning by drugs was highest, other agents were there (Table II).

Table II Distribution of patients according to the type of poisoning agents (n=204)

Type of agents	Frequency (Percentage)
Drug	96 (47.1)
Rat killer	46 (22.5)
Insecticides other than OPC	14 (6.9)
Corrosive	13 (6.4)
Chemical	8 (3.9)
Alcohol	2 (1.0)
Others	25 (12.3)
Total	204 (100.0)

Family disharmony was the single most cause which lead the patient to ingest poison. Inciting factors that lead to take poison are shown in Table III.

Table III Causes of self-harm (n=204)

Cause	Frequency(Percentage)
Family disharmony	96 (47.1)
To gain any benefit	30 (14.7)
Financial constraints	17 (8.3)
Social crisis	16 (7.8)
Failure in love affair	13 (6.4)
Academic failure	5 (2.5)
Others	27 (13.2)
Total	204 (100.0)

10 patients (4.9%) had a history of psychiatric disorder, a history of previous self-injury was found in 11 (5.4%), and 18 (8.8%) patients stated that they had written suicide notes though none was documented. On admission, 151 (74%) patients gave history on their own, while history was obtained from family members and others in 53 (26%) cases.

Regarding clinical presentation, on admission, most of the patients presented with gastrointestinal complaints, 14 (6.9%) patients were drowsy, 7 (3.4%) were unconscious, and 4 (2.0%) had no complaint at the time of admission (Table IV).

Table IV Symptoms during presentation

Symptoms	Frequency (Percentage)
Nausea	175 (85.8)
Abdominal pain	45 (22.0)
Heartburn	35 (17.0)
Vomiting	32 (15.7)
Altered sensorium	14 (6.9)
Unconsciousness	7 (3.4)
Asymptomatic	4 (2.0)
Haemoptysis	1 (0.5)

174 (85.3%) patients were co-operative. 19 (9.3%) patients were restless, 17 (8.3%) were dehydrated, and 2 (1%) were cyanosed. GCS 15 was in 175 (85.8%) cases, 14 in 22 (11%) and 3 in 7 (3.4%). Other vital signs were more or less within the normal range; pulse 80.02±12.01 bpm, systolic BP 104.21±13.95 mm of Hg, diastolic BP 69.11±9.74 mm of Hg, respiratory rate was 17.06±1.82 per minute. The breathing pattern was normal in 197 (96.6%), and lungs were clear in 188 (92.2%) cases. Pupils were mid-dilated in 170 (83.3%), dilated in 28 (13.7%) and constricted in 6 (2.9%) with intact light reflex in 197 (96.6%) patients. Cranial nerves were intact in 188 (92.2%) patients, while in others it could not be examined. Muscle tone was normal in 191 (93.6%) and decreased in 13 (6.4%) cases. Tendon reflexes were normal in 193 (94.6%) and diminished in 11 (5.4%). Plantar response was flexor in 198 (97%), extensor in 2 (1%) and equivocal in 3 (1.5%).

No investigation was done in 131 (64.2%) cases. 2 patients out of 21 had raised level of SGPT, 1 out of 6 had pneumonitis on chest X-ray. Upper GI endoscopy was done in one patient with harpic (Toilet cleaner) poisoning, which revealed erythematous gastric mucosa. ECG was done in 31 patients; out of these 5 (16%) had sinus tachycardia, 3 (9.7%) had sinus bradycardia and others were normal. Serum creatinine was done in 10 patients and prothrombin time in 5 patients, all within normal limits.

Most of the patients were managed by supportive treatment only. Specific antidotes were used only in 4 (2.0%) cases, N-Acetyl cysteine in 3 cases of Paracetamol overdose and Penicillamine in 1 patient poisoned by Copper sulphate.

Duration of hospital stay was variable (37.47±21.68 hours) according to the severity of poisoning ranging 3-144 hours. Most (195, 95.6%) of the patients developed no complication and recovered fully, 6 (2.9%) patients died. Out of 6 patients died, one due to harpic poisoning, one for nitric acid poisoning, one for alcohol intoxication, and three were unknown poisoning. 166 (81.4%) patients were discharged with advice, 11 (5.4%) took their Discharge On Risk Bond (DORB) 21 (10.3%) patients were absconded and 6 (2.9%) patients died.

Discussion

Data from the present study shows that a considerable number of hospital admissions (7.6%) were due to poisoning episodes and although OPC poisoning was the single most leading cause of self-harm, poisoning by other substances was quite higher than OPC alone. But fatality rate was found significantly lower in non-OPC cases. Out of total 6009 admissions during the study period, number of total deaths was 282 (4.7%), out of which death due to all poisoning were 25 (0.42%) [Death for OPC were 19 (0.32%) and death due to non-OPC poisoning were 6 (0.1%)].

This study's predominant patients were female (60.8%) with a female to male ratio of 1.55:1. This differs from the finding in "Pilot survey on cases of poisoning and its outcome in different category of hospitals in Bangladesh" done in 2005 and "Clinico-epidemiological pattern of poisoning in a tertiary level hospital" done in 2004 which showed higher incidence in males 62% and 64% respectively.[18,19] But the fact is, these two studies included all poisoning cases, and snake bite cases were also included in the Pilot survey. Non-OP poisoning are household products and available to the females and OPs are usually agriculture related products and usually more accessible to males.

The young population was found the most vulnerable group (Table-I) similar to other studies. The number of unmarried patients was more (56.9%) in contrast to other studies. Most of the patients were undergraduates, and students occupied the topmost position. Maximum patients came from the metropolitan area, low and middle-income group, lived with family and were brought to the hospital by family members. These results reflect that the financial constraints of living in a metropolitan area with inadequate affordability may have a negative psychosocial impact on young generation with less coping ability. Family disharmony was the single most important cause of self-harm. In most of the cases patients acknowledged that they were not intended to die but to overcome the mental stress at that moment they did this.

Most of the patients were poisoned by single-agent, offending agents were identified in 96.6% cases, drugs either singly or in various combinations being the most common agents (96, 47.1%). Out of these, 47 patients (49%) took sedatives in overdose. This is quite similar to the finding in a study done in Dhaka Medical College Hospital in 2008 on self poisoning by different pharmaceutical agents which showed benzodiazepines as the most common offending pharmaceutical agent (44.1%).[20] This is alarming as drugs like sedatives are purchasable without prescription in our country due to the irresponsibility of the pharmacies. The majority of the patients with sedative poisoning showed diminished muscle tone, tendon reflexes and dilated pupils.

Rat killer was found the second most common agent (22.5%) but the outcome was unremarkable in terms of liver and renal function tests and none developed any bleeding manifestation. This correlates to the history of ingesting small amounts followed by vomiting with little systemic absorption. One patient took Vitamin-A capsule which he collected from government EPI drug program. One patient took Insulin along with sedative. This patient was a diabetic, retired government employee, presented with deep unconsciousness, severe hypoglycaemia and hypotension; but responded well on supportive management.

One patient was admitted after ingestion of copper sulphate, who later developed haematuria and anaemia but recovered fully after treatment with Penicillamine, blood transfusion and other supportive measures. Surprisingly one patient was admitted after taking gall bladder of Tokkhok (Tokay gecko) as a treatment measure of some vague complaints, given by a traditional healer who later developed severe ulcers in lips, tongue and pharynx with secondary infection.

Poisoning by savlon were 8 cases, harpic 10, kerosene 4, mosquito coil 5, thinner 2, nitric acid 1, nitric oxide 1. The patient with nitric acid poisoning was a goldsmith who expired on the next day of admission. Other patients were poisoned by a variety of combinations of different agents and in variable amounts.

A history of previous self-injury was found in 11 (5.4%), and 18 (8.8%) patients stated that they had written suicide notes though none was documented. These findings are quite different from the Multicentre Study of Self-harm in England, which showed 84,378 self-harm episodes involving 47,048 persons, with a 79% repetition.[9] Rates of self-harm were strongly correlated with suicide rates in England. However, this study did not studied relation with suicide.

Limitations

- All patients could not be followed up as some were absconded, and some took their discharge after primary enrollment.
- No variable was used in the case record form regarding witness of poisoning.
- Symptoms on admission and physical examination findings were not grouped according to specific poisoning agents.

- As patients were admitted after a variable period from the time of poisoning actual clinical picture could not be found out.
- The study was carried out only in one Medicine unit.
- There were 3 cases of death where poisoning agents could not be identified.

Conclusion

Due to case fatality and patient load OP poisoning is considered as separate poisoning in toxicology practice in Bangladesh. Other poisoning are less addressed and treated as unknown/tablet/drug poisoning like headlines for which specific causative agents or consequences are not evidenced. The results of the present study demonstrate that trend and incidence of acute poisoning is changing over time. Multiple substances are used with various outcome are shown in the study. These will help to rethink about poisoning management.

Recommendation

The management of different poisoning is not well developed, with few specific antidotes and few evidence-based protocols. So approaches to primary prevention should be taken at the community level for improving mental health and increasing people's skills in coping with stressful conditions. Pharmacies should be monitored strictly. High-quality poison information services should be established as well. Large community based study or at primary health care centre based study will give more conclusive result.

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Contribution of authors

IA-Conception, design, data collection, data analysis, draftubg & final approval.
AG-Conception, critical revision & final approval.
RAMEU-Interpretation of data, critical revision & final approval.

Disclosure

All the authors declared no competing interests.

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