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Epidemiological study of poisoning from Eastern India

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ABSTRACT

Poisoning is a very common cause of mortality in our society. With changing socioeconomic conditions, the type of poison used and the age group most susceptible to poisoning is also changing. However, the data regarding the epidemiology of poisoning in Eastern India is very scarce. This was a hospital based observational study. Patients with Poisoning of any form, coming to the emergency departments of two teaching hospitals of West Bengal over a period of 1 year, were assessed and followed up till final outcome. Any animal/reptile bites were excluded as also patients with coexistent morbidities like malignancy. Relevant blood tests were also done. The data were analysed using standard statistical software. The gender ratio in our study population of 134 was 1.48:1 in favour of males. 60% of our patients were from rural background. 82% of our patients were aged less than 30. Suicidal intent was the main motive for poisoning in most cases. The predominant poison we found was organophosphorus [n=72], followed by acids and medicines. Mortality was 9.7% [n=13], majority were due to organophosphorus. GCS score at presentation was a significant predictor of mortality. Also, the patients with leucocytosis at presentation were more likely to die. Mortality in males were more than females [p=0.07]. Poisoning causes much morbidity in young adult population of our society. GCS score at presentation is an important determinant of subsequent mortality. Agricultural chemicals still comprise the commonest poison used in eastern India.

INTRODUCTION

Poisoning in various forms is an important cause of mortality and morbidity. It occurs in all societies, across all racial and socio economic groups [1]. The pattern of poisoning in a particular area depends on the predominant occupation of the area, the cultural setting and availability of different substances according to existing laws. A large number of deaths occur each year due to poisoning and a major portion of these deaths occur in agricultural societies of developing world [2]

A recent study from Maharashtra, India found that poisoning was the leading cause of unnatural deaths and the third leading cause of admission [1]. The most worrisome fact in this study was the large number of people in young adult age groups[1.] Poisoning thus, causes a significant loss of the workforce of agricultural societies, like India. In urban population studies, the rate of poisoning was found to be significantly lower [3]. Also, in different epidemiological studies, it has been found that the incidence of poisoning is not uniform throughout the year, but shows certain peaks, like monsoon seasons[1]. Eastern India is mainly an agricultural economy with most of the people living in rural areas. Poisoning of various substances is quite common in this part of the country. However, data on epidemiology of poisoning is very rare from this part of the country[4]. There are some data showing a female preponderance and mainly a suicidal intent behind the treated cases of poisoning[4]. But data on the relative frequency of different poisons or the outcome of the patients is largely lacking.

However, such data is very important to formulate the supply of emergency medicines and also for training of physicians dealing with emergency admissions. Each society must have its own protocol for dealing with poisoning cases. We therefore aimed to do a small pilot study on the epidemiology of poisoning in sample populations of two tertiary care centres in eastern India.

We wanted the data from this study to help clinicians formulate a protocol to care for acute poisoning cases and also help make a policy for emergency medicine supply in hospitals in this part.

METHODOLOGY

This hospital based observational prospective study was done simultaneously in two teaching institutions of west Bengal, one in Northern part of the state, mainly catering to a rural population and the other an urban hospital in the south, dealing with patients from both urban and rural settings. All patients presenting with poisoning of any form were studied for various parameters, both clinical and biochemical. Poisoning through any route like peroral, inhalation or percutaneous exposure was included. The name of the poison was known from the patient/relatives or confirmed by the specimen of poison as shown to us. The study period was from 16th may 2012 to 30th April 2013. The patients were then followed up till final outcome. All patients received standard treatment according to protocol for the type of poisoning. The study did not interfere with the treatment modalities in any way. The approval of the ethical committee of the hospital was taken and personal identity of any patient was not disclosed. We excluded snake bite or animal bite cases, patients with serious underlying diseases, like carcinoma or sepsis and pregnant patients were also excluded.

The patient was used as source of information in most cases after proper consent. In cases where patient was incapacitated, the next of kin was asked about information like cause of poisoning. All blood tests were done in the central laboratories of the two hospitals using standard equipment. The categorical data is presented as number/percentages. Continuous data are presented as mean± S.D. Students' T Test was used to compare parametrical data like biochemical test results. Pearson correlation coefficient was used to find correlation between continuous data. A logistic regression model was used to find determinants of mortality. P value <0.05 was considered significant. Online free software like MedCalc was used for calculations.

RESULTS

There were a total of 134 patients in our study. Males outnumbered females by a ratio of almost 3:2 (vide Table 1). It is seen from table 1 that 110 patients (82.1%) were in the age group 'less than 30 years'. The youngest patient in this study was 12 years of age. Thus, the majority of our patients were in the adolescent and young adult age group. 60% of our patients came from rural areas. Based on occupation/livelihood farmers were the largest (21.6%) followed by housewives/homemakers (n=19). Most of the time, the poisoning was suicidal [n=107; 79.8%]. Accidental poisoning was found in 7 cases, mostly with kerosene or wild fruit seeds. This was mainly found in 12-15 year old children (5 out of 7).

Table 1: Table showing the epidemiological profile of the patients {N=134}

Parameter		Number [percentage]
Gender	Male	80 [59.7%]
	Female	54 [40.3%]
Age	<20	45[33.6%]
	20--<30	65[48.5%]
	30--<40	15[11.2%]
	40--<50	5[3.7%]
	50 and above	4[3%]
Occupation	Farmer	29[21.6%]
	Manual labourer	16[12%]
	Student	19[14.2%]
	Housewife	21[15.7%]
	Unemployed	6[4.5%]
	Businessman	3[2.2%]
	Office worker/teacher	10[7.4%]
	Miscl.	30[22.4%]
Residence	Rural	80[59.7%]
	Urban	54[40.3%]

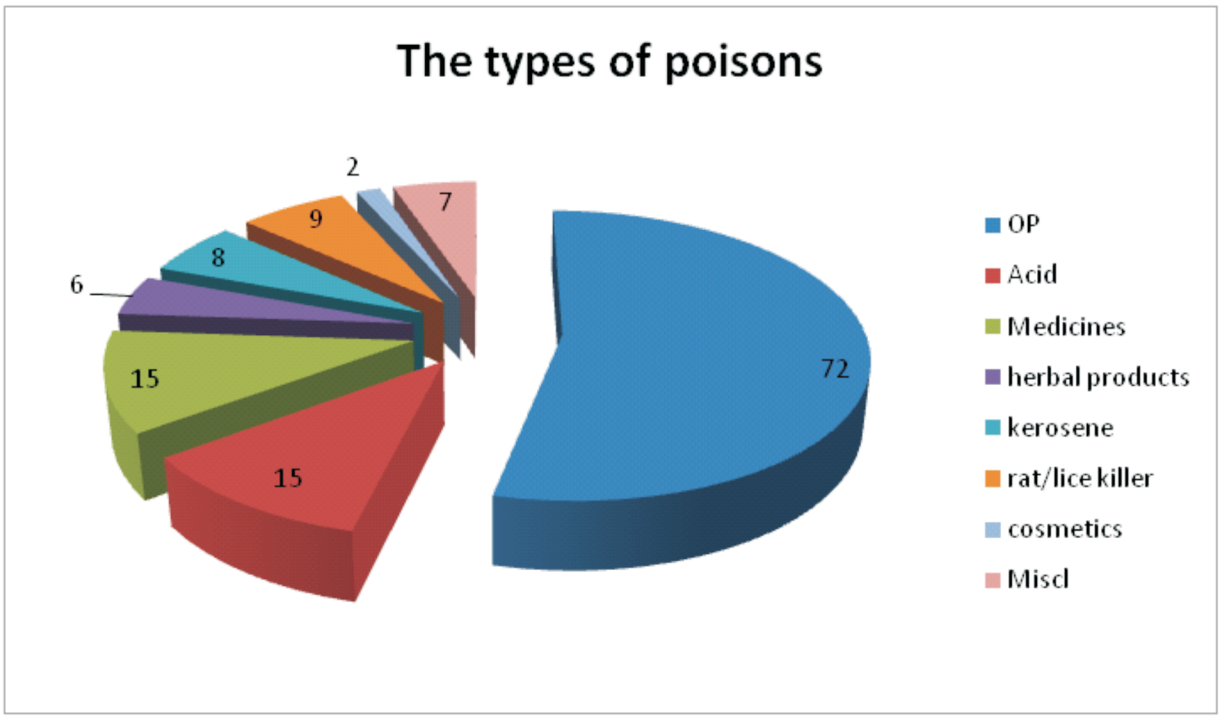

Fig. 1: Showing the type of poisoning in the study [N=134] OP=organophosphorus

Table 2: Poisoning by age and residence

Poison	Age group in years		Residence	
	<30	30 or more	Rural	Urban
OP	62	10	61	11
Acid	10	5	4	11
Medicine	11	4	2	13
Herbal products	6	0	5	1
Rat/lice killer	9	0	4	5

Organophosphorus (op) compounds were the commonest used poison [n=72; 53.7%] (Fig. 1). After it, the commonest poisons seen in our study were acids and different types of medicines [11.2% each; Fig .1]. Of the medicines, benzodiazepines were the commonest (n=7; 46.7%). Table 2 shows the rate of poisoning according to residence and age groups. It is seen that acids and different types of medicines were mainly used by urban people while in rural areas; the predominant form of poisoning was op. Of 80 rural patients, 61 (76.2%) had used op compounds. Of the 15 cases of poisoning by medicines, 86.7% were urban dwellers. Herbal products like yellow oleander seeds and household poisons like rat killer were only found in young adult group. The age range of poisoning by herbal products was 12 to 22 years and 83% of them [n=5] were rural people.

Table 3 shows the different investigation parameters in the poisoned patients. GCS≤ 13 at presentation was mainly present in op poisoning and in patients taking different types of medicines like benzodiazepines (72.2% and 46.7% of the cases respectively). Increased TLC was found in 41.7% of the cases of op poisoning and 46.7% of acid poisoning cases. Thrombocytopenia and leukopenia were mainly found in phenol

Table 3: Table showing the blood and other reports in the poisoning cases
[GCS: Glasgow coma scale score; TLC: total leukocyte count]

Parameters		op	acid	medicines	herbal	Rat/lice killer	kerosene
Na[meq/l]	<125	1	1	0	0	0	0
	125-135	59	10	13	5	7	7
	>135	12	4	2	1	2	1
K[meq/l]	<3.5	8	0	1[amitryp]	0	0	0
	3.5-5	64	15	13	6	9	6
	>5	0	0	1	0	0	2
TLC[/mm^3]	<4000	1	4	0	0	1	0
	4000-11000	41	4	13	6	7	5
	>11000	30	7	2[thyroxin, amitriptyline]	0	1	3
Platelet [/mm^3]	<100000	9	2	1	0	1	0
	100000-450000	62	13	14	5	8	8
	>450000	1	0	0	1	0	0
GCS at presentation	<8	7	2	2	0	0	0
	8-13	45	1	5	0	0	0
	14-15	20	12	8	6	9	8

poisoning cases. 8 cases of op poisoning had hypokalemia. Symptomatic hyponatremia was very rare [2 cases; 1.5%]. Hyperkalaemia was found in 2 cases of kerosene poisoning [25%]. Of the 134 patients in the study, 13 (9.7%) died due to various complications. The commonest cause of death was acute pulmonary edema [n=7; 53.9%]. Of the patients who died, 7 (53.9%) were of organophosphorus poisoning and 2 were of acid poisoning. Thus, mortality for op poisoning was 9.7% and that for acid poisoning was 13.3%. Of the 13 patients who died, 6 [46.1%] were from urban background and the rest 7 from rural area. Thus, mortality of urban patients was 11.1% as compared to 8.8% in rural patients (p=0.76 by Fisher's exact test, two tailed). Of the patients who died, 77% had GCS score less than 8 at presentation.

Altogether, 85 patients were brought to hospital within 1 hour and of them, 8.2% died. Of patients brought to hospital after 1 hour, 12.2% [n=6] died (p=0.54). Average time to bringing patients to hospital in rural setting was less compared to urban

Table 4: Showing the different parameters associated with mortality [n=13]

Parameter		Number [percentage]
Gender	Male	11[84.6]
	Female	2[15.4]
Age	<30	11[84.6]
	30 or more	2[15.4]
Poison	Op	7[53.8]
	Non-op	6[46.2]
GCS at presentation	<8	10[76.9]
	8-13	3[23.1]
	14-15	0[0]

Table 5: Table comparing our study with similar Indian studies [NG: not given]

Authors, year	Number of patients	Male: female ratio	Cause of poisoning	Mortality	% in <30 age group
N Kar, 2006[7]	100	2.1:1	OP	26%	NG
Thunga G ,2010[8]	100	2.1:1	OP	25%	45%
Banerjee I,2012[4]	968	1:1.38	OP	5.7%	NG
Present study	134	1.48:1	all	9.7%	82%

dwellers (2.11 hours vs. 9.53 hours; p=0.0216 by student's T test). Table 4 shows that of the patients who expired, 11[84.6%] were male and 84.6% were aged less than 30 years. Mortality in the male subset was higher (13.7%) compared to female patients (3.7%) although the difference was not just significant (p=0.07). The mean TLC in the subgroup who died was significantly higher than the others (15184±4471 in died group vs. 10180±3506 in survivors; p<0.05 by students' T test, 2 tailed). Standard ROC curve analysis showed that GCS≤8 had a sensitivity of 84% and specificity of 96% in predicting mortality (p<0.001; z statistic 46.782). Also, a TLC>11400/mm^3 was a predictor of mortality (p=0.0001). Logistic regression analysis using death as dependent variable showed only GCS at presentation had any significant correlation with mortality (OR=0.39; CI= 0.230.66; p=0.001). That is, lower the GCS, higher the mortality.

DISCUSSION

In this hospital based observational descriptive study in rural and urban settings, there was male preponderance of poisoning cases. Organophosphorus was the predominant poison used and intention was mainly suicidal. Maximum number of patients was aged less than 30. Mortality was 9.7%. GCS score at presentation and total leukocyte count were important predictors of mortality. Mortality in males was higher.

In one recent study from West Bengal, the authors have also found suicide as the predominant reason for poisoning (82% suicidal vs. 18% accidental) [4]. In our study too, we found 79.8% of the cases had suicidal intent. In some of our cases, the cause for

Table 6: Showing the comparison of our study with various international studies

Authors, year	Number of patients	Male: female ratio	Cause of poisoning	Mortality	% in <30 age group
Cavalci C, 2009[11]	460	1:1.5	all	0.7%	70.9% [<35 yr age]
Joubert 1990[15]	1306	1.5:1	all	4.6%	80
Malangu, 2009[16]	423	1:1.32	all	2.4	82
Howladar, 2008[17]	100	1.77:1	all	NG	46[<35 yrs]
Present study	134	1.48:1	all	9.7	82

poisoning was unknown as there was no one to give proper history. However, in the aforementioned study, females outnumbered males and the largest group of patients were housewives[4]. But in our study, we found males more in number and farmers were the largest occupational group (Table 1). This difference may be due to the fact that the other study saw only op poisoning cases, while we studied poisoning in general. In different studies conducted in India, suicidal intent was the main reason behind poisoning [5, 6]. Some other studies from India have also shown a male preponderance in poisoning cases varying from 2 to 2.3:1 [6, 7]. In our study, this ratio was 1.48:1. The study from South India in 2010 showed that 45% of the patients were less than 30 year age group[8]. In our study, this proportion was 82%. The following table 5 depicts the comparison of our study with various Indian studies. Some of the earlier studies have shown higher mortality rates, although in our case it was lower. Even considering the op subset of patients in our study, the mortality was still lower at around 9.5%. This difference needs further analysis because the types of op used were similar in all; methyl parathion was the commonest [4, 8.]

In our study, 21.6% of the poisoned patients were farmers. It is well known that Indian farmers are under various stresses and suicide rates in them are quite high [9]. Of the 29 farmers in our study, all had op poisoning. In the earlier West Bengal study too, 34% of the patients were farmers[4]. Thus, study into psychology of farmers and proper preventive counselling measures are urgently needed.

In our study, 11% of the cases were due to medicines of various groups. Proper legislation and regulation of marketing of drugs can help in this respect. Even for op poisoning, legislation to ban the most toxic compounds has dramatically decreased poisoning rates in some countries[10]. The maximum numbers of op poisonings in India are due to parathion use, a potent toxin banned in many countries[10]. The epidemiology of poisoning varies in different countries. In Western countries, drugs and alcohol are the commoner poisons[11]. However, in developing countries, pesticides are still the commonest poisons available[12]. Two studies in Sri Lanka separated by two decades have shown that pesticides are still the commonest poison found there[12, 13]. But two Turkish studies separated by 2 decades showed that the incidence of pesticide poisoning decreased from 55% to 4.8% [11, 14]. In our study, 76.2% of the rural patients had op poisoning, while in urban patients, op poisoning was found in 20.3% only. Thus, with changing economy and lifestyles, the nature of poisoning is also changing in India. However, the Turkish study also reported suicide as the commonest intent of poisoning [11]. The table 6 shows the comparison of our study with other studies from across the globe.

In African studies, the cause of poisoning is widely different. In different African studies, the poisoning agent varied from paraffin or kerosene to traditional herbal drugs[15,16]. In western countries, household chemicals and different drugs constitute the main poisons[18]. Of the drugs, analgesics and psychotropics are popular. Also, multi drug poisoning is common [11]. We did not find any multi drug poisoning in our study. In our study, we found phenol toxicity associated with significant changes like leucocytosis, thrombocytopenia and obtundation. Phenol poisoning is known for a variety of systemic features and requires aggressive treatment[19].

Although our study was spread over a year, we did not find any seasonal variation in the type of poisoning. In our study, GCS score at presentation was a very important predictor of mortality. In a similar study from Nepal, they have also found that GCS<8 and delay in seeking care were good predictors of mortality[20]. A study from Bangladesh on op poisoning showed that GCS<7 was associated with 100% mortality[21]. Another study found that GCS<13 was associated with increased mortality [22.] In our study, GCS≤8 was associated with increased mortality. However, other parameters like blood pressure and presence of other neurodeficits may also be used to predict outcome in poisoning

cases[21]

The limitation of our study is the small number of patients. Also, this was a tertiary care centre study. Thus, some patients who present to primary care only may be missed. Again, due to lack of facilities, we could not arrange for toxicology screen of blood or other body fluids of the patients. Thus, the level of toxins and their correlation with symptoms and mortality could not be assessed. Also, a few cases of multi-poisoning may have been missed.

CONCLUSION

Poisoning with suicidal intent is an important cause of morbidity and mortality in our society. The young adult age group is the most susceptible to this and it is equally prevalent in males and females. In our set up, organophosphorus poisoning is the most common and all emergency departments should be well equipped for its treatment. However, acids and different drugs are also significant contributors to the overall poisoning scenario. Hence, accurate drug history is essential in all cases. Besides treatment of the poison, associated factors like electrolyte disturbances should also be taken care of. A larger study is needed to assess the different prognostic parameters like GCS scoring in poisoning cases.

Social, economic and legal actions are necessary to decrease the morbidity from poisoning.

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