

## Epidemiological profile of acute poisoning cases and its outcome in a North Eastern teaching hospital of India

Swapan Sarkar<sup>1</sup>, Bidhan Goswami<sup>2,\*</sup>, Bitan Sengupta<sup>4</sup>, Shauli Sengupta<sup>3</sup>, Bhaskar Bhattacharjee<sup>3</sup> and J. Harish<sup>1</sup>

<sup>1</sup>Department of Medicine; <sup>2</sup>Department of Microbiology; <sup>3</sup>Multidisciplinary Research Unit, Agartala Government Medical College, Agartala, Tripura; <sup>4</sup>Tripura Health Service, Tripura, India.

### ABSTRACT

The National Crime Records Bureau (NCRB) report of 2019 revealed that among the means adopted for committing suicide, poisons contributed to 25.8% of all cases in 2019. This hospital-based observational study was planned to generate epidemiological profile of acute poisoning from the state of Tripura. The main objectives of this study were to determine the pattern, commonly used substances, socio-demographic profile and treatment outcome associated with acute poisoning in a teaching hospital of Tripura. Overall one hundred ninety four patients admitted to the hospital with acute poisoning were the study participants. Information was collected on parameters like age, gender, type of poison, intention of poisoning and final in-hospital outcome. Quantitative data were expressed as means and standard deviation. Descriptive data were expressed in percentages and frequencies using charts and tables. Chi-squared test was applied to explore any association between treatment outcome and other variables. Organophosphate (OP) compounds were the most commonly used substance (30.9%) followed by drugs (21.13%). But mortality rate was very high (86%) among the Paraquat consumers. Treatment outcome of all the patients was associated with age group, ethnicity status, type of poisons and also with poisoning

complications which were also statistically significant ( $P < 0.05$ ). Poisoning cases were more common among younger people of this state and suicidal intention was the most common motive. The overall mortality rate in the present study was comparatively low which reflects good management of these emergency cases at this teaching hospital of North Eastern India.

**KEYWORDS:** poisoning, Organophosphate compounds, Paraquat, ethnicity, North East India.

### INTRODUCTION

Poisoning is the harmful effect that occurs when a toxic substance is swallowed or inhaled or comes in contact with the skin, eyes or mucous membranes of the mouth or nose. Poisoning occurs when someone is sufficiently exposed to a substance that can cause illness, injury or death. Illness may occur very quickly after exposure to a poison, or it may develop over several years with long-term exposure [1]. If illness occurs quickly after exposure to a poison, which is also called as acute poisoning, then it is a medical emergency and the patient needs to be managed immediately at hospital settings to prevent any adverse outcome.

According to WHO data, in 2012, an estimated 193,460 people died worldwide from intentional poisoning. Of these deaths, 84% occurred in low- and middle-income countries [2]. In India during 2019, according to the National Crime Records Bureau reports, poisoning contributed to 5.1% of

---

\*Corresponding author: agmcmru@gmail.com

all accidental deaths recorded in the country [3]. The NCRB report of 2019 also indicates that, among the means adopted for committing suicide, poisons contributed to 25.8% of all cases in 2019 [3]. Agricultural pesticides such as organophosphorous, organochloride, zinc and aluminum phosphide are commonly used substances for intentional or accidental poisoning in Asian countries due to their easy availability while the misuse of the drugs such as paracetamol, opioids, benzodiazepines, and tranquilizers is commonly seen in industrial and developed countries [4].

The clinical presentation and outcome of the acute poisoning can be influenced by different epidemiological factors like geography, occupation, socioeconomic status, literacy rate, and cultural as well as religious practices. Therefore to understand the pattern of poisoning in a specific geographical region, periodical studies need to be conducted. India is a vast country with wide variation in the geography, socioeconomic status, cultural and religious practices. Tripura is a small state situated in the North eastern region of India. Very few studies are available regarding the pattern of poisoning in the North eastern part of India and most of them are based on retrospective data and hence very little information is available from the state of Tripura. Therefore, this present hospital-based observational study was planned to generate information on epidemiological profile of acute poisoning cases from the state of Tripura. It was aimed to determine the pattern, commonly used substances, socio-demographic profile and treatment outcome associated with acute poisoning in a teaching hospital of Tripura.

## MATERIALS AND METHODS

This was an observational study conducted among patients admitted with history of poisoning in the medicine department of Agartala Govt. Medical College and GBP hospital, a teaching hospital of Tripura. The study was conducted during July 2020 to June 2021 over a period of one year. Patients admitted with history of snake bite, other animal bites and food poisoning were excluded. Patients unwilling to be a part of the study were also excluded. Overall one hundred ninety four (194) patients with history of acute poisoning,

admitted in the study setting during the study period were enrolled in the study. All the study participants were followed up till discharge from hospital or death. A structured interview schedule was used to collect data from the participants and in case of severely ill or old aged persons caregivers were interviewed to retrieve information. Information was collected on parameters like age, gender, ethnicity, type of poison, intention of poisoning and final treatment outcome. Data was entered and analyzed in computer using the Statistical Package for the Social Sciences (SPSS) software [5]. Quantitative data were expressed as mean and standard deviation. Descriptive data were expressed in percentages and frequencies using charts and tables. Chi-squared test was applied to explore any association between different variables. Ethical approval for the study was obtained from the institutional ethics committee (IEC) of Agartala Govt. Medical College (AGMC).

## RESULTS

During the study period of one year, total two hundred seven (207) patients were admitted with acute poisoning and out of them eleven (11) patients were excluded based on exclusion criteria and two (2) more were unwilling to be a part of the study. Thus data was collected from total one hundred ninety four (194) participants and analysis was done based on that information.

The median age of study participants was 26 years with interquartile range (IQR) of 19-35 years. Minimum and maximum age of study participants were 14 and 85 years, respectively. Majority of study subjects belonged to the age group of 20-29 years (30.4%). Majority of the participants were female (80.9%) and only 19.1% were male. Out of total study subjects, 63.4% come from rural area whereas remaining 36.6% come from urban area. Majority of the study subjects were high school students (52.2%). Table 1 describes the demographic characteristics of the participants. About 92.3% of these poisoning cases were due to suicidal attempt. Regarding treatment outcome, 94.3% recovered after treatment whereas 5.7% expired.

Table 2 represents association between treatment outcome and different parameters. It has been observed that treatment outcome of all the patients

**Table 1.** Characteristics of study population.

Parameters	N (%)
Age, years ( $\pm$ SD)	29.07 ( $\pm$ 12.77)
<u>Gender</u>	
Male	37 (19.1%)
Female	157 (80.9%)
<u>Mode of poisoning</u>	
Accidental	14 (7.2%)
Suicidal	179 (92.3%)
Homicidal	1 (0.5%)
<u>Outcome</u>	
Alive	183 (94.3%)
Dead	11 (5.7%)
<u>Urban or Rural</u>	
Urban	71 (36.6%)
Rural	123 (63.4%)
<u>Ethnic or Non-ethnic</u>	
Ethnic	46 (23.7%)
Non-ethnic	148 (76.3%)

**Table 2.** Association between treatment outcome and different parameters.

	Parameters	Chi-square value	P value
<b>Outcome</b>	Age group	15.071	0.035
	Ethnicity	10.276	0.001
	Urban/Rural	0.250	0.617
	Type of poison	29.285	0.001
	Complications	25.155	0.000

depends on age group, type of poisons and also poisoning complications which are also statistically significant ( $P < 0.05$ ).

In this study, statistically significant ( $P = 0.030$ ) association was also found between outcome of poisoning and gender of participants (Table 3). Mortality rate was higher among the male participants (16.7%) as compared to the female (3.1%).

Distribution of different types of poisons among the participants is described in a pie chart (Chart 1). Organophosphate compounds were the most

commonly used substance (30.93%) followed by drugs (21.13%). Drugs were more preferable choice of poisoning among the urban population whereas among rural population, Organophosphate poisoning was more common.

Although mortality rate is comparatively low in the north eastern part of India, two poisons namely Paraquat poison (54.5%) and Organophosphate (36.4%) poison are the most important substances responsible for this mortality (Table 4). Strong association was observed

**Table 3.** Association between outcome of poisoning and gender of participants.

Outcome of poisoning	Male	Female	Total	Chi <sup>2</sup> value	P-value
Alive	30	155	185	4.731	0.030
Dead	4	5	9		

**Table 4.** Mortality rate and type of poison.

Type of poison	Frequency	Death
OP	60	4 (6.7%)
Others	42	1 (2.4%)
Paraquat	7	6 (86%)
	<b>Total</b>	<b>11</b>

**Table 5.** Association between type of poison and ethnicity status.

Type of poison	Ethnicity status	Pearson Chi <sup>2</sup> value	P-value
		36.486	0.000

between the type of poison and ethnicity status of the study participants (Table 5).

Chart 2 represents bar chart of ethnicity percent by type of poison. It has been observed that Organophosphate poison and drugs were the most common substances used by the local ethnic participants for self-poisoning, whereas non-ethnic subjects preferred OP compared to any other poisonous substances for committing suicide.

## DISCUSSION

The present observational study evaluated the epidemiological profile of acute poisoning cases admitted to a tertiary care hospital of Tripura. According to the present study, acute poisoning was more common among women than men which supports the observation of other studies conducted in other regions of the country on this same topic [6, 7]. Moreover some other studies with similar aim had also reported a higher male

preponderance than females [8, 9]. This male-female discrepancy in poisoning cases may be due to socio-demographic variability of each region. The present study also observed that majority of acute poisoning cases was among younger subjects i.e. below 30 year age group. Similar type of observations was reported by other studies done on poisoning in different parts of India [8-10]. This is probably because of the fact that younger generation are nowadays in more stress due to modern life-style and unemployment.

In the present study, Organophosphate compounds and drugs were found to be the most commonly used substances for poisoning. This may be due to easy availability of such poisonous substances in market. Pesticides and medicines have also been reported as the predominant means of poisoning in different other hospital-based studies [11-13]. Very few studies reported corrosive agents as the predominant means of poisoning [14]. The present study reported suicide as the most common intent for poisoning, accounting for 92.3% of the cases.

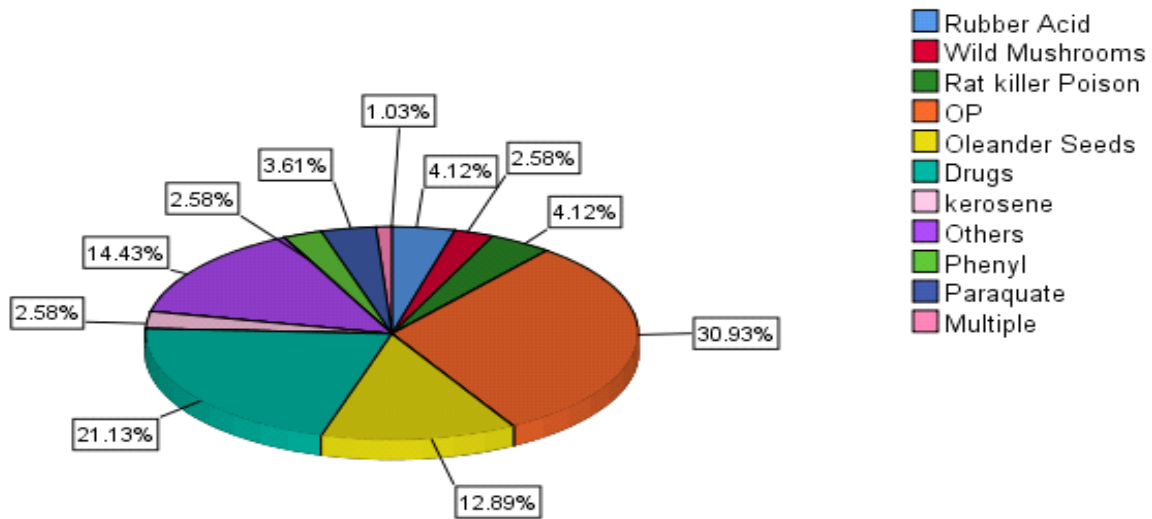


Chart 1. Distribution of types of poison among the study subjects.

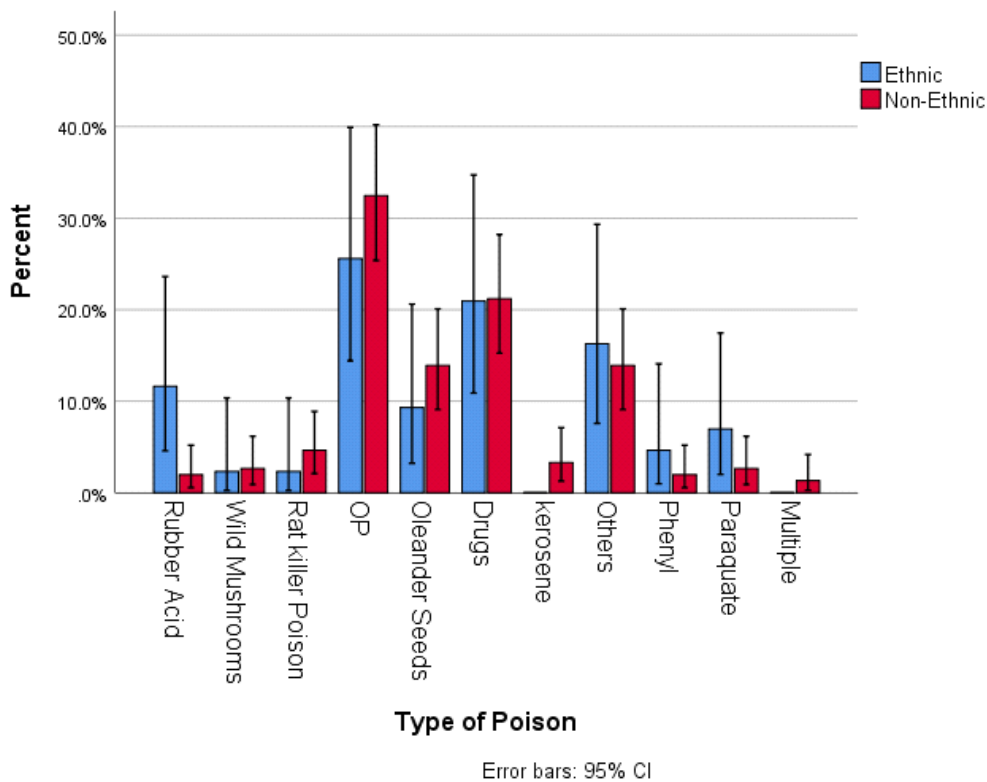


Chart 2. Bar chart of ethnicity percent by type of poison.

This observation shows similarity with observations reported by other studies conducted on poisoning. Ramesha *et al.* reported in their study that 78% of the poisoning cases admitted in

a hospital were due to suicidal attempt [10]. Mathew *et al.* reported suicidal attempt as the main motive of poisoning in their study [14] whereas, Chatterjee *et al.* reported accidental

exposure as the commonest mode of poisoning in their study [9]. This difference may be due to inclusion of snakebite cases in their study which was excluded in the present study.

Acute Paraquat self-poisoning is a significant problem in parts of Asia, the Pacific and the Caribbean [15]. Paraquat poisoning has been widely reported worldwide but only a few case reports were described in the literature from India [16, 17]. In this present study, severe outcome was found among the Paraquat consumers. Paraquat poisoning was predominantly found in males with high fatality rate (86%) because of multi-organ failure. This poison should not be made freely available in open market and requires some restriction and strict vigilance. This study result supports the research work done by K. Venkatanand *et al.* [18].

Ethnicity status among the study participants played an important role in our present study result. Choice of poison and outcome of poisoning significantly associated with ethnicity status of the subjects. Out of total forty six (46) ethnic participants forty four (44) recovered and two died (4.3%), whereas among one hundred forty eight (148) non-ethnic subjects, one hundred thirty nine (139) recovered and nine (9) expired (6.1%). This could be due to the variation in the food habits and life style of the local population of this state.

The fatality rate among the poisoning cases was 5.7% in the present study whereas, about 17% developed some complication. Studies from other parts of the country reported different mortality rates in cases of acute poisoning. Mathew *et al.* reported a lower mortality rate (2.5%) than that found in the present study, whereas Chatterjee *et al.* reported a higher mortality rate (15%) among poisoning cases [9, 14]. Asawari *et al.* reported a mortality rate of about 10% in their study on acute poisoning [19]. This discrepancy in mortality rates among acute poisoning cases could be due to the use of different inclusion and exclusion criteria by those studies. A few of the studies included snakebite and animal bite cases also which has poor outcome. But the low mortality rate among the poisoning cases, reported by the present study, reflects a good treatment outcome in the study setting.

### **Limitation**

The present study has a few limitations and short span of observation was one of those. Other than this, the design of this study was hospital-based which might not reflect the accurate situation of poisoning in this region, as some cases might not come to the hospital due to poor accessibility, financial constrain or any religious or cultural belief. We also excluded snake and animal bite cases for our convenience, which were considered as causes of acute poisoning in previous studies.

### **CONCLUSION**

Organophosphate compounds followed by drugs were the most common poisons used in all poisoning cases. Cases of poisoning were more common among younger people and suicidal intent was the most common motive. Strategies like educational and awareness programs and establishment of poison information and surveillance centers will be helpful for the prevention of these emergencies. Strict regulations on availability of OP, Paraquat and drugs may reduce the incidence of acute poisoning as these are the most commonly used substances for poisoning. The overall mortality rate in the present study was very low, which reflects good management of these emergency cases at this teaching hospital of North eastern India. Present research study strongly recommends the need to take necessary steps towards a progressive ban of Paraquat.

### **ACKNOWLEDGEMENT**

The authors are indebted and thankful to the Department of Health Research (DHR), Govt. of India. Authors are also grateful to all the technical staffs of MRU, AGMC for their participation and successful completion of this study.

### **FUNDING**

Department of Health Research (DHR), Ministry of Health & Family Welfare, Govt. of India, New Delhi through Multidisciplinary Research Unit, Agartala Govt. Medical College.

### **CONFLICT OF INTEREST STATEMENT**

There is no conflict of interest.

**REFERENCES**

1. Ahuja, H., Mathai, A. S., Pannu, A. and Arora, R. 2015, *J. Clin. Diagn. Res.*, 9, UC01-4.
2. Poison prevention and Management. World Health Organization. Available in <https://www.who.int/teams/environment-climate-change-and-health/chemical-safety-and-health/incidents-poisonings/prevention-and-management-of-cases-of-poisoning>
3. National Crime Records Bureau, Ministry of Home Affairs, Government of India. 2019. <https://ncrb.gov.in/sites/default/files/ADSI-2019-FULL-REPORT.pdf>
4. Rajbanshi, L. K., Arjyal, B. and Mandal, R. 2018, *Indian J. Crit. Care Med.*, 22(10), 691-696.
5. IBM Corp. Released 2017. Version 25.0. Armonk, NY: IBM Corp.
6. Chary, R. S., Suraj, S., Mittal, C. and Jamshid, P. 2017, *J. Indian Soc. Toxicol.*, 13, 21-26.
7. Bhowmick, K., Ghosh, B. and Pain, S. A. 2019, *J. Emerg. Med.*, 56(5), 512-518.
8. Dash, S. K., Aluri, S. R., Mohanty, M. K., Patnaik, K. K. and Mohanty, S. 2005, *J. Indian Acad. Foren. Med.*, 27, 133-138.
9. Chatterjee, S., Verma, V. K., Hazra, A. and Pal, J. 2020, *Perspect. Clin. Res.*, 11(2), 75-80.
10. Ramesha, K. N., Rao, K. B. and Kumar, G. S. 2009, *Indian J. Crit. Care Med.*, 13(3), 152-155.
11. Srivastava, A., Peshin, S. S., Kaleekal, T. and Gupta, S. K. 2005, *Hum. Exp. Toxicol.*, 24, 279-285.
12. Bamathy, B., Punnagai, K., Amritha, C. A. and Chellathai, D. D. 2017, *Biomed. Pharmacol. J.*, 10, 1285-1291.
13. Gargi, J., Tejpal, H. R., Rai, G., Chaudhary, R. and Chanana, A. 2008, *J. Punjab Acad. Foren. Med. Toxicol.*, 8, 17-19.
14. Mathew, R., Jamshed, N., Aggarwal, P., Patel, S. and Pandey, R. M. 2019, *J. Family Med. Prim. Care*, 8(12), 3935-3939.
15. Senarathna, L., Eddleston, M., Wilks, M. F., Woollen, B. H., Tomenson, J. A., Roberts, D. M. and Buckley, N. A. 2009, *QJM: An International Journal of Medicine*, 102(4), 251-259.
16. Sandhu, J. S., Dhiman, A., Mahajan, R. and Sandhu, P. 2003, *Indian J. Nephrol.*, 13, 64-68.
17. Agarwal, R., Srinivas, R., Aggarwal, A. N. and Gupta, D. 2007, *Singapore Med. J.*, 48(11), 1000-1005.
18. Venkatanand, K., Agrawal, A., Sarma, M. B. R. 2016, *Int. J. Res. Med. Sci.*, 4, 3048-3051.
19. Asawari, R., Atmaram, P., Bhagwan, K., Priti, D., Kavya, S. and Jabeen, G. A. 2017, *J. Young Pharm.*, 9(3), 315-320.