

Clinico-Epidemiological Profile and Short-Term Outcomes of Patients with Acute Poisoning Presenting to an Emergency of a Tertiary Care Center in Western Rajasthan

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Abstract

Background: This research aimed to evaluate the clinico-epidemiological profile and short-term outcomes of patients admitted to the emergency department of a tertiary hospital. **Materials and Methods:** This prospective observational cross-sectional study was conducted between January 1, 2021, and June 30, 2022, in the Emergency Department of a tertiary hospital. Patients of either gender of any age attending the emergency department with acute poisoning were included. These cases were analyzed for their epidemiological profiles, poisoning characteristics, and various clinical variables influencing patient outcomes. **Results:** Out of a total of 236 patients, 190 patients (80.5%) were aged more than 18 years. Comorbidities were present in 32 (13.5%) patients, and psychiatric illness was the most common comorbidity. The intention of poisoning was suicidal in 185 patients (78.4%) and accidental in 51 patients (21.6%). Organophosphate was the most common poisoning seen in 55 patients (23.3%), followed by drug ingestion seen in 44 patients (18.6%). Twenty-eight patients (11.8%) were transferred to the intensive care unit. Nineteen patients (8.1%) required mechanical ventilation. There were ten deaths (4.2%) in the study population. Aluminum phosphide poisoning was associated with the highest mortality rate, followed by organophosphate poisoning. **Conclusions:** This study indicates that most poisoning cases involved young people, mainly males. Organophosphorus poisoning was one of the most common poisonings, followed by the ingestion of drugs in this part of the world. Aluminum phosphide had the highest fatality rate.

Keywords: Emergency, epidemiological profile, intensive care unit, mortality, poisoning

INTRODUCTION

The term “poison” refers to a substance that, when ingested, inhaled, or comes into contact with it, causes harm to the body and poses a threat to life.^[1] Accidental and intentional poisoning is a medical emergency that can cause considerable morbidity and fatality.^[2] Many people die by suicide yearly, and about 20 times as many individuals try suicide.^[3] In low- and middle-income nations, suicide rates are by far the highest.^[4]

There are several predisposing factors linked with poisoning, including financial strain, psychiatric illness, patriarchal system, and others. Young persons are more likely to poison themselves by suicide than older adults, which causes a high economic and physical cost to society.

Depending on the toxins, acute toxicity can manifest in various ways. Patients with organ failure need to be admitted to the

intensive care unit (ICU) for specialized treatment and organ support.^[5] High fatality rates can result from a wide range of factors, such as the toxin nature, the timing of presentation, and multi-organ failure. Early detection and rapid treatment in the emergency department (ED) and ICU are necessary to avoid hospital morbidity and mortality in poisoned patients.

There have only been a few studies performed on the epidemiology and clinical features of poisoning in Rajasthan.^[6-13] The pattern

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of poisoning in the western part of Rajasthan especially jodhpur region is poorly understood. As a result, there is a need for the generation of regional clinico-epidemiological data on poisoning. These statistics will help determine the best use of available resources for poisoning prevention and management. Therefore, this study aimed to evaluate epidemiological indicators for acute poisons and short-term outcomes of patients who were brought to the emergency room of a tertiary care facility.

METHODS

Study settings

This prospective cross-sectional study was carried out in a 960-bed academic hospital of a teaching hospital after getting approval from the Institutional Ethics Committee via letter no. AIIMS/IEC/2021/3369 on March 12, 2021; furthermore, this study was submitted for registration (CTRI/2021/09/036691).

Patients

This research was carried out in the department of emergency medicine for 18 months, between January 1, 2021, and June 30, 2022. This study enrolled patients of either sex belonging to any age group with acute poisoning who attended the emergency department. This study excluded patients with idiosyncratic or adverse reactions to the prescribed drug, patients with food poisoning and snake or unknown bites, and patients or their relatives who refused to participate.

Data collection

Patients exposed to toxins who presented to the emergency department were immediately assessed and resuscitated to maintain their airway, breathing, and circulation. For this research, informed consent was acquired from eligible patients or legally authorized representatives for unconscious patients.

Data regarding demography, marital status, literacy, comorbidities, intention, and route of poisoning were collected according to the history given by the patient or their relatives. The type of the poison was identified using contextual information, a trustworthy

history, the residual substance or container from which the poison was consumed, and clinical indicators. A complete history, general examination, and systemic examination were carried out in each case. Glasgow Coma Scale (GCS) and quick Sequential Organ Failure Assessment (qSOFA) scores were computed at the time of admission. In addition to routine investigations, liver and renal function tests were also performed.

Treatment was explicitly given to the cases and managed with antidotes if indicated. If necessary, patient decontamination was carried out after initial patient stabilization. After an initial assessment, care, and a brief observation period, the patient's disposition was determined by the level of toxicity that had been observed and was anticipated to occur. Need for vasopressor, need for ICU admission, requirement of mechanical ventilation, and length of hospital stay were also assessed. Patients were followed up until either they were discharged from the hospital or died.

Statistical analysis

The SPSS IBM program version 22 (IBM SPSS Advanced Statistics, Chicago, IL, USA) was used to input and analyze data. Frequency and percentages were used to characterize nominal data, and the Chi-squared or Fisher's exact test was used to compare these data. Continuous data were reported using mean \pm SD and compared using an unpaired t-test. The median and interquartile range (IQR) were used to characterize and compare non-normally distributed data and compared using the Mann-Whitney U test. A P value < 0.05 was deemed statistically significant. The association between two variables was measured by the Spearman rank-order correlation coefficient.

RESULTS

During the research period, 260 patients with acute poisoning attended the emergency room. Twenty-four patients were excluded from the research due to insufficient data; subsequently, 236 patients were enrolled [Figure 1].

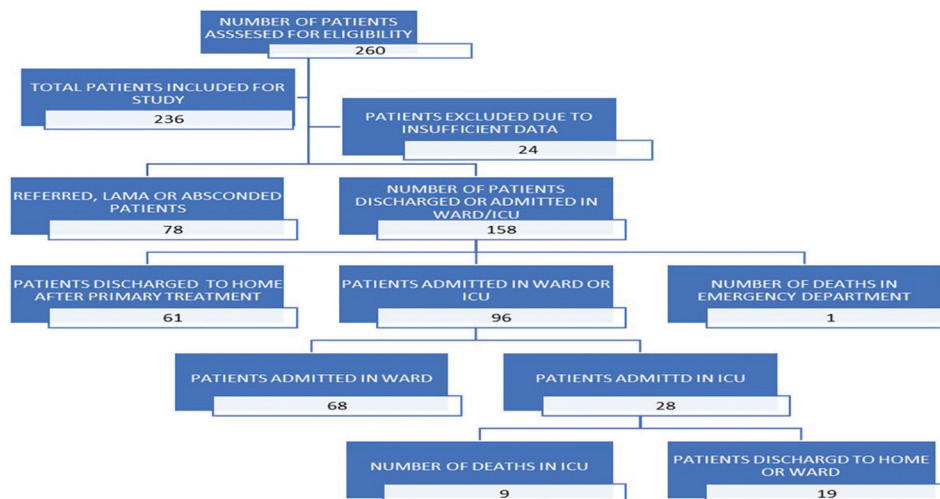


Figure 1: Flow diagram of participants in the study

The median age of patients was 25.0 (18.0, 36.0) years. The proportion of male patients was 60.5%. Out of the 236 patients, a maximum number (n = 88) was from the 21-30 years of age group. One hundred and ninety patients were aged more than 18 years. Most adult patients were graduates and postgraduates. One hundred and twelve out of 190 (58.95%) adult patients were married. One hundred and forty-nine (63.1%) patients belonged to urban areas [Table 1].

Comorbidities were present in 32 patients. Eighteen patients in the study population had previously been diagnosed with psychiatric illness. Depression was the most common psychiatric illness, followed by insomnia. The intention of poisoning was suicidal in 185 patients (78.4%) and accidental in 51 patients (21.6%). None of the cases had homicidal intentions. Twenty-three patients received medical care before reaching to our hospital.

The oral route was the most prevailing mode of poisoning, accounting for 99.1% of all cases among 234 individuals. The inhalation route of poisoning was seen in only two patients. The two cases of inhalational poisons were aerosols of organophosphate and fumes of cadmium and sulfur. Organophosphate was the most common poisoning presenting to emergency seen in 55 patients (23.3%), followed by drug ingestion seen in 44 patients (18.6%) [Tables 2 and 3]. Two hundred and nineteen patients were symptomatic. The most common symptom at the time of presentation was nausea and vomiting (37.1%), followed by altered sensorium (17.3%) [Figure 2]. One hundred and ninety-five patients had a GCS of 15 at presentation, and 41 patients had a GCS of <15 at presentation. Gastric lavage and activated charcoal were given to 68 and 44 patients, respectively. Lactate levels were elevated (>2.2 mmol/L) in 21 patients. Fourteen patients had metabolic acidosis. Twenty-one patients required vasopressor support. It was

mostly needed in aluminum phosphide poisoning. Eight patients had renal dysfunction. Eight patients had liver dysfunction, and nine had coagulopathy.

Seventy-eight patients were referred, absconded, or left against medical advice after primary treatment. These patients were referred due to non-availability of in-patient department (IPD) beds after initial stabilization. Out of 158 (excluding the patients who were referred, absconded, or left against medical advice), the median duration of stay in the hospital was 48 (3,96) hours. There was no statistically significant correlation between age and duration of stay in the hospital [ρ (p) = 0.041, P = 0.606]. Of 158 patients, 110 had qSOFA score of 0, and 48 had qSOFA \geq 1]. Twenty-one out of 48 patients with qSOFA \geq 1 required ICU admission. Patients with qSOFA \geq 1 had a statistically significantly higher requirement of ICU admission (P < 0.001). A total of 28 patients were admitted to ICU. Nineteen patients required mechanical ventilation. Total of 10 patients (five with aluminum phosphide poisoning and five with organophosphate poisoning) died in the study population. Out of these patients, nine had died after admission in the ICU. One death occurred in an emergency itself with aluminum phosphide poisoning. Overall mortality rate was 6.3%.

Demographic variables, qSOFA score, and various outcomes were compared between 158 patients with organophosphorus (n = 41) and non-organophosphorus (n = 117) poisoning who were either discharged after primary treatment or admitted to the ward or ICU. There was no statistically significant association between these variables except qSOFA (P = 0.004) [Table 4].

DISCUSSION

The present study addresses the short-term outcomes and clinico-epidemiological profile of patients presenting to the emergency department of our institution at Jodhpur, Rajasthan. There is only one study in the literature evaluating on fatal poisoning pattern of 100 patients in Jodhpur region done during 2012-2014.^[10] Ours is the most recent study involving 236 patients in this part of world. The various studies describing poisoning pattern in Rajasthan state are shown in Table 4.^[6-13]

Table 1: Demographic characteristics

Parameters	Values
Age in years [Median (Q1, Q3)]	25.0 (18.0, 36.0)
Gender	
Male [n (%)]	143 (60.5%)
Female [n (%)]	93 (39.5%)
Education	
No formal education	6 (3.1%)
Primary and middle school	13 (6.8%)
High school and higher secondary	83 (43.6%)
Graduate and postgraduate	88 (46.3%)
Comorbidities	
Psychiatric illness	18 (7.6%)
Hypertension	7 (2.9%)
Diabetes mellitus	5 (2.1%)
Tuberculosis	1 (0.4%)
Ischemic heart disease	1 (0.4%)
Requirement of vasopressor support	21 (8.8%)
Median duration of hospital stay (hours)	48 (3-96)
Need of ICU	28 (11.8%)
Need of mechanical ventilation	19 (8.1%)

ICU: Intensive care unit

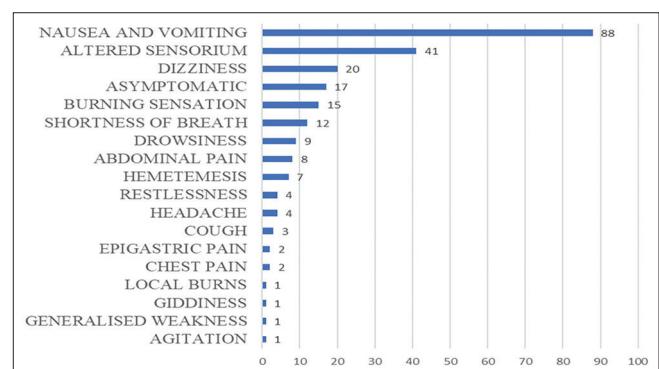


Figure 2: Symptom distribution in the study population

Table 2: Causative agents of acute poisoning cases

Poison	Number of patients	Percentage
Organophosphate	55	23.3%
Drugs	44	18.6%
Benzodiazepines	18	
Paracetamol	2	
Cyclopam	2	
Tramadol	2	
Amlodipine	2	
Phenobarbitone	2	
Trihexyphenidyl	1	
Methamphetamine (MDMA)	1	
Terbutaline	1	
Minoxidil	1	
Iron syrup	1	
Escitalopram	1	
Multidrug ingestion	10	
Detergents and Corrosives	38	16.1%
Aluminum phosphide	24	10.1%
Alcohol (Ethanol)	10	4.2%
Cannabis	10	4.2%
Hydrocarbons	9	3.8%
Paint thinner	9	3.8%
Petrol and diesel	6	2.5%
Kerosene	5	2.1%
Turpentine oil	2	0.85%
Camphor	2	0.85%
Opium	5	2.1%
Hair dye (Para-phenylenediamine)	2	0.85%
Copper sulfate	1	0.42%
Potassium permanganate	1	0.42%
Paint	1	0.42%
Mercury	1	0.42%
Cadmium sulfide	1	0.42%
Ammonium dichromate	1	0.42%
Unknown	18	7.6%

Singh *et al.*^[14] showed that the majority (36%) of the cases of poisoning belonged to the age group 21-30 years. Thapa *et al.*^[15] showed that the most common age group in poisoning cases was 21-30 years. In our study, the maximum number of patients was from the age group of 21-30 years (37.2%), followed by age groups of 31-40 years (20.3%). The mean age of the patients in our study was 27.8 ± 16.1 years, compared with the above studies. This can be attributed to increased work stress, family issues, financial strain, and other life-settling issues in this age group. In a study by Patel *et al.*^[16] 59.2% of patients with poisoning were male. Similarly, in our study of 236 participants, 143 (60.5%) were males. The male predominance of poisoning might be due to their greater exposure to stress in everyday life and work dangers compared to females. Indu *et al.*^[17] conducted a study showing the predominance of suicidal poisoning in married people. The greater poisoning prevalence among married people might be attributed to financial strain, dysfunctional families, and stress. In our study, comparing the marital status of 190 patients aged more than 18 years, we found that 112 patients (58.95%) were married.

According to a study, comparing the education status of patients with poisoning, the majority of patients with acute poisoning were illiterate (59.2%), followed by primary school education (21.4%), secondary school (16.5%), and higher education (2.9%) level.^[18] However, in our study, comparing the education status of patients, the majority were graduates and postgraduates (46.3%), followed by high school and higher secondary education (43.6%), primary and middle school education (6.8%), and 3.1% patients having no formal education.

Teklemariam *et al.*^[19] found that disputes (family or marital) (75.9%), psychiatric issues (14.8%), and substance addiction (9.3%) were often mentioned in patients with poisoning. In our study, psychiatric illness was the most common comorbidity seen in 18 out of 236 patients (7.6%),

Table 3: Comparison between patients with organophosphate and non-organophosphate poisoning

	Organophosphate (n=41)	Non-Organophosphate (n=117)	P
Age (Years)	25 (19-40)	26 (18-35)	0.508
Median (IQR)			
qSOFA Score	1 (0-1)	0	0.004
Median (IQR)			
Sex			0.526
Female	17	42	
Male	24	75	
Liver dysfunction			1.0
No	41	111	
Yes	0	6	
Renal dysfunction			-
No	40	112	
Yes	1	5	
Coagulopathy			1.0
No	39	112	
Yes	2	5	
Vasopressor requirement			0.539
No	36	107	
Yes	5	10	

qSOFA: quick sequential organ failure assessment

Table 4: Various studies on poisoning pattern of Rajasthan state in chronological order

Author Year	District	Study period	Number and age of patients included	Most common age affected	Gender affected	Most common poison
Sharma <i>et al.</i> ^[6] 1974	Jaipur	January to June 1973	80 Pediatric age group	1-3 years	M>F	Kerosene oil
Agarwal <i>et al.</i> ^[7] 2016	Bikaner	October 2013 to September 2014	177 Pediatric age group	1-3 years	M>F	Not mentioned
Kumar <i>et al.</i> ^[8] 2016	Udaipur	January 2013 to December 2015	183 All age groups	20-29 years	M>F	Aluminum Phosphide
Khosya <i>et al.</i> ^[9] 2016	Kota	July 2009 to December 2011	799 All age groups	21-30 years	M>F	Organophosphate
Danagus <i>et al.</i> ^[10] 2016	Jodhpur	September 2012 to February 2014	100 All age groups	31-40 years	M>F	Organophosphate
Yadav <i>et al.</i> ^[11] 2019	Udaipur	January 2017 to January 2018	200 >18 years	21-30 years	M>F	Organophosphate
Bhagora <i>et al.</i> ^[12] 2020	Udaipur	January 2017 to December 2018	799 All age groups	21-30 years	M>F	Aluminum Phosphide
Verma <i>et al.</i> ^[13] 2021	Jhalawar	January 2014 to December 2018	Adults	21-30 years	M>F	Organophosphate

M: Male, F: Female

followed by hypertension in seven patients (2.9%). Out of the 18 patients with psychiatric illness, depression was the most common, seen in six patients (33.3%), followed by insomnia seen in four patients (22.2%), mania and anxiety disorders seen in three patients (16.6%), and bipolar disorder and adjustment disorder seen in one patient (5.5%).

As per Shah *et al.*,^[20] the most common route of exposure was oral ingestion (71.4%) of poison, followed by dermal and inhalation routes. In a study by Pannu *et al.*,^[21] ingestion for self-harm remained the predominant method of poisoning. In their study, the ratio of intentional self-harm to unintentional exposure was 4:1. Similarly, in our study, the most common route of ingestion was by oral route (99.1%).

Pannu *et al.*^[21] showed that about two-thirds of the poisoning cases included pesticides, with organophosphate (22.6%), aluminum phosphide (18.9%), and paraquat (4.7%) being the most prevalent substances. In our study, organophosphate was the most common cause of poisoning in 55 patients (23.3%). Drugs were the second most common cause of poisoning in 44 patients (18.6%), followed by detergents and corrosives in 38 patients (16.1%).

In a study by Senarathna *et al.*,^[22] 21% of all poisonings were caused by prescription medicines. Paracetamol was the cause of nearly half of them. The other medications belonged to the therapeutic groups of analgesic, antipsychotic, anti-asthmatic, and antihypertensives. In our investigation, benzodiazepines were the most often used drug.

Teklemariam *et al.*^[19] observed that the common presenting symptom in patients with poisoning was diarrhea and vomiting (49.5%), which was followed by altered consciousness (16.5%) and epigastric discomfort (13.6%). In our study, nausea and vomiting were the most common symptoms seen in 37.1% of patients, followed by altered sensorium in 17% of patients. Mehrpour *et al.*^[23] showed that most patients with poisoning presented to the emergency had a GCS score of less than 9. However, in the present study, most patients had normal GCS (n = 195, 82.6%). The number of patients with GCS 13 to 14 was 21 (8.9%), 9 to 12 was 4 (1.7%), and 3 to 8 was 16 (6.8%).

Pannu *et al.*^[21] found that the length of stay of patients with poisoning in the hospital was two days. In their study, only 13.7% of patients stayed for seven days or longer. A study by Islambulchilar *et al.*^[24] showed that the average duration of stay in the hospital was 3.02 ± 2.8 days. Similarly, our study's median duration of stay was 48 (3-96) hours.

Adinew *et al.*^[25] showed that most patients with poisoning received supportive care, whereas 27% and 24% of patients received gastrointestinal decontamination and particular antidotes. In their study, the most widely used remedies were atropine and activated charcoal. Among other forms of treatment, 3.0% got both stomach lavage and the administration of charcoal for decontamination, whereas 17.6% had intestinal lavage, and 6.4% were given activated charcoal.^[25] In our study, gastric lavage and activated

charcoal were given to 68 and 44 patients, respectively. In organophosphate poisoning, most patients received gastric lavage and activated charcoal.

According to a study by Mathai *et al.*,^[26] patients with hemodynamic instability who presented late had early signs of organ failure, had acidosis, and required vasoactive medications had a poor prognosis. In the same research, patients who required mechanical ventilation and vasoactive support also had a greater mortality rate. Rajbanshi *et al.*^[27] showed that 16.5% of survivors of poisoning had acute renal failure. In our study, eight patients had renal dysfunction. Aluminum phosphide poisoning had the maximum number of patients with renal dysfunction, followed by benzodiazepines. Due to its extensive usage and ease of availability, acetaminophen overdose continues to be the most significant cause of acute liver failure in Western countries; however, our data showed that it was seldom discovered in reports from low- to middle-income countries.^[21] We had only two patients with acetaminophen overdose. In our study, eight patients had liver dysfunction, and nine had coagulopathy. In the present study, 28 patients were admitted to ICU. Organophosphate was the poisoning with the maximum ICU admission, followed by aluminum phosphide poisoning.

In a study by Rajbanshi *et al.*,^[27] patients with non-organophosphorus poisoning had 1.6 times more ICU mortality. In our study, mortality rate in patients with poisoning was 6.3%. Aluminum phosphide poisoning has the highest mortality rate, followed by organophosphate poisoning. We also compared various parameters between organophosphorus and non-organophosphorus poisoning and found no significant association except with qSOFA ($P = 0.004$).

LIMITATIONS

This study has certain limitations. It was conducted in a single center. The epidemiological data do not incorporate socioeconomic conditions, cultural and religious information, or occupational data, which might have given further insight into the clinical spectrum of poisoning. Because our hospital is a tertiary care center, individuals with poisoning might have appeared late after obtaining first aid at the local level, thus missing the precise identification of toxins. As the institute of this study is located in an urban area, the patients are more likely to reach from urban area leading to a Selection Bias (Berkson's Bias). We did not include patients with snakes or unknown bites. Multicenter studies with larger sample sizes are required in the future for the generalizability of our results.

CONCLUSION

The current research revealed that acute poisoning is prevalent among men, young individuals, married people, and personnel with psychiatric disorder. Organophosphorus poisoning is one of the most common types of poisoning in this part of the world, followed by ingestion of drugs. Aluminum phosphide poisoning was associated with the highest mortality rate.

Educational initiatives with a focus on prevention are required to raise public awareness of various toxins.

Ethics approval

IRB approval was taken from the Institutional Ethics Committee (IEC Reg No.- AIIMS/IEC/2021/3369 dated 12/03/2021).

Consent to participate

Informed written consent was obtained from all the patient's relatives.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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