UNDERSTANDING THE CLINICAL AND SOCIOECONOMIC PERSPECTIVE OF ACUTE POISONINGS: A STUDY FROM TERTIARY CARE HOSPITAL

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ABSTRACT

Acute poisoning is a significant public health concern, with a tremendous impact on both individuals and healthcare systems globally. The current retrospective study was conducted at the District Civil Hospital Osmanabad, Maharashtra, from April 2022 to March 2023. The objective of the current study was to investigate the clinical-epidemiological profile, demographics, characteristics, causes, treatment, and outcomes of acute poisoning cases in the east Marathwada region. A patient information sheet was used to compile the data, and evaluated using descriptive statistics such as percentage, mean, and standard deviation (Mean $\pm$ S. D.). A total of 143 cases of acute poisoning were reported at the emergency department among which the majority of the patients were female 86 (60.14%) with the highest incidence in the 21-30 age group (34.97%). Organophosphorus compound (OPC) poisoning (22.38%) and insecticide poisoning (14.69%) were the most common poisoning agents. Intentional poisoning was the major type, constituting 78.32% of cases, with family disharmony (27.27%) having a significant motive. Oral ingestion was the primary route, accounting for 97.90% of cases. Home environments were the most common source of poisoning (80.42%), and the highest incidence occurred during the autumn season (57.34%). Higher incidence rates (88.81%) were observed in rural areas, particularly among housewives (45.45%) and those with lower levels of education (56.64%). Atropine (61.23%) and pralidoxime (23.08%) were used in primary management. Positive outcomes were achieved in 92.31% of cases.

This study highlights the complexity of acute poisoning and its comprehensive effects, showing the necessity for specific treatments and public awareness to reduce its negative effects on health.

KEYWORDS: Acute poisoning, Pesticide poisoning, Food poisoning, Medication poisoning, Atropine.

INTRODUCTION

Poison is described as any agent that could harm, kill, or impair everyday physiological features in humans, inflicting standard or nearby harm or disorder within the body.[1] Ancient Greece referenced poisons for both suicide and homicide. Presently, poisoning remains a global concern due to shifting lifestyles and behaviors, leading to both intentional and unintentional cases.[2,3] Acute poisoning contributes significantly to emergency department visits and hospitalizations globally, resulting in substantial morbidity and mortality. The availability of toxic substances and local healthcare resources influence poisoning incidents. In underdeveloped regions, pesticide-related self-poisoning is prevalent due to high fatality rates, limited healthcare access, and inadequate training for handling such cases.[1,4] According to 2012 data, the World Health Organization (WHO) estimates that approximately 1,93,460 accidental poisoning deaths are occurring worldwide every year. In rural Asia, over 60% of fatal self-harm cases involve poisoning, which surpasses other methods like hanging.[5] According to the WHO, there are over three million annual poisoning cases globally, with a majority of fatalities occurring in underdeveloped countries. Epidemiology varies across regions, but poisoning is a significant health concern globally.[6] Developing nations often face severe consequences of poisoning due to weaker regulations and healthcare systems, with pesticide usage for self-harm being a significant contributor. In the United Kingdom, intentional self-poisoning accounts for 50% of overdose incidents. India reports a high annual incidence of poisoning cases, ranging from 1 to 1.5 million cases.[7,8] According to the National Crime Records Bureau, poisoning was responsible for 4.6% of the 451,757 unintentional deaths in India in 2014 and 6.3% of the 413,457 unintentional deaths in 2015.[9] This study addresses acute poisoning as a significant public health concern in the east Marathwada region. By examining the incidence, patterns, and management of poisoning cases, the study provides valuable insights into the depth of this problem and emphasizes the need for effective preventive measures.

MATERIALS AND METHODS

The retrospective study was carried out for 12 months at District Civil Hospital Osmanabad, a 300-bed multi-specialty government hospital. A total of 143 acute poisoning cases were reported at the emergency and medicine department during the study period. Ethical clearance and verbal consent were obtained before data collection, and primary clinical data was collected using a standardized case report form. The study design was carried out by refereeing various databases such as PubMed, Delnet, Medline, Science Direct, and the National Library.[10-12] Patient data was collected using hospital administrative databases, patient charts, interviews, and physician consultations at the emergency department and medicine wards. The results were analyzed by descriptive statistics using Microsoft Excel and GraphPad Prism (latest version of 10.0.3.). All the patients following the study design are included except those who are not from a predefined area.

RESULT AND DISCUSSION

Result

The results demonstrated a relatively even gender distribution, with 57 (39.86%) male and 86 (60.14%) female patients. The male-to-female ratio was 1.5:1. The highest number of poisoning cases occurred in the age group of 21-30 years 50 (34.97%), followed by31-40 years 33 (23.08%). Particularly, patients between the age group of 11-20 (13.99%) and 41-50 years (16.78%) were also significantly affected. The age groups of 0-10 years and those over 60 years had the lowest number of cases (2.80%) respectively. The mean age was found 31.98 years ± 12.99 years (Figure 1-a). 130 (90.91%) patients required ventilation or oxygen support, indicating the severity of their condition (Table 3-h). At the time of admission, 126 (88.11%) of the total cases were conscious, while 17 (11.89%) were unconscious (Table 3-i). 103 (72.03%) cases were exposed to known poisoning agents, while 40 (27.97%) cases were with unknown agents. OPC poisoning was the most common 32 (22.38%), followed by other insecticide poisoning 21(14.69%), and household poisoning 11 (7.69%) (Figure 1-b). Poisons in liquid forms were the most common 74(51.75%), followed by solids 39 (27.27%) and gaseous 3 (2.10%) (Figure 2-a). Intentional poisoning accounted for 112 (78.32%), while unintentional poisoning was in 12 (8.39%) cases. In 19 (13.29%) cases the poisoning remained unknown (Figure 2-b). The study reveals that 97(67.83%) cases have a reason for ingesting poison. Family disharmony 39 (27.27%), marital disharmony 19 (13.29%), financial stress 11 (7.69%), and mental disorders 1 (0.70%) were significant factors for consuming the poison (Figure 3-a). The time of arrival at the hospital played a crucial role in

treatment. A majority 87 (60.84%) of patients reached the hospital within 2 hours of exposure, while 54 (36.36%) arrived between 2 to 4 hours. Only a small number of 4 (2.80%) reached the hospital after 4 hours of exposure (Table 3-j). Oral ingestion was the predominant route 140 (97.90%) through which patients consumed the poison, while intranasal ingestion was less common 3 (2.10%) (Table 3-k). In terms of the source of poisoning agents, 126 (88.11%) cases had known sources. The most common source was the home environment 115 (80.42%), while drugs 10 (6.99%) and hotels 1 (0.70%) were lesser contributors (Figure 3-b). A significant case of 82 (57.34%) of poisoning was reported in the autumn season followed by winter 37 (25.87%). Monsoon 17 (11.89%) and summer 7 (4.90%) had comparatively fewer cases (Table No. 3-l). Laboratory investigations were crucial for understanding poisoning severity. Parameters like serum cholinesterase 136 (95.10%), ultrasound sonography (USG) test (abdomen) 128 (89.51%), and blood sugar levels 125 (87.41%) were commonly tested, aiding in determining appropriate treatment approaches (Table l). Management strategies included both non-pharmacological and pharmacological methods. Non-pharmacological approaches involved decontamination techniques like gastric lavage using $KMno_4$ solution in 119 (83.22%) of cases. Atropine was the primary pharmacological antidote 88 (61.23%), followed by pralidoxime 33 (23.08%) (Table 2). Considering the demographic status, the majority of cases occurred in rural areas 104 (88.81%), while a smaller proportion 16 (11.19%) occurred in urban regions (Table 3-a). Significant poisoning was reported in housewives 65 (45.45%), farmers 44 (30.77%) followed by students 28 (19.58%) (Table 3-b). Considering the social and economic status 114 (80%) of patients belonged to above poverty level (APL), while 29 (20%) fell below poverty level (BPL) (Table 3-c). Education's impact was evident, with 81 (56.64%) of patients being illiterate, and 62 (43.36%) being literate (Table 3-d). Home remedies were given to 16 (11.19%) of patients, with the majority 127 (88.81%) not receiving any home remedy (Table 3-e). Hospital stays varied, with most patients 44 (50.35%) being discharged within 1-2 days, 57 (39.86%) between 3-4 days, and 14 (9.97%) after 4 days (Table 3-f). Treatment outcomes were positive for the majority, as 132 (92.31%) of patients were cured during treatment. A small proportion of 9 (6.29%) was transferred to an advanced center, and 2N (1.40%) unfortunately did not survive the treatment (Table 3-g).
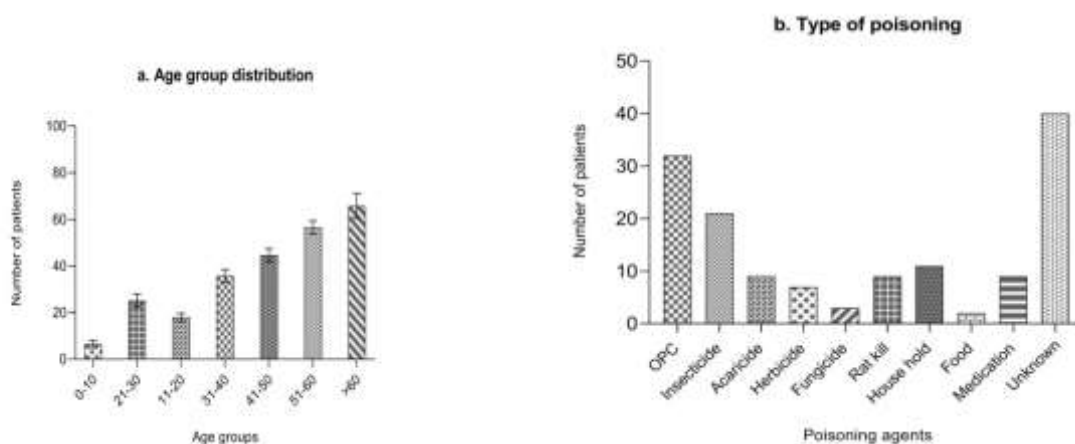
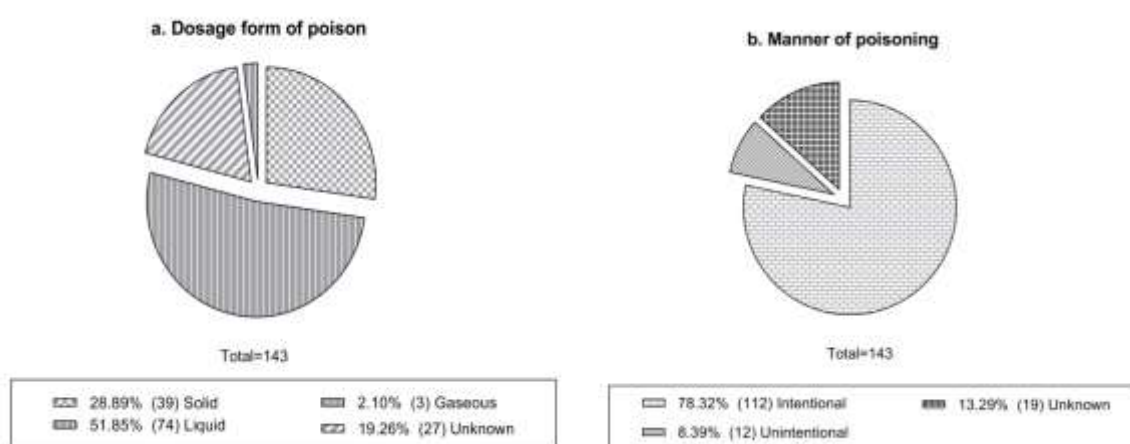**Figure 1: Age group distribution (a) and Type of poisoning (b).**

Figure 2: Dosage form of poison (a) and Manner of poisoning (b).
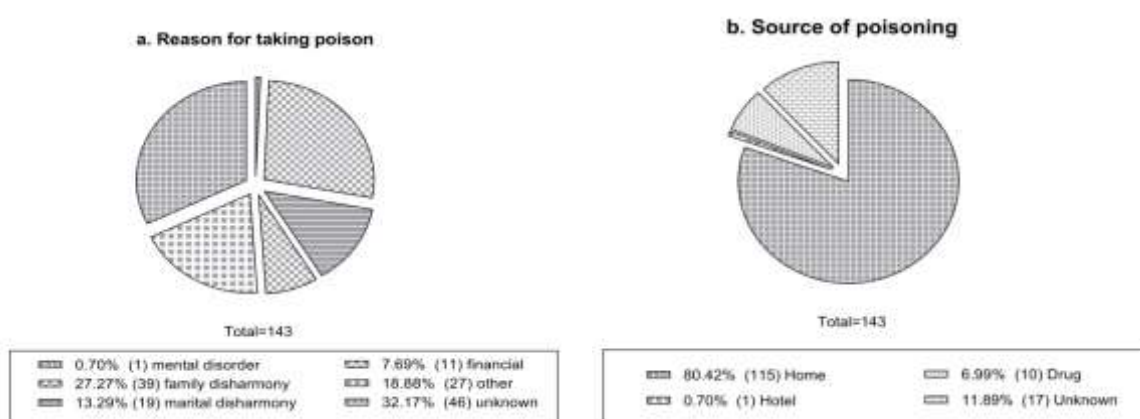

Figure 3: Reason for taking poison (a) and source of poisoning (b).

Table 1: Laboratory investigation.

Laboratory investigation	No. of patients (N)	Percentage of patients (%)
i. BSL	125	87.41
ii. ECG	36	25.17
iii. LFT/RFT	125	87.41
iv. Sr. cholinesterase	136	95.10

v.	Chest X-ray	14	9.79
vi.	CBC	87	60.84
vii.	USG (abdomen)	128	89.51

*Where N=143 and the values are expressed in number and percentage

Table 2: Management of poisoning cases.

Management of poisoning cases	No. of Patients (N)	Percentage of patients (%)
a. Non-pharmacological		
i. $KMnO_4$ solution	119	83.22
ii. Saltwater	16	11.19
iii. NG tube	12	8.39
iv. NS solution	5	3.50
b. Pharmacological		
i. Atropine	88	61.54
ii. Pralidoxime	33	23.08
iii. Ceftriaxone	129	90.21
iv. Pantoprazole	134	93.71
v. Ondansetron	132	92.31
vi. Metronidazole	28	19.58
vii. Vitamin K	14	9.79

*Where N=143 and the values are expressed in Number and Percentage

Table 3: Clinical and Non-clinical observations.

Parameters	No. of Patients (N)	Percentage of patients (%)
a. Demographic status		
i. Urban	39	11.19
ii. Rural	104	88.81
b. Occupation		
i. Farmer	44	30.77
ii. Housewife	65	45.45
iii. Student	28	19.58
iv. Other	06	4.20
c. Economical status		
i. APL	114	80
ii. BPL	29	20
d. Educational status		
i. Literate	62	43.36
ii. Illiterate	81	56.64
e. Home Remedy		
i. Yes	16	11.19
ii. No	127	88.81
f. Duration of stay		
i. 1-2 days	72	50.35
ii. 3-4 days	57	39.86
iii. >4 days	14	9.79
g. Treatment outcome		
i. Cure	132	92.31

ii.	Death	2	1.40
iii.	Transfer	9	6.29
h.	**Ventilation/oxygen support**		
i.	Yes	130	90.91
ii.	No	13	9.09
i.	**Physical status of the patient**		
i.	Conscious	126	88.11
ii.	Unconscious	17	11.89
j.	**Time of arrival**		
i.	<2 hours	87	60.84
ii.	2-4 hours	52	36.36
iii.	>4 hours	4	2.80
k.	**Route of administration**		
i.	Oral	140	97.90
ii.	Intranasal	3	2.10
l.	**Season of poisoning**		
i.	Autumn	82	57.34
ii.	Winter	37	25.87
iii.	Monsoon	17	11.89
iv.	Summer	7	4.90

*Where N=143 and the values are expressed in number and percentage

DISCUSSION

The annual prevalence rate of acute poisoning was determined to be 7.94% per 1000 people. Among the total cases of poisoning, it shows that most of the females were consuming poison as compared to the males. The highest incidence of poisoning occurred in the 21-30 age group consistent with findings by Maheshwari *et al.*[13] The mean age of the patients was 31.98 years ± 12.99 years, very similar to a study by Azazh *et al*., 2011 indicating that the sample population's age distribution was comparable to previous research.[14] In terms of severity, most of the patients required ventilation or oxygen support, highlighting the severity of the cases. Most patients were conscious at admission, while few were unconscious, indicating different states of consciousness in situations of poisoning, these findings show similarity with Rutto *et al.,*2012 study.[4] Most poisoning cases were associated with a known agent, with OPC poisoning being the most common, followed by insecticide poisoning. This highlighted the importance of identifying the specific poison for appropriate management, it is to some extent identical to findings by Hakim *et al.,*2014 and Maheshwari *et al.*[13,15] Liquid forms of poisoning agents were more frequent than other forms of poisoning agents because the liquid pesticides or household products were easily available in this region, this correlated with studies in South India, South Turkey, and Gondar, Ethiopia, which were conducted by Jesslin J *et al.,* 2010, Adinew GM *et al.,* 2017 and Ayrik C *et al.,* 2015 which

showed the oral route as the most common mode of poisoning.[1,16,17] Regarding intent, many cases were intentional (Such as self-harm or suicide attempts), some were unintentional, and the least number had an unknown intention. Similar studies in Nepal, India, and Ethiopia which are reported by Maheshwari *E et al*., Desalew M *et al.,* 2011, and Marahatta S *et al.,* 2009 reported intentional poisoning as the majority, emphasizing the need for mental health interventions and suicide prevention strategies.[13,18,19] Among known reasons family disharmony and marital disharmony were common causes, along with financial reasons and mental disorders, but another study conducted at Tikur Anbessa at Specialized Teaching Hospital in Addis Ababa, Ethiopia conducted by Desalew M *et al.,* 2011 reported temporary quarrels as the most common reason, followed by emotional disturbance. Understanding the underlying causes can help in addressing the social and psychological factors contributing to poisoning incidents.[18] The home was the primary source of poisoning, followed by drugs (Medication) and hotels (Contaminated foods). The primary objective should be to raise awareness and promote safety within homes and other potential sources. This is similar to the conclusion of a study conducted in Gondar, Ethiopia conducted by Adinew GM *et al.,* 2017 in which hotels and homes were the main sources of poisoning agents.[16] Both non-pharmacological (Gastric lavage, Activated charcoal) and pharmacological (Atropine, pralidoxime) approaches were used in treatment. Decontamination measures were consistent with the Maheshwari *et al*. study.[13] Most poisoning incidents occurred in rural areas, highlighting the need for targeted awareness campaigns and accessible healthcare facilities in these regions. Housewives, farmers, and students constituted the largest occupational groups among patients. It is similar to the study conducted by D Sarkar *et al.,* 2013 were housewives significantly more frequent than farmers and students.[20] Educational levels were low, and plenty of patients were illiterate. This emphasizes the role of education and awareness in preventing poisoning incidents. Most patients were discharged within 1-2 days, while a smaller number of patients required a longer hospital stay (3-4 days), reflecting the severity of cases, similar to Abd-Elhaleem*et al*.'s findings.[21]

CONCLUSION

Acute poisoning affects a large number of young populations, particularly females. The incidence of acute poisoning has been on the rise, highlighting the need for effective preventive measures and improved management strategies. The sociodemographic tendencies of the patients played an essential role in identifying the effects of acute poisoning cases. It emphasized the need for comprehensive preventive strategies, targeted interventions for high-

risk groups, and improvements in the management of acute poisoning cases. The findings of this study provided a valuable foundation for future research, the development of policy, and the implementation of effective public health measures to address the growing concern of acute poisoning in the region. It was recommended that further studies be conducted to look deeper into the specific risk factors contributing to acute poisoning incidents, explore the long-term outcomes of poisoning cases, and evaluate the effectiveness of preventive measures implemented. The primary limitation is the constrained study area hence outcomes may differ. Also, socioeconomic conditions and geographical locations may influence the findings. This study provides a foundation for policy development in the region.

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