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DEMOGRAPHIC PROFILE AND PATTERN OF ACUTE POISONING CASES IN A TERTIARY CARE CENTRE: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Acute poisoning is a major public health problem particularly in developing countries like India. It adds significantly to emergency admissions and avoidable deaths. Knowledge of demographic and clinical characteristics of poisoning is crucial to guide prevention and effective management. Objective: To evaluate the socio-demographic features, nature of poisoning agents, the intent and the clinical outcome among cases of acute poisoning admitted in the tertiary care center located in North Maharashtra.

Materials and Methods: A hospital based, cross-sectional study was conducted over at a tertiary care hospital. One hundred and fifty acute poisoning was randomly collected for the study. Details of the patients were recorded on a pretested structured proforma, including demography, type and mode of poisoning, time to hospital reporting, treatment and outcome. All statistical analysis was conducted with SPSS software 26.0. Associations between categorical variables were examined using Chi-square test and p-value of <0.05 was considered as significant.

Results: Most patients were of 18–30 years old (45.3%) and male (61.3%) and most of the cases had rural residence (60%). The commonest agents of poisoning were organophosphate compounds (36.7%) and drug overdosage (20%). Suicidal poisonings comprised of 70% of the cases. The rate of recovery was 84% and the overall mortality was 12%. The mode of poisoning was significantly associated with clinical outcome ($\chi^2 = 12.56$, $p = 0.005$). Late hospital presentation was associated with worse outcomes.

Conclusion: Young adults from rural areas, especially males, are the most affected by acute poisoning. Organophosphates and suicidal intent dominate the poisoning profile in this region. Early hospital intervention plays a critical role in improving patient outcomes. There is an urgent need for preventive strategies, public education, regulation of toxic substances, and strengthening of mental health services and emergency care infrastructure.

Keywords: Acute poisoning, Organophosphates, Suicidal poisoning, Clinical outcome, Rural health, North Maharashtra.

INTRODUCTION

Acute poisoning represents a major public health problem and its impact is more marked in low and middle income countries where it constitutes a major cause of morbidity and mortality. The burden at the Indian scenario Poisoning contributes 20–30% of emergency department admissions in the tertiary hospital is very high on the health care system.[1] The characteristics of poisoning are country specific and it is related to the accessibility and availability of poisonous substances, socioeconomic status, and help-seeking behavior.

Pesticide poisoning is a leading cause of acute poisoning in Indian scenario, mainly in rural/ agricultural regions. Organophosphorous, aluminum phosphide and herbicides are often involved because they are easy to obtain and sold illegally.[2]

Maharashtra, as the most agriculturally developed state, reports large number of cases of both kinds. Reports from various districts in the state including Vidarbha and Marathwada reveal that deliberate self-harm with agricultural poisons is alarmingly widespread.[3] However, scant published data are available for the people residing in the north Maharashtra regions, which are prominently populated by tribal and semi-urban population with delayed healthcare accessibility.

In the area, tertiary care institutions such as the government medical colleges are referral areas for poisoning cases from surrounding rural areas. Poor knowledge about safe handling of pesticides, storage management, mental disorders, and absence of poison control centres are other factors that add to the burden of both accidental and suicidal attempts of poisoning. The age group affected is most commonly young adults, followed by males more than females, and the majority of cases are associated with intent to suicide.[4] Furthermore, the medicolegal significance of documenting and handling such patients should not be ignored, as they represent an important interface in the fields of clinical practice, public health, and forensic medicine.

Given the paucity of regional data from North Maharashtra, this study aims to explore the profile and pattern of acute poisoning cases presenting to a tertiary care centre. The findings will aid in identifying vulnerable populations, common toxic agents, delay in treatment, and outcomes—helping design preventive strategies and improve medico-legal documentation.

MATERIALS AND METHODS

This was a hospital-based, cross-sectional observational study conducted in the Department of Community Medicine and Forensic Medicine at a tertiary care teaching hospital in Maharashtra. The hospital serves as a referral center for urban, rural, and tribal populations from the surrounding districts. The study population comprised patients of all age groups and both sexes who were admitted with a clinical diagnosis of acute poisoning. A random sample of 150 acute poisoning cases was selected from all eligible admissions during the study period using systematic random sampling. Every second or third eligible case, depending on patient flow, was included until the desired sample size was reached.

Patients that developed acute manifestations of poisoning within 24 hours of the exposure and who had complete clinical, demographic and outcome information were enrolled. Both direct admissions and patients referred from peripheral centers were included. Informed consent was obtained from patients or from their legal guardians. Patients with chronic poisoning, presenting after 24 hours of such exposure, animal bite or sting and incomplete medical records; or those who left against medical advice before attending to, were excluded from the study.

Data was collected on a pre-structured proforma. History was taken by a direct patient interview or by a relative, and information was collected by reviewing patients' documents or medico-legal case files. The variables measured were demographic, such as age, sex, occupation, place of residence, and socioeconomic status, clinical details like type and intent of poisoning, time from exposure to hospital presentation, mode of presentation, symptoms at presentation, and outcome like period of hospital stay, recovery, and death.

Approval of Institutional Ethics Committee was obtained before the study. All subjects provided informed consent and anonymity of all patient information was ensured. Data was entered into Microsoft Excel and SPSS version 26.0 was used for analysis. Data was summarized with descriptive statistics (mean, and standard deviations, frequency, percentage). The analysis of the association between categorical variables was performed using the Chi-square test, and $p < 0.05$ was considered statistically significant.

RESULTS

A total of 150 cases of acute poisoning were studied at a tertiary care hospital in Maharashtra over a period of one year. The study was particularly addressed to the demographic profile of the patients, nature and purpose of poisoning, clinical manifestations, treatment outcomes, and resultant medico-legal aspects. Most of the cases occurred in young adults and with predominance of males. The most common toxicant was organophosphates and the commonest motive for poisoning was suicidal. The clinical deterioration however varied depending on the poison ingested and the delay between the exposure and hospitalization.

Table 1: Sociodemographic Characteristics of Patients with Acute Poisoning (n = 150)

Variable	Category	Number of Cases	Percentage (%)
Age Group (years)	<18	12	8.0
	18–30	68	45.3
	31–45	40	26.7
	46–60	20	13.3
	>60	10	6.7
Gender	Male	92	61.3
	Female	58	38.7
Residence	Urban	60	40.0
Variable	**Category**	**Number of Cases**	**Percentage (%)**
	Rural	90	60.0

Occupation	Farmer	38	25.3
	Student	30	20.0
	Homemaker	28	18.7
	Laborer	24	16.0
	Unemployed/Other	30	20.0

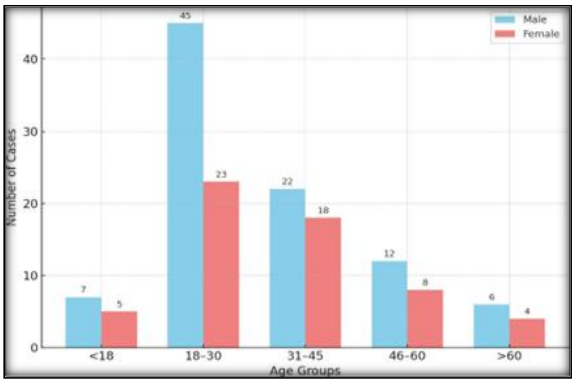

Figure 1: Age and Gender Distribution of Poisoning Cases.

As seen in [Table 1], the highest percentage of acute poisoning events occurred in the 18 –30 years age category (45.3%), followed by individuals aged 31–45 years (26.7%). Meanwhile, children and teenagers under 18 years represented 8% of the cases, and those aged 60 or over made up 6.7%. Men were predominantly affected, with a male-to-female ratio of about 1.6:1. Most of the patients (60%) came from rural areas as opposed to urban (40%). Occupationally, more farmers (25.3%) followed by students (20%), unemployed/others (20%), homemakers (18.7%), and labourers (16.6%). This pattern corresponds to the susceptibility of the young rural and economically productive population to mass poisoning.

As shown in [Figure 1], age and sex distribution of acute poisoning cases is depicted. The maximum number of cases were in the 18-30 years age group, with a significant male preponderance in this group. There were more males than females in all age groups, particularly in the 18–30 and 31–45 belonging. This infers that young adult males are one of the worst hit with this expressory, possibly because of increased susceptibility to occupational stress, availability of the substance and impulsivity.

Table 2: Distribution of Cases According to Type of Poisoning Agent (n = 150)

Poisoning Agent	Number of Cases	Percentage (%)
Organophosphates	55	36.7
Aluminum phosphide	20	13.3
Drug overdose	30	20.0
Household chemicals	18	12.0
Corrosives	12	8.0
Unknown substance	15	10.0

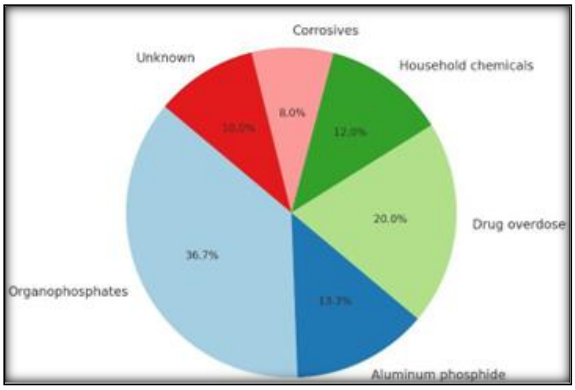

Figure 2: Proportion of Poisoning Agents Used

[Table 2] shows that organophosphates were the most frequently accused toxic in 36.7% of the cases. The second cause was drug overdose (20%) followed by aluminum phosphide (13.3%) and household chemicals (12%). Corrosive ingestion was observed in 8% with unknown substance in 10% cases. This pattern indicates the easy accessibility of pesticides and medications in the area, and must be accompanied by the reinforcement of regulations and public awareness about proper handling and storage.

The types of poisoning agents used among the study population are shown in [Figure 2]. The maximum proportion was for Organophosphates followed by drug overdose and aluminum phosphide. Household chemicals and corrosive agents also accounted for a smaller, yet significant, percentage of cases. A significant 10% included unknown substances. The preponderance of agrochemical and drug poisoning is indicative of the availability of the agents in rural and semi-urban areas which point to the requirement of better regulations and educational campaigns.

Table 3: Distribution of Cases by Mode of Poisoning (n = 150)

Mode of Poisoning	Number of Cases	Percentage (%)
Suicidal	105	70.0
Accidental	35	23.3
Homicidal	2	1.3
Unknown/Unclear	8	5.4

As indicated in [Table 3] suicidal poisoning has been the commonest mode in 70% cases, suggesting a strong prevalence of mental distress burden at community level. Ingestion was accidental in 23.3%

of the cases, frequently regarding children or accidental ingestion. Homicidal intoxications were infrequent (1.3%), and among these cases, 5.4% of intent was unclear or unknown. The high lethality in suicide shows the necessity of timely interventions of mental health and psychosocial support in those who are vulnerable.

Table 4: Clinical Outcome of Poisoning Cases (n = 150)

Outcome	Number of Cases	Percentage (%)
Recovered	126	84.0
Died	18	12.0
Referred	4	2.7
LAMA	2	1.3
ICU Admission	Yes: 40, No: 110	-
Ventilator Support	Yes: 22, No: 128	-
Mean Hospital Stay	-	3.8 ± 2.1 days

The clinical results of the poisoning groups are presented in [Table 4]. Most patients (84%) survived after the adequate treatment, while the 12% died as a result of poisoning which manifests strongly established mortality load. Few (2.7%) cases were referred to higher centers, while other (1.3%) cases left against medical advice. 40 patients needed to be admitted to the ICU and 22 were ventilated, demonstrating the severity of poisoning in a substantial proportion. The mean hospital stay was 3.8 ± 2.1 days. These results highlight the importance of early intervention and strong emergency health care.

Table 5: Association Between Mode of Poisoning and Outcome (n = 150)

Mode of Poisoning	Recovered	Died	Other (LAMA/Referred)	Total
Suicidal	84	17	4	105
Accidental	35	1	0	36
Homicidal	1	1	0	2
Mode of Poisoning	**Recovered**	**Died**	**Other (LAMA/Referred)**	**Total**
Unknown	6	0	2	8
Total	126	18	6	150

Chi-square value = 12.56, p = 0.005 (statistically significant)

The mode of poisoning and clinical results are presented in Table 5. In the 105 cases of suicide, 84 survived and 17 died, with the case fatality rate higher in the intentional poisonings. Among the accidentally infected, the CFR was much lower with only 1 death in 36 cases. One victim of homicidal poisoning survived and one died and the unknown intent victims were the majority of persons who survived or were referred. There is significant association between mode of poisoning and outcome ($\chi^2 = 12.56$, p = 0.005) which indicates that suicidal poisoning has more adverse outcomes as compared to accidental/unknown cause.

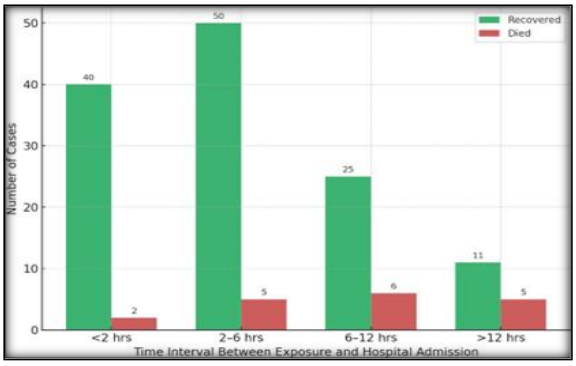

Figure 3: Time Interval Between Exposure and Hospital Admission vs Clinical Outcome.

The time from poisoning exposure to hospital entrance according to the outcome is showed in [Figure 3]. Recoveries were most frequent in patients who took the compound within 2-6 hours following exposure. But the death rate was markedly higher of those arriving later, especially later than 6 hours, and the greatest number of deaths were in the >12 hours' group. The results highlighted the importance of early intervention in hospitals for the increase in the survival and success rates in acutely poisoned cases. Hesitation in undergoing treatment was obviously associated with a worse outcome.

DISCUSSION

Current study reveals the characteristics regarding demography, clinical presentation, and toxicological profile of acute poisoning cases reported to a tertiary care center in North Maharashtra. We reviewed in total 150 cases, dominated by young adults of 18–30 years and a strong male bias. It is consistent with findings of the earlier studies in all parts of India suggesting that the mean age of poisoning is the second and third decades of life with highest prevalence in male perhaps, due to higher occupational and psychosocial stressors exposure in this age group.[5,6]

The preponderance of rural dwellers (60%) in our study attests to the fact that the rural area presents a higher risk for poisoning possibly due to the easy accessibility of agricultural chemicals; low health literacy and time lag in accessing emergency care.

There have been similar observations described in reports from central and southern India highlighting that the rural communities are at high risk due to pesticide poisonings.[7]

The most commonly used agent was organophosphates (36.7%) followed by drug over dose and aluminium phosphide. Organophosphates and other pesticides are the major toxicants responsible for poisoning in India as they are used extensively and are easily accessible over the counter, studied by Batra et al. and Singh et al.[8,9] Despite its prohibition in many formulations, aluminum phosphide remains a cause of considerable morbidity and mortality in India owing to its high toxicity and continued availability in rural market places.[10]

In this study, the major form of toxicity was suicidal (70%), followed by accidental (23.3%). This observation is reported in several studies conducted across the regions of India as well where suicidal intention contributed to the most of the poisonings.[11] The increasing anxiety, impact of socio-economic factors and lack of access to counseling services may be the drivers behind this growing trend. It also highlights the requirement for integrated mental health care at the primary level.

The clinical outcomes revealed an 84% recovery and 12% death. The fatality is similar to previous studies which had cited case fatality rates of 6%-15% according to the poison type and promptness of treatment.[12] A significant correlation between the pattern of poisoning and outcome was also found ($p = 0.005$) with more deaths occurring in suicidal poisonings. This indicates that intentional ingestions may result from larger amounts or more lethal agents. A key predictor of outcome was the time to presentation to the hospital. Recovery predominated in patients presenting 2–6 hours after ingestion and death was commoner in those who arrived more than 6 hours after poisoning. Early decontamination, antidotal therapy, and supportive care have been reported to improve survival in acute poisoning.[13] Late arrival to the hospital usually results in a worse clinical condition and reduces the efficacy of the available specific antidotes.

ICU and ventilator support were needed in a considerable number of patients, strengthening the importance of developing adequately equipped emergency and critical care facilities for poisoning management. Furthermore, absence of Poison information centers in most part of the county continues to be a shortcoming in the Indian health care set up. The development of such centers can aid in the timely identification of, management of interventions for, and policy implementation for the regulation of toxic agents.

CONCLUSION

The present study brings forth the magnitude of the menace of acute poisoning which is a matter of concern in Maharashtra; more so, young adult males with rural background were affected more. Organophosphates were the most frequent poisoning agents and most of the exposures were intentional suicide attempts. Mode of poisoning was found to be significantly associated with clinical outcome and suicidal poisoning resulted in higher mortality. Late-onset hypotonia was also found to be a predictor of worse outcome, stressing the role of early treatment. These results stress the necessity to implement preventive measures in the regions studied, such as work of social learning in communities, support in mental health, regulation of toxic substances and better emergency care in rural and semi-urban areas.

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