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Original Research Article

Profile of Deaths Due to Poisoning at a Tertiary Care Centre

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Abstract

Introduction: Poisoning is a critical public health concern with increasing mortality rates in India. Intentional poisoning, particularly through suicidal acts, and unintentional poisoning incidents both contribute to the burden of poisoning-related deaths. This study aims to provide a comprehensive profile of deaths due to poisoning at a tertiary care center, including demographic information, manner of poisoning, types of poisons involved, and socioeconomic factors.

Methods: This retrospective study was conducted at GMERS Medical College Morbi during the period of Feb 2022 to Jan 2023. It involved the collection and analysis of data related to deaths due to poisoning. Detailed information and history were obtained from police records, relatives of the deceased, and hospital records. Meticulous autopsies were performed, and routine viscera and body fluids were collected for chemical analysis. The data collected was analyzed using descriptive statistics, and the findings were entered into a standardized proforma.

Results: The results of our study revealed that out of the total victims, 64% were males and 36% were females. In terms of age group distribution, the highest number of victims (29%) belonged to the 21-30 years age group, followed by 21% in the 31-40 years age group. Among the occupation of the victims, housewives accounted for the highest number of cases (23), followed by laborers (15) and farmers (16). Students and individuals in private jobs had lower numbers, with 9 and 16 victims respectively. The most prevalent type of poisoning identified in our study was organophosphorus, accounting for 52% of the cases. Aluminium phosphide was the second most frequently detected poison, with 25% of the cases.

Conclusion: This study provides important insights into the demographics, occupational profiles, types of poisoning, and religious distribution of poisoning cases. The findings highlight the need for targeted interventions, increased awareness, and preventive measures to reduce the incidence of poisoning-related deaths.

Keywords: poisoning, mortality, demographics, occupational profiles.

Introduction

Poisoning is a pressing public health concern that encompasses a broad range of incidents involving the ingestion, inhalation, or exposure to harmful substances. It poses a significant threat to individuals of all ages and can lead to severe morbidity and mortality. Poisoning represents a critical public health challenge with alarming implications for mortality rates. In India, the burden of poisoning-related deaths has shown a concerning increase.[1] According to recent data, there were 22,186 reported deaths due to poisoning in 2020, which surged to 23,323 deaths in 2021, indicating a notable 4.9% increase.[2] The diverse nature of poisoning incidents and their potential for devastating consequences necessitate a comprehensive understanding of the problem. Intentional poisoning, particularly through suicidal acts, represents a distressing aspect of poisoning in India. Factors such as mental health issues, social pressures, and personal crises contribute to a high prevalence of self-harm by poisoning.[3] The availability and misuse of toxic substances, including pesticides and pharmaceuticals, further exacerbate the problem. Understanding the underlying motives and risk factors associated with intentional poisoning is crucial for the development of preventive strategies and the provision of timely mental health interventions.[4]

Unintentional poisoning incidents pose a significant challenge in India. In 2019, the mortality rate for unintentional poisoning was more than one person per 100,000 population, showing a slight decrease from the previous year and indicating an overall downward trend in mortality rates.[5] However,

despite this positive trend, the burden of unintentional poisoning remains significant. The absolute number of deaths due to unintentional poisoning in South Asia decreased by 32.6% from 10,558 deaths in 1990 to 7,112 deaths in 2019.[6] Factors such as accidental ingestion of toxic substances, occupational exposures, and improper storage of household chemicals contribute to a considerable number of poisoning cases. Limited awareness, inadequate safety measures, and restricted access to emergency medical care in certain regions further complicate prevention and management efforts.[6] This study aims to comprehensively understand the characteristics, circumstances, and risk factors associated with unintentional poisoning cases in India, informing targeted interventions to reduce morbidity and mortality.

Material and Methods

This retrospective study was conducted at GMERS Medical College Morbi during the period of Feb 2022 to Jan 2023. The study obtained permission and approval from the institutional ethics committee before commencing. A total of 100 cases were included in the study, and data was collected retrospectively from the hospital records. A specified proforma was used to record patient history and other relevant details. The data collection process involved reviewing the case sheets of the study subjects, ensuring that the inclusion and exclusion criteria were met. The collected data included information on gender, age, route and reason of poisoning, seasonal variation, and agents involved. Detailed analysis was conducted on the police inquest reports, patient history, signs, and symptoms. Descriptive analysis included age, sex, and associated complications, while continuous variables were described using mean and standard error. The study adhered to ethical guidelines and obtained the necessary approvals for data collection and analysis.

In cases of poisoning, detailed history and information were collected from the police and the relatives of the deceased through questionnaires. Post-mortem findings were analyzed along with the chemical analysis reports. For hospital-admitted cases, information was collected from hospital records. Additional information was obtained through visits to the crime scene or from photographs. Exclusions were made for cases of food poisoning, snake bites, insect bite envenomation, and deaths due to idiosyncratic reactions to drugs.

Meticulous autopsies were performed, and routine viscera and body fluids were collected for chemical analysis at the Forensic Science Laboratory. The results from the laboratory reports, along with information from the relatives and investigating officers, were entered into a standard proforma for further study. Overall, this methodology ensured comprehensive data collection and analysis to achieve the study objectives of profiling deaths due to poisoning at GMERS Medical College Morbi during the specified period.

Results

In present study across different age groups, varying numbers of deaths due to poisoning were observed. The 21-30 age group stands out with the highest number of deaths among both males and females followed by 31-40 age groups.

The percentage values in table 1 indicate the proportion of deaths within each category, offering insights into the relative distribution of deaths among married and unmarried individuals within each age group. The male female ratio for present study was 1.7:1 with higher number of married victims (59%) among both sex groups (Table 1).

Table 1: Age, marital status and sex-wise distribution of victims

Age (yrs)	Male			Female		
	Married	Unmarried	Total	Married	Unmarried	Total
0-20	0	4(4%)	4(4%)	0	0	0
21-30	10	19 (19%)	29(29%)	19(19%)	9(9%)	28 (28%)
31-40	9(9%)	7(7%)	16(16%)	6(6%)	1(1%)	7 (7%)
41-50	8(8%)	1(1%)	9(9%)	1(1%)	0	1 (1%)
51-60	6(6%)	0	6(6%)	0	0	0
Total	33	31	64	26	10	36

Figure 1 represents the occupation of the victims, reveals the highest number of victims were observed among housewives, with a total of 23 victims. Laborers and farmers follow closely, with 15 and 16 victims respectively. Students and individuals in private jobs have lower numbers of 9 and 16 victims respectively. (Fig. 1) The majority of victims (81) belong to the Hindu religion, while there is only one Christian victim and 18 Muslim victims.

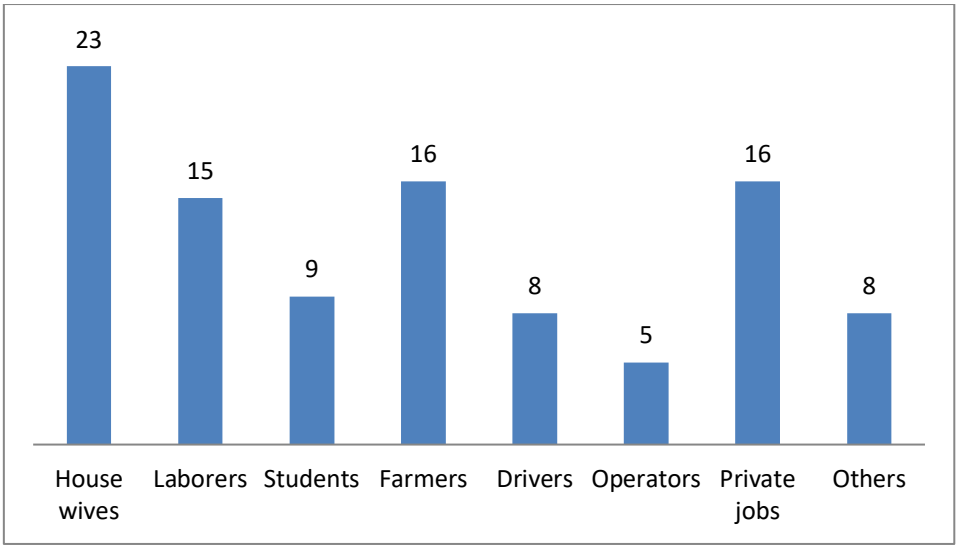

Figure 1: Occupation of the victims

Among the study population, accidental poisoning accounts for 8 cases (8%), homicidal poisoning for 3 cases (3%), and the majority of cases, 89 (89%), are classified as suicidal poisoning. (Table 2)

The figure 2's findings on the distribution of victims based on socioeconomic class reveals that a significant majority (69%) of the victims belong to the lower class, indicating a potential association between lower socioeconomic status and the occurrence of poisoning-related deaths.

Table 2: Distribution of the study population according to manner of poisoning.

Manner	Frequency	Percentage
Accidental	8	8
Homicidal	3	3
Suicidal	89	89
Total	100	100

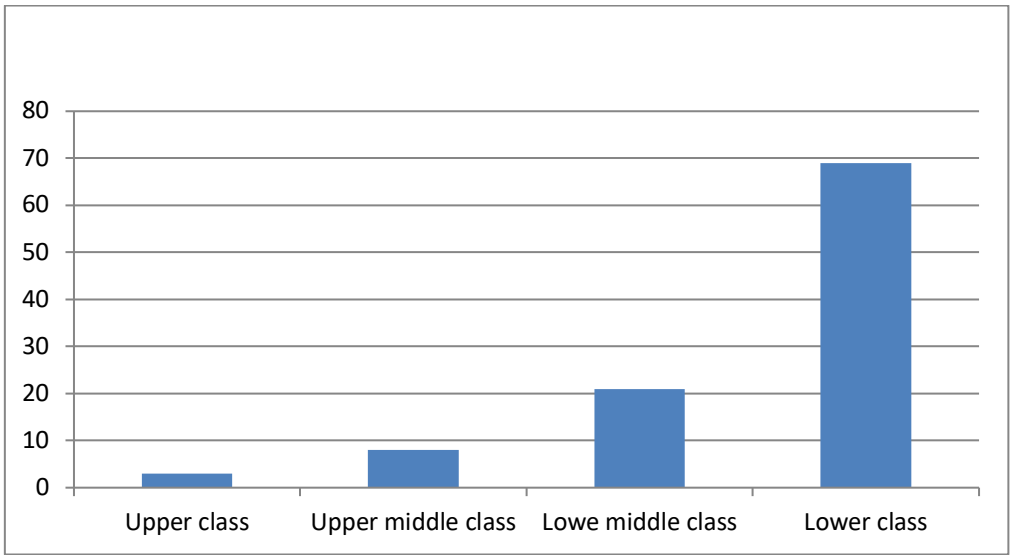

Figure 2: Study population according to Socio economical Status

The table 3 presents the results of the chemical analysis conducted by the Forensic Science Laboratory (FSL) on the poisoning cases. Among the analyzed cases, the most prevalent chemical detected is Organophosphorus, accounting for 52 cases (52%). Aluminium Phosphide is the second most frequently detected chemical, with 25 cases (25%). Other chemicals found include Carbamate (3 cases, 3%), Paraquat (3 cases, 3%), Alcohol (7 cases, 7%), Sulphuric acid (1 case, 1%), Pyrethroid (1 case, 1%), Paraphenylendiamine (1 case, 1%), and Benzodiazipine (1 case, 1%). Additionally, there were 6 cases (6%) where no specific chemical was detected (Not Detected).

Table 3: Distribution of poisons detected by chemical analysis (FSL)

Chemical Analysis (FSL)	Frequency (n)	Percentage (%)
Organophosphorus	52	52%
Carbamate	3	3%
Pyrethroid	1	1%
Paraquat	3	3%
Aluminium Phosphide	25	25%
Alcohol	7	7%
Sulphuric acid	1	1%
Paraphenylendiamine	1	1%
Benzodiazipine	1	1%
Not Detected	6	6%
Total	100	100%

Discussion

The study objectives were to ascertain the most common gender and age group involved, examine the occupation and socio-economic status of the victims, determine the manner of poisoning, and identify the common types of poisons involved. The results revealed valuable insights into the demographic characteristics of the victims, with a particular focus on gender and age group distributions. Additionally, the analysis shed light on the occupational and socio-economic factors contributing to poisoning incidents. The findings also highlighted the prevalent manner of poisoning and the most common types of poisons involved.

We reported the higher number of male victims (n=64) than females with highest reported age group of 21-30 years. Around 59% of the study participants were married in our study. In comparison to other studies, our findings align with some of the previously reported data. The study by Haloi et al.[7] found a higher number of male victims (62.50%) compared to females (37.50%), which is consistent with our study's observation of a higher number of male victims (64%). Both studies identified the age group of 20-29 years as the most common age range for poisoning cases. Similarly, the study conducted by B.D. Gupta et al.[8] reported a predominance of male victims (71.77%) and a significant number of cases in the age group of 20-29 years (42.74%), supporting our findings. Moreover, the study by Prajapati et al.[9] found a higher proportion of male cases (70.8%) and a notable presence of cases in the age group of 21-30 years (45.08%), consistent with our study's results. These findings collectively support the notion of a higher prevalence of poisoning cases among males and in the young adult age group, reinforcing the need for targeted interventions and prevention strategies in these demographic segments. Our study on the occupation of the victims revealed that the highest number of victims were observed among housewives (23), followed closely by laborers (15) and farmers (16). In comparison, the study by Sewagram et al.[10] reported agriculture as the most common occupation among poisoning victims, without specifying the exact number. Chatterjee et al.[11] found that excluding students and children, the most affected occupational groups were daily wage workers, housewives, service holders, and farm workers. Patil et al.[12] noted a higher frequency of poisoning in unmarried cases (40.5%) and the study by Mathew et al.[13] reported the occupation distribution as an unemployed (106, 53%), unskilled worker (27, 13.5%), semiskilled worker (16, 8%), skilled worker (34, 17%), and professional (17, 8.5%). Maharani et al.[14] found that male laborers (18.66%) and farmers (13.33%) were commonly affected, along with housewives (28%) and students (16.66%).

Our study's findings on the distribution of victims based on socioeconomic class, which shows a significant majority (69%) belonging to the lower class, are consistent with other studies. Patil et al.[12] found that victims from lower socioeconomic groups were most commonly affected (84%), followed by the middle class (13%) and upper class (3%). Ninave et al.[15] reported that a high percentage of married individuals (87.50%) involved in poisoning cases belonged to the lower socioeconomic status, with a significant representation from the agriculture occupation. Maharani et al.[14] and Prajapati et al.[9] also reported similar findings, highlighting the association between lower socioeconomic status and the occurrence of poisoning cases.

In our study, we found that the majority of victims (81) belonged to the Hindu religion, while there was only one Christian victim and 18 Muslim victims. This finding is consistent with studies conducted in Gujarat, where a higher proportion of the population follows the Hindu faith.[8] For example, in a study conducted by Patil et al.[12], they reported that most of the patients were Hindus (85.1%) followed by Muslims (14.9%). Similarly, Tejus Prajapati et al.[9] found that the majority of poisoning cases were from the Hindu community. These findings highlight the influence of regional demographics and religious composition on the distribution of poisoning cases in different geographical areas.

Our findings on the distribution of poisoning cases based on the manner of poisoning reveal that the majority of cases (89%) in our study were classified as suicidal poisoning, followed by 8% of cases being accidental and 3% being homicidal. These findings are consistent with the study by Patil et al.[12], which reported the highest percentage of suicidal deaths by poisoning (97%), followed by homicidal and accidental cases. Similarly, Prajapati et al.[9] found that 74.6% of poisoning cases were classified as suicidal. Koulapur et al.[16] reported that the most common manner of poisoning was suicidal (87%), followed by accidental cases (7.37%). Additionally, Mathew et al.[13] observed that out of 200 poisoning cases, 57.5% were suicidal, 34% were accidental, and 8.5% were homicidal. The higher prevalence of suicidal poisoning cases (89% in our study) compared to accidental and homicidal cases is supported by findings from Patil et al.[12], Prajapati et al.[9], Koulapur et al.[16], and Mathew et al.[13] These studies consistently report a similar trend, indicating that suicidal poisoning is the predominant manner of poisoning across different populations.

The consistency in findings suggests that suicidal poisoning is a critical public health concern that warrants focused attention from healthcare professionals, policymakers, and relevant stakeholders. By understanding and acknowledging the predominance of suicidal poisoning, targeted strategies can be developed to identify at-risk individuals, enhance mental health support, and create a supportive environment for those in need. The consistent findings regarding the distribution of specific chemicals in poisoning cases across various studies reinforce the validity and significance of our results. Our study identified Organophosphorus as the most prevalent chemical, followed by Aluminium Phosphide, Carbamate, Paraquat, and others. These findings align with previous studies, including those by Mathew et al.[13] (Organophosphorus compounds: 10%), Koulapur et al.[16] (Organophosphorus compounds: 64.3%, organo-chloro compounds: 25.2%, carbamates: 11.5%), Maharani et al.[14] (Organophosphorus: 58.66%), Vikram Palimar & Prateek Rastogi[17] (Organophosphates: Predominant), and Vishwajeet Pawar et al.[10] (Insecticides poisoning: Most common, Organophosphorus: Commonest). The high prevalence of Organophosphorus compounds, as observed in our study and supported by multiple investigations, underscores their significance in poisoning cases. The consistent identification of Organophosphorus compounds as a common poison emphasizes the need for stringent regulations, improved handling practices, and increased awareness regarding their toxicity and potential harm.

Furthermore, the presence of other chemicals, such as Aluminium Phosphide, Carbamate, Paraquat, and others, reinforces the diverse range of toxic substances involved in poisoning cases. These findings highlight the importance of understanding the specific chemicals and their prevalence, which can inform tailored prevention strategies, targeted interventions, and public education initiatives. Overall, our findings, combined with the results from other studies, contribute to a broader understanding of the chemical profile in poisoning cases. These insights can inform the development of comprehensive prevention programs, risk assessment protocols, and treatment strategies, ultimately enhancing patient care and reducing the incidence of poisoning-related morbidity and mortality.

Some limitations of our study should be acknowledged. Firstly, the retrospective design introduced potential biases and limitations in data collection, including the reliance on existing records that may contain incomplete or missing information. Secondly, as a single-center study, the generalizability of our findings to broader populations or settings may be limited. Thirdly, the data collection process involved subjective input from police records, hospital records, and relatives, which could introduce reporting bias or inaccuracies. Lastly, the exclusion of certain cases, such as food poisoning or snake bites, may restrict the comprehensive representation of all poisoning-related deaths.

Conclusion

In conclusion, our study on the profile of deaths due to poisoning has provided valuable insights into the demographic characteristics, occupational patterns, socioeconomic status, manner of poisoning, and types of poisons involved in poisoning incidents. The findings highlight the predominance of male victims in the 21-30 age group and the higher representation of housewives, laborers, and farmers among the victims. Additionally, the study reveals a significant association between lower socioeconomic status and the occurrence of poisoning cases. The prevalence of suicidal poisoning and the identification of specific chemicals, such as Organophosphorus compounds, emphasize the need for targeted prevention strategies, mental health support, and regulatory measures. These findings contribute to our understanding of poisoning-related deaths and can guide efforts to reduce the incidence and impact of such incidents on public health.

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