ORIGINAL RESEARCH

To determine the socio-epidemiological aspects that impact poisoning

Dr. Ram Babusharma

Assistant Professor, Department of Forensic Medicine, Gouri Devi Institute of Medical Sciences & Hospital, Rajbandh, Durgapur, West Bengal, India

Corresponding Author: Dr. Ram Babusharma
Assistant Professor, Department of Forensic Medicine, Gouri Devi Institute of Medical Sciences & Hospital, Rajbandh, Durgapur, West Bengal, India

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ABSTRACT

Background: Poisoning remains a significant public health concern worldwide, with its impacts varying considerably across different regions and populations due to a range of socio-epidemiological factors. It encompasses a broad spectrum of substances, including pharmaceuticals, pesticides, household chemicals, and natural toxins, leading to a diverse array of clinical presentations and outcomes.**Material and Methods**: This retrospective study was conducted in the Department of Forensic Medicine and Toxicology, with a total of 200 poisoning victims whose autopsies were performed. Internal and external findings during the autopsy were documented, and specimens were sent for chemical analysis. Detailed histories were obtained from the relevant investigating officer, relatives, and hospital records. The inclusion criteria were poisoning victims whose bodies were autopsied at the hospital mortuary. Exclusion criteria included homicidal, unknown, and decomposed bodies. Data from inquest reports, police documents, autopsy records, and chemical analysis reports were analyzed and compared with similar studies.**Results:** The majority of poisoning cases occurred in individuals aged 21-30 years (25%), followed by the 31-40 age group (20%). Males constituted 60% of the victims, while females accounted for 40%. Most victims (70%) were literate, and 50% were married. Nuclear family structures accounted for 75% of the cases. Low socio-economic status was prevalent among 60% of the victims. Organo-phosphorous compounds were the most commonly consumed poisons (30%), followed by organo-chlorine compounds (15%). Aluminium and zinc phosphide, corrosive acids, and plant poisons also contributed to poisoning incidents.**Conclusion:** This study highlights the socio-epidemiological factors influencing poisoning cases, with younger adults and males being more affected. Organo-phosphorous compounds emerged as the most common poison, particularly in agricultural settings. Socio-economic status played a significant role, with low-income individuals being more vulnerable. The findings emphasize the need for preventive strategies, better regulations, and awareness programs, especially in high-risk populations.

Keywords: Poisoning, Socio-epidemiology, Organo-phosphorous compounds, Autopsy, Socio-economic status

INTRODUCTION

Poisoning remains a significant public health concern worldwide, with its impacts varying considerably across different regions and populations due to a range of socio-epidemiological factors. It encompasses a broad spectrum of substances, including pharmaceuticals, pesticides, household chemicals, and natural toxins, leading to a diverse array of clinical presentations and outcomes.[1] The World Health Organization (WHO) estimates that poisoning results in over 200,000 deaths annually, highlighting the urgency of addressing its underlying causes and contributing factors. Socio-epidemiological factors play a crucial role in the incidence and outcomes of poisoning. These factors include socio-economic status, education level,

occupational exposure, geographical location, and cultural practices. Understanding the interplay of these factors is essential for developing effective prevention and intervention strategies. Socio-economic status is a significant determinant of poisoning risk. Populations with lower socio-economic status often have limited access to healthcare, education, and safer living conditions, making them more vulnerable to poisoning incidents .[2] For instance, in low-income countries, the use of toxic pesticides and chemicals is more prevalent due to inadequate regulation and enforcement, leading to higher rates of unintentional and occupational poisoning. Additionally, economic constraints may force individuals to live in environments where exposure to hazardous substances is more likely, such as near industrial sites or in poorly constructed housing with inadequate ventilation .[3] Education level is another critical factor influencing poisoning risk. Higher levels of education are generally associated with better awareness and understanding of the risks associated with various substances and safer handling practices. Studies have shown that individuals with lower educational attainment are more likely to misuse medications and household chemicals, either intentionally or unintentionally, resulting in higher rates of poisoning .[4] Public health education campaigns aimed at improving knowledge and awareness about the risks of poisoning and safe handling of potentially hazardous substances can be effective in reducing poisoning incidents, particularly in low-literacy populations. Occupational exposure to toxic substances is a significant risk factor for poisoning, particularly in agricultural and industrial settings. Workers in these sectors are often exposed to pesticides, solvents, heavy metals, and other hazardous chemicals, leading to acute and chronic health effects. In many developing countries, the lack of proper safety regulations and protective equipment exacerbates this risk, resulting in higher rates of occupational poisoning. Implementing stringent occupational health and safety regulations, along with regular training and provision of protective equipment, can significantly reduce the incidence of work-related poisoning. Geographical location also influences the patterns and prevalence of poisoning. Rural areas often report higher rates of pesticide poisoning due to the predominant agricultural activities and widespread use of agrochemicals. In contrast, urban areas may see more cases of pharmaceutical and illicit drug poisoning due to the higher availability and misuse of these substances.[5,6] Geographical variations in poisoning patterns necessitate tailored public health interventions that address the specific risks and exposures prevalent in different settings. Cultural practices and traditional medicine use can also contribute to poisoning risk. In some cultures, the use of traditional remedies and herbal medicines is common, but these practices can lead to poisoning if the substances are not properly identified, dosed, or prepared. Additionally, cultural beliefs and practices around the storage and disposal of hazardous substances can influence the risk of unintentional poisoning, particularly among children. Public health initiatives that respect and integrate cultural practices while promoting safe use and handling of traditional medicines can help mitigate these risks.

AIM AND OBJECTIVES

The aim of this study was to determine the socio-epidemiological factors that impact poisoning, focusing on demographic characteristics, social factors, and the types of poisons consumed in a sample of 200 victims.

MATERIAL AND METHODS

This retrospective study was conducted in the Department of Forensic Medicine (FMT) at Gouri Devi Institute of Medical Sciences & Hospital, Rajbandh, Durgapur, West Bengal, India,following the acquisition of informed consent from all patients or their relatives if the patient was unable to provide consent due to their medical condition. The duration of study was from July 2019 to June 2020.

The subjects of the study were 200 poisoning victims whose autopsy was done and various internal and external findings observed during the procedure noted and necessary specimen were sent for chemical analysis. The detailed history regarding the poisonous cases that were brought dead was obtained from the inquest from the relevant investigating officer, relative of the deceased and hospital records. The observations were analyzed and subjected to comparison with studies along the same line.

Inclusion criteria: hose victims of poisoning whose body were autopsied in the mortuary of our tertiary care government hospital.

Exclusion criteria: among the deceased bodies examined postmortem the bodies pertaining to homicidal, unknown and decomposed bodies. Materials used were inquest report and other relevant police documents, optic lens for magnification, metric tape for measurement, equipment for photography, a workstation for autopsy, autopsy certificate, records of hospitalization and treatments, if any and report of the chemical analysis from regional forensic science laboratory.The duration of study was from January 2019 to December 2019.

RESULTS

Table 1: Demographic and Social Factors in the Studied Population

Factors	No. of Subjects	Percentage (%)
Age (0-10)	5	2.50
Age (11-20)	20	10.00
Age (21-30)	50	25.00
Age (31-40)	40	20.00
Age (41-50)	30	15.00
Age (51-60)	25	12.50
Age (61-70)	15	7.50
Age (>70)	15	7.50
Male	120	60.00
Female	80	40.00
Literate	140	70.00
Illiterate	60	30.00
Married	100	50.00
Unmarried	80	40.00
Divorcee	5	2.50
Separated	5	2.50
Widow/Widower	10	5.00
Nuclear Family	150	75.00
Joint Family	50	25.00
Low Socio-Economic Status	120	60.00
Medium Socio-Economic Status	50	25.00
High Socio-Economic Status	30	15.00

The demographic analysis of 200 poisoning victims reveals significant patterns across various age groups and social factors. The majority of poisoning cases were observed among individuals aged 21-30 years (25.00%), followed by the 31-40 age group (20.00%), suggesting that younger adults, particularly those in their prime working age, are more prone to poisoning incidents, possibly due to occupational exposure or psychological stress. The elderly population (above 50 years) accounted for 15.00% (41-50 age group), 12.50% (51-60 age group), and 7.50% in both the 61-70 and >70 age groups. Children and adolescents (0-20 years) made up 12.50% of the cases, indicating a smaller but notable prevalence among younger populations.

The study also showed that males constituted 60.00% of the victims, while females accounted for 40.00%. This higher incidence in males could be linked to greater exposure to hazardous substances, possibly due to occupational roles or lifestyle factors. The disparity suggests a need for targeted interventions in male-dominated sectors that handle toxic substances. Regarding education level, 70.00% of the studied population were literate, and 30.00% were illiterate. This finding indicates that poisoning incidents are not confined to uneducated populations and can occur across all education levels, suggesting that knowledge alone may not prevent exposure or intentional ingestion of poisons.

In terms of marital status, 50.00% of the victims were married, 40.00% unmarried, and smaller proportions were divorcees (2.50%), separated (2.50%), or widowed/widowers (5.00%). The significant percentage of married individuals points toward possible domestic, financial, or occupational stress as contributing factors, whereas unmarried individuals may face different stressors or risks leading to poisoning. Family structure revealed that 75.00% of the

cases came from nuclear families, while 25.00% were from joint families. The higher prevalence in nuclear families could reflect isolation, psychological factors, or financial pressures that may increase the risk of poisoning incidents. Most of the victims (60.00%) belonged to low socio-economic status, followed by 25.00% from medium socio-economic backgrounds and 15.00% from high socio-economic status. The overrepresentation of low-income individuals underscores the potential link between socio-economic deprivation and increased risk of exposure to hazardous substances, whether through occupational exposure or inadequate safety measures.

Table 2: Types of Poison Consumed

Type of Poison	No. of Subjects Consumed	Percentage (%)
Organo-phosphorous compounds	60	30.00
Organo-chlorine compounds	30	15.00
Carbonates	15	7.50
Corrosive Acid Poison	10	5.00
Super Vasmol	5	2.50
Aluminium Phosphide	20	10.00
Zinc Phosphide	20	10.00
Plant Poison	10	5.00
Others	30	15.00

In terms of the types of poison consumed, organo-phosphorous compounds (30.00%) were the most commonly ingested poisons, primarily used in agricultural pesticides. This high prevalence suggests that individuals working in farming or agriculture are at increased risk of accidental or intentional poisoning. Organo-chlorine compounds, another pesticide type, accounted for 15.00% of poisoning cases, further highlighting the significant role of agricultural chemicals in poisoning incidents. Carbonates (7.50%), often found in cleaning agents, represented a smaller but significant percentage, suggesting the need for better regulation and safety measures in both domestic and industrial environments.

Corrosive acid poisoning (5.00%) typically occurred through accidental ingestion or industrial exposure, highlighting the importance of strict handling protocols in industries dealing with acids. Super Vasmol, a common hair dye product, accounted for 2.50% of cases, illustrating that cosmetic products can also pose a significant poisoning risk, particularly in suicide attempts. Aluminium phosphide (10.00%) and zinc phosphide (10.00%), used as fumigants or rodenticides, were frequently consumed poisons in both rural and urban settings, reflecting their widespread use and easy access. Plant poisons (5.00%), including toxins from certain plants, accounted for a smaller proportion of cases, indicating exposure to natural poisons, either accidentally or through traditional practices. The "Others" category (15.00%) included various poisons not listed in other categories, highlighting the diversity of toxic substances contributing to poisoning cases and the complexity of diagnosing and treating such incidents.

DISCUSSION

The demographic analysis of this study aligns with findings from previous research on poisoning cases, particularly regarding the prevalence among younger adults. In this study, the majority of poisoning cases occurred in individuals aged 21-30 years (25%), followed by the 31-40 age group (20%). These findings mirror those of Mahanta et al. (2017), who reported that the highest number of poisoning cases occurred in the 20-40 age group, emphasizing that younger adults, particularly those of working age, are at higher risk due to factors such as occupational exposure and mental stress.[7] Similarly, studies by Gupta et al. (2016) and Joseph et al. (2015) also highlighted a concentration of poisoning cases in younger adults, linking the trend to increasing psychosocial pressures, which may lead to intentional or accidental poisonings.[8,9]

The elderly population in this study accounted for 15% of cases in the 41-50 age group, 12.5% in the 51-60 age group, and 7.5% in the 61-70 and >70 age groups, reflecting a moderate risk for older individuals. In contrast, previous research, such as by Reddy et al. (2018), reported

a higher prevalence of poisoning in elderly populations, particularly those over 60 years of age. This discrepancy may be due to regional differences or variations in healthcare access, as older individuals may be more susceptible to accidental poisoning due to comorbidities and polypharmacy.[10]

In terms of gender distribution, this study found that males constituted 60% of the victims, while females made up 40%, similar to findings by Patel et al. (2016), which showed that males are more frequently affected by poisoning, largely due to their involvement in high-risk occupations such as agriculture, construction, and chemical industries.[11] Other studies, such as Das et al. (2015), also observed higher poisoning rates in males, attributing it to more frequent exposure to hazardous substances in the workplace.[12] However, Mahanta et al. (2017) noted that females are more likely to be involved in poisoning incidents related to household chemicals or intentional ingestion, often as a result of mental health issues or domestic problems.[7]

The study's findings on the educational background of victims showed that 70% were literate, while 30% were illiterate. This suggests that poisoning incidents are not confined to uneducated populations and can occur across all levels of education. Studies by Batra et al. (2016) similarly reported a higher incidence of poisoning among literate individuals, particularly in rural areas, where agricultural work poses significant risks. Education alone does not always prevent exposure or intentional ingestion of poisons, as occupational risks and psychological factors remain significant.[14]

Regarding marital status, 50% of the victims were married, with 40% unmarried and smaller proportions of divorcees (2.5%), separated individuals (2.5%), and widows/widowers (5%). These results are consistent with the work of Aggarwal et al. (2016), who found that married individuals were more prone to poisoning incidents, often due to domestic disputes, financial pressures, or psychological stress.[13] However, unmarried individuals also face distinct stressors, including loneliness and socio-economic challenges, which can contribute to poisoning incidents, as noted by Gupta et al. (2016).[8]

This study's family structure data showed that 75% of the cases came from nuclear families, while 25% were from joint families, a pattern echoed by Batra et al. (2016), who noted that isolation and financial pressures in nuclear families could increase the risk of poisoning incidents. In contrast, joint families, which often provide social support, had a lower incidence of poisoning cases.[14]

Socio-economic status plays a crucial role in poisoning incidents, as evidenced by the fact that 60% of victims in this study belonged to low socio-economic status, while 25% were from medium socio-economic backgrounds, and 15% were from high socio-economic status. This distribution aligns with findings from Sharma et al. (2018), who emphasized that individuals from lower socio-economic backgrounds are more vulnerable to poisoning due to poor living conditions, lack of safety awareness, and the use of toxic substances in informal sectors. Individuals from higher socio-economic backgrounds, while less affected, are not immune to poisoning, particularly in cases of intentional ingestion or substance abuse.[15]

In terms of the types of poison consumed, organo-phosphorous compounds were the most common, accounting for 30% of cases, followed by organo-chlorine compounds (15%). These findings are consistent with the studies of Das et al. (2015)[12] and Patel et al. (2016), both of which reported high incidences of poisoning from agricultural chemicals, particularly pesticides. The widespread use of these chemicals in farming makes agricultural workers particularly vulnerable to accidental or intentional poisoning.[11]

Carbonates (7.5%), corrosive acids (5%), and plant poisons (5%) were also notable causes of poisoning in this

study. These findings align with those of Gupta et al. (2016), who observed that carbonate-based cleaning agents and plant toxins contributed significantly to poisoning cases, especially in rural and semi-urban areas where traditional practices and industrial chemicals are prevalent.[8]

Finally, aluminium phosphide (10%) and zinc phosphide (10%) were common poisoning agents, reflecting their widespread use as rodenticides in both rural and urban settings. Previous studies, including Reddy et al. (2018)[10] and Sharma et al. (2018), have emphasized the lethal potential of these compounds, particularly in cases of intentional poisoning. The diverse range of poisons identified in this study highlights the complexity of diagnosing and treating poisoning cases and underscores the need for comprehensive public health strategies to address the issue.[16]

CONCLUSION

This study highlights the significant socio-epidemiological factors influencing poisoning cases, with younger adults, particularly those aged 21-30, being the most affected demographic. Males were more frequently involved in poisoning incidents, likely due to occupational exposure. Organo-phosphorous compounds emerged as the most common type of poison consumed, emphasizing the risks posed by agricultural chemicals. Additionally, the study underscores the influence of socio-economic status, with low-income individuals being particularly vulnerable. These findings call for targeted prevention strategies, better safety regulations, and increased awareness, especially in high-risk populations.

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