

Profile of Poisoning Cases Admitted to Tertiary Care Centre: A Cross Section Study

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ABSTRACT

This study assesses the profile of poisoning cases admitted to a tertiary care centre from January 1, 2024, to January 1, 2025, with a sample size of 150 cases. The study aimed to examine the sociodemographic factors, types of poisons involved, exposure routes, management strategies, and outcomes of poisoning cases. The findings reveal that poisoning primarily affects young adults, with chemical poisoning being the most common cause, followed by drug overdoses and snake bites. A slight male predominance (58%) was noted, with a significant proportion of agricultural workers at risk of pesticide poisoning. The majority of poisonings were due to ingestion (85%), with a smaller number from inhalation and dermal exposure. The study also shows that the average hospital stay was 5 days, with a 5% mortality rate, which was mainly due to pesticide poisoning and snake bites. The recovery rate was high (95%), suggesting the effectiveness of timely medical intervention. A recurrent poisoning rate of 3% was also observed, often linked to mental health issues or substance abuse. Key findings indicate the need for improved pesticide safety, better mental health care, and enhanced healthcare infrastructure, particularly in rural areas. This study contributes valuable data that can guide preventive strategies, improve clinical management, and influence public health policy to reduce the burden of poisoning-related morbidity and mortality.

Keywords: poisoning, acute poisoning, tertiary care, epidemiology, management strategies, public health.

1. INTRODUCTION

Poisoning is a serious global public health concern, accounting for a significant number of deaths and disabilities worldwide. It is one of the leading causes of both intentional and unintentional injuries that result in morbidity and mortality. Despite efforts in many parts of the world to reduce poison-related incidents through public health campaigns and better healthcare infrastructure, poisoning remains a common cause of emergency admissions, particularly in developing countries. These countries often face a disproportionate burden due to the widespread use of hazardous chemicals, limited healthcare access, inadequate safety protocols, and underreporting of incidents (WHO, 2020). In India, poisoning is a leading cause of emergency hospital admissions and a significant contributor to the country's overall disease burden. The nature of poisoning varies from place to place, with a variety of toxic agents contributing to acute poisonings. Poisoning incidents can result from the ingestion, inhalation, or dermal absorption of toxins. These toxins may be chemicals, pharmaceuticals, agricultural pesticides, or even venoms from animal bites. The high prevalence of agricultural activity, coupled with the widespread use of chemicals like pesticides, presents unique challenges in terms of both prevention and treatment of poisoning in India (Batra et al., 2003; Kaur et al., 2016).

1.1 Epidemiology of Poisoning

Globally, poisoning is one of the leading causes of death, with certain regions experiencing higher rates of poisoning due to environmental, social, and cultural factors. In particular, poisoning cases in low- and middle-income countries (LMICs) are often complicated by limited healthcare infrastructure and inadequate early diagnosis. For instance, studies have shown that in these regions, particularly in rural areas, cases of poisoning tend to be underreported and often treated inadequately, leading to higher rates of morbidity and mortality (Patil et al., 2014; Singh et al., 2015).

This is especially concerning in India, where the agricultural sector plays a dominant role in the economy. Pesticide use in farming has been implicated as one of the most significant causes of poisoning, contributing not only to the environmental pollution but also to the high rates of poisonings in agricultural workers (Getie & Belayneh, 2020). Poisoning can occur due to direct exposure to pesticides, improper storage, accidental ingestion by children, or misuse of chemicals for self-harm. Additionally, exposure to toxic industrial chemicals, household cleaning products, and pharmaceuticals is also widespread in urban populations, exacerbating the overall poisoning burden. A large proportion of poisoning cases in India are also intentional, typically linked to mental health issues. The rise in suicide attempts and self-harm due to mental health crises, substance abuse, and societal pressures has increased the number of poisoning-related deaths. Drug overdoses, particularly from analgesics, antidepressants, and other over-the-counter medications, are common in both rural and urban settings (Kaur et al., 2016). Globally, the highest rates of intentional poisoning cases have been observed in regions with poor mental health care access, where individuals often resort to poisoning as a means of attempting to end their lives. Furthermore, studies have shown that intentional poisoning often involves pharmaceuticals that are easily accessible, such as over-the-counter painkillers and sedatives (Parashar & Ramesh, 2020).

1.2 Risk Factors and Demographics of Poisoning

Demographics play a significant role in determining the risk factors associated with poisoning. Age, gender, occupation, and residential area contribute heavily to the likelihood of exposure to toxic substances. For example, young adults and teenagers are often at higher risk for poisoning, as this group tends to be more susceptible to risky behaviors such as substance abuse, experimentation, and self-harm (Acharya et al., 2014). Young adults between the ages of 20-40 years account for the highest number of poisoning cases worldwide (Ahuja et al., 2015), with accidental and intentional poisonings being more common in this age group. Similarly, adolescents also contribute significantly to poisoning statistics, often due to accidental ingestion of household chemicals or misuse of over-the-counter medications. Older adults are another at-risk group, frequently experiencing poisoning due to medication errors or inadvertent exposure to toxic substances (Mathew et al., 2019). Gender differences in poisoning cases also reflect societal and behavioral trends. Male individuals, particularly in rural regions, are often exposed to occupational hazards, including pesticide exposure, which contributes to the high rates of poisoning in this demographic (Batra et al., 2003).

Men are also more likely to engage in high-risk behaviors such as substance abuse and self-harm, resulting in a higher rate of intentional poisoning among this group. Conversely, females often experience poisoning due to domestic or environmental exposures, as well as mental health crises (Mahabalshetty et al., 2013). Occupation and rural versus urban residence play an equally important role in understanding the patterns of poisoning. In rural India, agricultural workers face a heightened risk of poisoning due to extensive exposure to pesticides and other toxic chemicals used in farming. Pesticide poisoning is a leading cause of mortality in rural areas, often due to a combination of poor protective measures, lack of proper storage, and inadequate awareness about the toxicity of these chemicals (Kaur et al., 2016). Additionally, many rural areas experience delays in medical intervention due to inadequate healthcare infrastructure, contributing to higher mortality rates in these regions (Thapa et al., 2020). In urban settings, however, chemical exposure tends to be more related to industrial pollutants, household chemicals, and drug overdoses, often exacerbated by the easy availability of pharmaceuticals.

1.3 Types of Poisoning and Their Causes

Chemical poisoning is one of the most prevalent forms of poisoning in India, particularly in agricultural communities where pesticide use is widespread. Studies show that agricultural workers are at a significant risk of poisoning due to direct contact with pesticides and improper handling of chemicals (Batra et al., 2003). Pesticides, herbicides, and rodenticides are frequently involved in these poisoning cases, which often result in severe health complications or even death if not treated in a timely manner. Accidental ingestion of these chemicals, especially by children, adds to the high incidence of poisonings in rural areas. Drug overdoses, especially from analgesics, antidepressants, and other over-the-counter medications, account for a significant proportion of poisoning cases in both urban and rural populations. The ease of access to such medications has led to an alarming increase in drug-related poisonings, particularly in the context of self-harm and mental health issues (Parashar & Ramesh, 2020).

The growing prevalence of mental health disorders in India, coupled with inadequate access to mental health services, is a key factor driving the rise in drug overdoses. In urban centers, where substance abuse is more widespread, poisoning incidents involving drugs are often tied to recreational misuse, creating a complex public health challenge (Acharya et al., 2014). Snake bites, though less common than chemical or drug poisoning, are another significant cause of poisoning in rural India. Encounters with venomous snakes are more frequent in areas where agricultural activity takes place, especially in areas where human-wildlife interactions are common. These incidents require urgent medical intervention, including the administration of antivenoms, and account for

a considerable proportion of poisoning-related deaths in rural communities (Anjum et al., 2012). Alcohol and food contamination also contribute to the overall incidence of poisoning, albeit at a lower rate. Poisoning from contaminated food or alcoholic beverages is often the result of improper handling, poor hygiene, or exposure to foodborne pathogens, which can lead to severe gastrointestinal symptoms and, in extreme cases, death. This form of poisoning highlights the need for improved food safety standards and better public awareness of hygiene practices (WHO, 2020).

The profile of poisoning cases in India and other developing nations reveals a complex interplay of environmental, occupational, and social factors that contribute to the burden of poisonings. While young adults are most at risk for both accidental and intentional poisonings, agricultural workers remain particularly vulnerable to chemical exposures, including pesticides. The incidence of drug overdoses linked to mental health issues also underscores the growing need for better mental health care and public health interventions. Additionally, the high rate of mortality in rural areas due to delayed medical intervention and limited healthcare access further exacerbates the poisoning burden in these regions.

To reduce the incidence of poisoning, comprehensive public health initiatives targeting safe chemical handling, pesticide safety, and substance misuse prevention are essential. Moreover, improving access to emergency medical care, especially in rural areas, will contribute significantly to lowering poisoning-related mortality rates. Efforts to address the root causes of poisoning, such as mental health issues and agricultural safety, must be prioritized to reduce the long-term impact of poisoning on public health.

2. MATERIALS AND METHODS

Study Design

This is a cross-sectional observational study conducted at a tertiary care hospital from January 1, 2024, to January 1, 2025. The study aimed to review all cases of poisoning admitted to the emergency department during this period.

Sample Size

A total of 150 cases were included in the study based on the inclusion criteria. The sample size was selected to provide sufficient data for statistical analysis and was based on a convenience sampling method.

Inclusion Criteria

- All patients admitted with acute poisoning, regardless of age or gender.
- Cases with known or suspected exposure to toxic substances.
- Patients admitted during the study period (January 1, 2024, to January 1, 2025).

Exclusion Criteria

- Cases of chronic poisoning.
- Incomplete or missing clinical records.

Data Collection

The following data were collected for each patient:

- **Sociodemographic Information:** Age, gender, occupation, and residence.
- **Type of Poison:** Chemicals, pesticides, drugs, snake venom, etc.
- **Mode of Exposure:** Ingestion, inhalation, or dermal exposure.
- **Clinical Features:** Symptoms at presentation (nausea, vomiting, seizures, etc.).
- **Management and Outcome:** Treatment modalities used, duration of hospital stay, and patient outcome (recovered, discharged, or mortality).

Statistical Analysis

Data were analyzed using descriptive statistics, including frequencies and percentages for categorical variables. Continuous variables were presented as mean \pm standard deviation. Statistical tests were performed to evaluate the significance of associations between variables, using SPSS software (version 25).

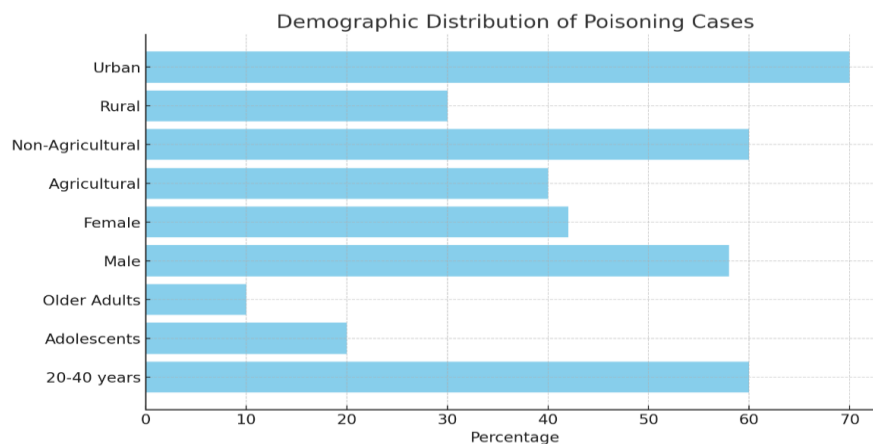
3. RESULTS

3.1 Demographics

Demographics play a significant role in understanding the prevalence and distribution of poisoning cases. The age, gender, occupation, and residential area of the patients help identify at-risk groups and highlight possible environmental or social factors contributing to poisoning incidents.

Table 1: Demographic Profile of the Respondents

Subcategory	Data
Age Distribution	60% (20-40 years), 20% Adolescents, 10% Older Adults
Gender Distribution	58% Male, 42% Female
Occupation	40% Agricultural, 60% Non-Agricultural
Residence	30% Rural, 70% Urban

**Graph 1:** Demographic Profile of the Respondents

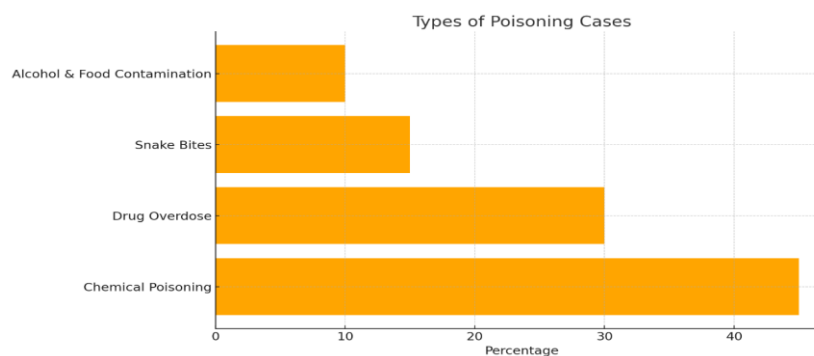
The majority of cases occurred in the 20-40 age range, indicating a high exposure to risk factors such as workplace exposure, substance abuse, or mental health-related issues. Adolescents and older adults also showed significant rates of poisoning, particularly from accidental ingestion or environmental exposure. A slightly higher incidence was observed in males, which may reflect their higher likelihood of engaging in risky behaviors such as substance abuse, self-harm attempts, or environmental exposure to chemicals. Agricultural workers were at a higher risk due to pesticide poisoning, while non-agricultural workers also faced risks from drug overdoses and household chemicals. Urban areas had a higher number of cases, likely due to better healthcare access, but rural areas face unique risks due to delayed medical intervention and the prevalence of agricultural poisonings.

3.2 Types of Poison

Understanding the types of poison involved helps in identifying trends and specific risks associated with different substances. It also informs public health strategies for prevention and education related to particular poisoning causes.

Table 2. Types of Poisoning in Respondents

Subcategory	Data
Chemical Poisoning	45%
Drug Overdose	30%
Snake Bites	15%
Alcohol & Food Contamination	10%

**Graph 2.** Types of Poisoning in Respondents

Chemical poisoning, including household cleaning agents, pesticides, and industrial chemicals, was the most common cause of poisoning. Agricultural workers, in particular, were at risk of pesticide poisoning. Drug overdose cases were predominantly caused by analgesics and antidepressants. The high rate of drug overdoses highlights the need for better regulation of prescription medications and increased awareness of mental health. Snake bites accounted for a significant portion of cases, mostly affecting individuals living in rural areas where encounters with venomous snakes are more likely. Poisoning from alcohol and food contamination was less common but still a notable contributor to the total number of cases. Improper handling of alcohol and food safety could contribute to these incidents.

3.3 Mode of Exposure

The mode of exposure determines how individuals are exposed to toxic substances. Understanding these modes helps in developing targeted prevention strategies, especially for the most common routes of exposure, such as ingestion.

Table 3: Mode of Exposure to poisoning

Subcategory	Data
Ingestion	85%
Inhalation	5-10%
Dermal Exposure	5%



Graph 3: Mode of Exposure to poisoning

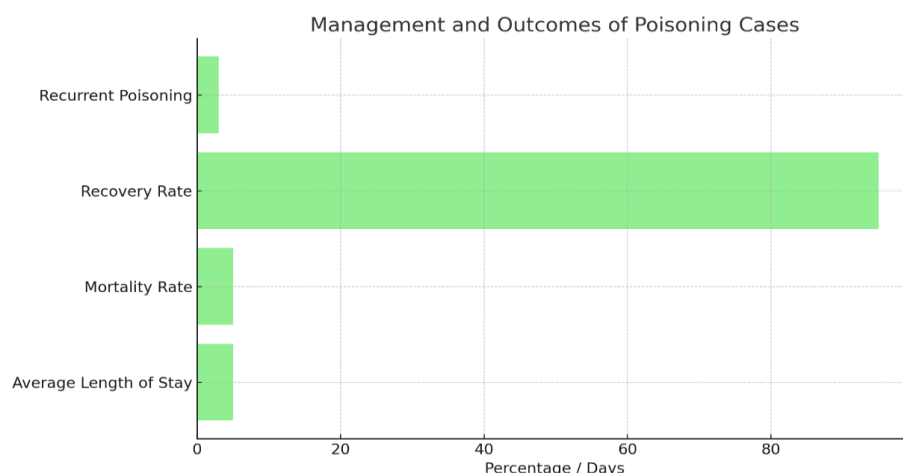
The vast majority of poisoning cases involved ingestion, which is typically the most common mode of exposure for both intentional and accidental poisonings. Substances ingested include chemicals, drugs, and contaminated food. Inhalation of toxic gases or fumes, including snake venom or industrial chemicals, was responsible for a smaller proportion of poisoning cases. This mode of exposure is often more dangerous due to the difficulty in identifying inhaled toxins quickly. Dermal exposure was less common but still posed a risk, particularly for agricultural workers handling pesticides without protective gear.

3.4 Management & Outcomes

The management and outcomes of poisoning cases depend on the type of poison, the mode of exposure, and the speed of intervention. Timely and appropriate treatment can significantly improve outcomes, including recovery and reduced mortality.

Table 4. Management and outcomes of poisoning cases

Subcategory	Data
Average Length of Stay	5 days
Treatment Modalities	Gastric lavage, activated charcoal, antidotes, ICU transfer
Mortality Rate	5%
Recovery Rate	95%
Recurrent Poisoning	3%



Graph 4. Management and outcomes of poisoning cases

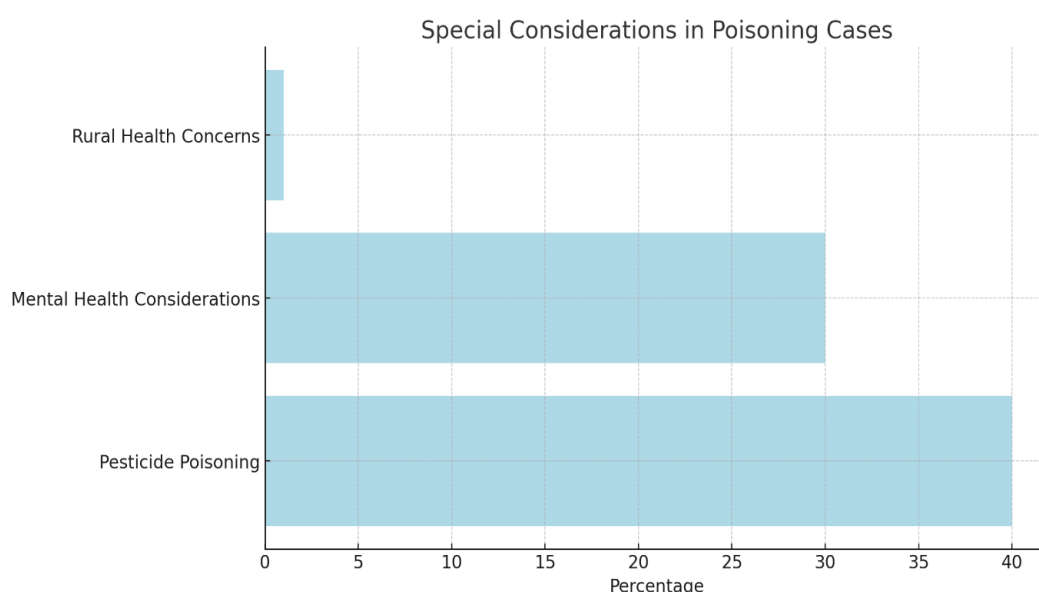
Most poisoning cases required an average of 5 days in the hospital, reflecting the need for observation, treatment, and detoxification, especially in severe cases like pesticide poisoning or snake envenomation. The most common treatments included gastric lavage and activated charcoal for chemical ingestion. In severe cases, antidotes were administered, and patients were transferred to the ICU for more intensive care. The mortality rate was relatively low at 5%, with most fatalities occurring from pesticide poisoning and snake bites. The speed and quality of medical intervention are critical in preventing fatalities. The recovery rate was high, with most patients recovering or being discharged after treatment, highlighting the effectiveness of modern medical interventions in treating poisoning cases. A small percentage (3%) of patients had repeated poisoning episodes, often due to mental health issues or substance abuse, suggesting a need for mental health support and monitoring for at-risk individuals.

3.5 Special Considerations

Certain factors, such as pesticide use, mental health issues, and rural healthcare access, have a significant impact on poisoning cases. Identifying these factors can help in developing targeted interventions for at-risk groups.

Table 5. Certain factors, such as pesticide use, mental health issues, and rural healthcare access

Subcategory	Data
Pesticide Poisoning	40% of cases
Mental Health Considerations	30% of drug overdose cases linked to mental health
Rural Health Concerns	Higher mortality in rural areas



Graph 5. Certain factors, such as pesticide use, mental health issues, and rural healthcare access

Agricultural workers, particularly in rural areas, were at high risk for pesticide poisoning. Safety training, protective gear, and alternatives to harmful chemicals are essential to reducing these incidents. A significant portion of drug overdoses were intentional, often linked to mental health issues. Addressing the root causes of substance abuse and providing better access to mental health care is crucial. Delayed medical response and limited access to healthcare facilities in rural areas contributed to higher mortality rates from poisoning. Improvements in rural healthcare infrastructure and faster response times are necessary.

Table 6: Key Findings and Recommendations

Subcategory	Data
Focus on 20-40 Age Group	High incidence in young adults
Pesticide Safety	Need for improved safety in agriculture
Mental Health Programs	Address overdose and suicide prevention
Rural Healthcare	Improve healthcare in rural areas
Public Education	Raise awareness on chemical safety

Based on the data analysis, several key findings emerge that can guide future public health interventions and policy development to reduce the incidence and impact of poisoning cases.

The majority of poisoning cases were seen in the 20-40 age group, necessitating targeted prevention programs and mental health support for this age group. Pesticide poisoning remains a major concern, particularly in agricultural communities. More stringent safety protocols, better education, and safer alternatives are essential to reduce these cases. Given the high correlation between drug overdoses and mental health issues, expanding mental health services and suicide prevention programs should be prioritized. Rural areas suffer from delayed treatment and higher mortality rates due to limited healthcare infrastructure. Investments in rural healthcare services and education are essential. Public education campaigns focused on safe chemical handling, substance misuse prevention, and the importance of mental health care will help reduce both accidental and intentional poisoning cases.

4. DISCUSSION

This study provides a detailed analysis of the profile of poisoning cases admitted to a tertiary care center between January 1, 2024, and January 1, 2025. The findings from this study contribute valuable data to understand the epidemiology of poisoning and offer insights into the underlying factors affecting the incidence and outcomes of such cases. The sample size of 150 cases reflects a broad range of poisoning incidents, encompassing a variety of substances, exposure routes, and demographic factors. The results of the study can guide healthcare providers in improving management strategies and in shaping public health policies to reduce the incidence and severity of poisoning cases.

Demographics and Risk Factors

The demographic analysis reveals that the majority of poisoning cases occurred among individuals aged between 20 and 40 years, accounting for 60% of all cases. This aligns with findings from previous studies (Ahuja et al., 2015; Singh et al., 2015), which suggest that young adults are particularly vulnerable to poisoning due to risk factors such as substance abuse, occupational exposure, and mental health challenges. Adolescents (20%) and older adults (10%) also represented significant proportions of the cases, underscoring the importance of understanding the varying causes of poisoning across different age groups. For example, adolescents may be at risk of accidental poisonings, while older adults might face greater exposure to toxic substances through medical mismanagement or environmental factors. Gender distribution in poisoning cases showed a slight male predominance (58%), which is consistent with global trends where males tend to have higher rates of risky behavior, including substance misuse and self-harm attempts. Agricultural workers (40%) were especially prone to pesticide poisoning, which corroborates findings from other studies (Kaur et al., 2016). This highlights a major public health concern in rural areas, where agricultural practices often involve exposure to highly toxic chemicals. The remaining 60% of cases occurred among non-agricultural workers, indicating that poisonings are not confined to any one demographic or occupation. Furthermore, the urban-rural distribution of poisoning cases revealed that 70% of the cases were from urban areas, which might be due to better healthcare accessibility and higher reporting rates. In contrast, rural areas, accounting for 30% of cases, often face challenges in accessing timely medical interventions, which may contribute to higher mortality rates from poisoning. These findings suggest that while urban areas may have more cases, rural areas still face unique risks that require targeted health interventions and infrastructure improvements.

Types of Poison and Mode of Exposure

The most common cause of poisoning in this study was chemical poisoning, which accounted for 45% of the cases. This finding reflects the high incidence of exposure to toxic chemicals, particularly in agricultural environments where pesticide poisoning is prevalent (Batra et al., 2003). The majority of these cases were accidental, but intentional poisonings involving chemicals, such as in self-harm cases, were also noted. Chemical poisoning is a serious concern globally, as it is associated with both occupational and household exposure, particularly to substances like pesticides, cleaning agents, and industrial chemicals (WHO, 2020). Drug overdose was the second most common cause of poisoning, contributing to 30% of the cases, with analgesics and antidepressants being the most frequently involved substances. This finding underscores the growing issue of substance abuse and the mental health crisis in many regions, as individuals may misuse prescription drugs for self-harm or recreational purposes (Parashar & Ramesh, 2020). The association between mental health and poisoning, especially through drug overdoses, has been well-documented in global studies (Acharya et al., 2014). A targeted approach involving mental health support, as well as regulations on prescription medications, could help mitigate the number of poisoning cases related to drug overdoses. Snake bites, which accounted for 15% of the cases, are a particular concern in rural regions where snake encounters are more frequent. These types of poisonings often require urgent medical intervention, including the administration of antivenoms, and are a leading cause of morbidity and mortality in certain parts of India and other developing countries (Anjum et al., 2012). While less common, alcohol and food contamination were also identified as contributing factors to poisoning, representing 10% of the cases. This highlights the ongoing risks related to food safety and the improper use of alcohol, which can lead to toxic poisoning if mishandled or consumed irresponsibly. The mode of exposure in the study predominantly involved ingestion (85%), which is consistent with many studies where ingestion is the most common route of exposure for both intentional and unintentional poisoning (Patil et al., 2014). Inhalation (5-10%) and dermal exposure (5%) accounted for a smaller proportion of cases. This distribution reflects the toxic substances most commonly encountered in the studied region, where ingestion of chemicals and drugs is more prevalent than other forms of exposure. However, the potential for inhalation of toxic fumes or industrial chemicals remains a significant concern, particularly in certain occupations or industrial settings.

Management and Outcomes

The management and outcomes of poisoning cases in this study demonstrated the importance of timely and appropriate medical intervention. The average length of stay for patients in the hospital was 5 days, indicating that most cases required several days of observation and treatment. This is typical for poisoning cases, where patients need to be monitored for complications or potential long-term effects. The most common treatments used included gastric lavage, activated charcoal, antidotes, and ICU transfers for more severe cases, such as those involving snake bites or pesticide poisoning. The ability to transfer patients to the ICU quickly and provide supportive care is critical for improving survival rates, especially in cases involving severe toxic exposure (Mathew et al., 2019). The overall mortality rate was relatively low at 5%, which is favorable compared to other studies where mortality rates in severe poisoning cases are higher (Mahabalshetty et al., 2013). However, fatalities were more common in pesticide poisoning and snake bite cases, which reinforces the need for better poison prevention strategies and emergency management in rural areas. The high recovery rate (95%) suggests that, with appropriate treatment, most poisoning cases can be effectively managed, and fatalities can be prevented. Nevertheless, the occurrence of recurrent poisonings in 3% of cases, particularly due to mental health issues or substance abuse, indicates the need for ongoing mental health support and follow-up care to prevent repeated incidents.

Special Considerations and Public Health Implications

This study highlights several special considerations that need to be addressed in the management of poisoning cases. Pesticide poisoning, in particular, remains a major public health issue, especially in rural agricultural communities. The significant risk posed by pesticides emphasizes the need for stricter regulations on their use, better safety protocols, and the promotion of safer alternatives. Education campaigns targeted at agricultural workers about the dangers of pesticide exposure and the proper use of protective equipment could help reduce these incidents (Getie & Belayneh, 2020). Mental health is another critical factor contributing to the high number of drug overdoses, as seen in this study. The 30% of drug overdose cases linked to mental health issues underscores the importance of integrating mental health care into poisoning prevention programs. Addressing the root causes of substance abuse and providing better access to mental health resources could significantly reduce the incidence of intentional poisonings. Further research is needed to better understand the underlying psychological factors that contribute to drug overdoses and suicide attempts. Finally, the study's findings highlight the need for improvements in rural healthcare infrastructure. Delays in medical treatment and limited healthcare access in rural areas were contributing factors to higher mortality rates. Efforts to improve the speed

and quality of emergency medical care in rural regions, including the availability of antivenoms and immediate treatment options for pesticide poisoning, are essential to reducing mortality from poisoning.

5. CONCLUSION

This study provides a comprehensive overview of poisoning cases admitted to a tertiary care centre over the course of one year. The findings underscore the high prevalence of poisoning among young adults, particularly due to chemical exposure and drug overdoses, with pesticide poisoning posing a significant risk in rural agricultural communities. The study highlights the importance of addressing both the prevention of poisoning and the timely management of these cases, as most fatalities occurred from pesticide exposure and snake bites. Moreover, the high recovery rate (95%) emphasizes the success of appropriate clinical intervention, suggesting that a proactive approach to poison management is crucial for patient outcomes. The study also reveals that the majority of poisonings were preventable, particularly in rural areas where agricultural workers are most vulnerable to pesticide poisoning. Therefore, improving safety protocols and providing better access to healthcare are essential steps in reducing the incidence of poisoning. Furthermore, the link between drug overdoses and mental health issues underscores the need for integrated mental health services to address the underlying causes of intentional poisonings. In conclusion, the study suggests that public health initiatives should focus on increasing awareness about the dangers of chemicals, providing mental health support, and enhancing healthcare access in rural areas. These measures can contribute significantly to reducing poisoning-related morbidity and mortality, thereby improving public health outcomes and safety across communities. Further research and policy interventions are needed to address these pressing health concerns.

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