




# Prevalence and Incidence of Intentional and Unintentional Poisoning in a Tertiary Care Hospital, Erode, India

Lokesh Narayanan<sup>1</sup> Kamesh Kaliyaperumal<sup>1</sup> Kameswaran Ramalingam<sup>2</sup>  
Rajkapoor Balasubramanian<sup>3</sup>

<sup>1</sup> Department of Pharmacy Practice, J.K.K. Nattraja College of Pharmacy, Komarapalayam, Tamil Nadu, India

<sup>2</sup> Department of Pharmacy Practice, Pushpagiri College of Pharmacy, Thiruvalla, Kerala, India

<sup>3</sup> Department of Pharmacology, J.K.K. Nattraja College of Pharmacy, Komarapalayam, Tamil Nadu, India

**Address for correspondence** Rajkapoor Balasubramanian, PhD, Department of Pharmacology, J.K.K. Nattraja College of Pharmacy, Komarapalayam 638183, Tamil Nadu, India (e-mail: rajkapoorb@gmail.com).

J Health Allied Sci<sup>NU</sup>

## Abstract

Poisoning is a significant burden in developing countries, with high fatality rates due to deliberate self-harm and unintentional exposures. This study aimed to raise awareness and provide guidance on poison consumption in a tertiary care hospital in Erode. A cross-sectional study over 6 months involved 377 poisoning cases. Females aged 21 to 30 years, semi-urban residents, and illiterate individuals were found to be the vulnerable groups. Rat killers and tablets were common poisoning agents, often linked to family problems. Comprehensive approaches, addressing mental health, family support, and health care access, are needed. Raising awareness, counseling, and educating high-risk individuals are essential preventive measures. Interventions enhanced poisoning management knowledge and coping strategies, emphasizing the importance of integrated efforts to combat poisoning's socioeconomic impact.

## Keywords

- ▶ Prevalence
- ▶ cross-sectional study
- ▶ poison
- ▶ interventions
- ▶ intentional
- ▶ unintentional

## Introduction

Poisoning refers to the act of causing harm or illness to living organisms through the contact or ingestion of harmful substances. It can be either intentional or unintentional, and the severity of its effects depends on the toxicity of the specific chemical involved.<sup>1,2</sup> Developing countries bear a significant burden of fatal poisoning cases, accounting for 90% of the global total.<sup>3</sup> Deliberate self-harm (DSH) is a growing issue worldwide, with various methods employed, including the use of rodenticides in the Indian subcontinent.<sup>4</sup> Depression is a prevalent condition in India, affecting approximately 57 million individuals, which accounts for 18% of the global estimate.<sup>5</sup> In the agricultural sector, organophosphates,

commonly used as pesticides, pose a significant poisoning risk due to their widespread use in farming practices.<sup>6</sup> It is crucial for regulatory authorities to implement measures to restrict the packaging and uncontrolled sale of these pesticides. The availability and affordability of over-the-counter (OTC) medications have made them a popular choice for consumers over prescription drugs. This shift in medication accessibility has led to unintentional poisonings caused by a wide range of substances and exposures, each requiring specific preventive and harm-reduction measures.<sup>7</sup> Household products such as kerosene oil and cleaning agents containing substances like chloroxylenol and bleach, as well as strong acids like sulfuric acid used for drain cleaning, pose significant poisoning risks, particularly in Asian and African communities.

DOI <https://doi.org/10.1055/s-0044-1782641>.  
ISSN 2582-4287.

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Poisoning due to medications and other substances is a major cause of morbidity and mortality worldwide. According to the World Health Organization (WHO), more than 800,000 people die by suicide each year, with 75% of these cases occurring in low- and middle-income countries.<sup>8</sup> While the percentage of mortality due to acute poisonings in developed nations is relatively low at 2%, developing countries like India experience a much higher rate, with approximately 50,000 deaths occurring annually, accounting for 30% of mortality.<sup>9–11</sup> Despite the high incidence of poisoning, morbidity and mortality rates are comparatively low.<sup>12</sup> Poisoning resulting from accidental or intentional ingestion or inhalation of medications and other chemicals is a common medical emergency. There is a lack of extensive research conducted on this particular topic. To reduce the risk of exposure or increase preparedness for such incidents, implementing comprehensive changes in households and social environments can be beneficial. Collaboration among physicians, nurses, pharmacists, and poison control professionals is crucial to providing essential guidance to the public. Our study has provided counseling to individuals exposed to harmful substances, whether intentionally or unintentionally, with the aim of raising awareness about the consequences of poison use. Effective counseling from health care professionals can help decrease the incidence of child poisonings, medication errors, dispensing mistakes, the use of expired prescriptions, and the ingestion of harmful substances.

## Methodology

In this study, the authors employed a cross-sectional prospective design to examine the patterns and characteristics of poisoning cases within a specific tertiary care hospital in Erode over a period of 6 months. The sample size was determined using the RaoSoft sample size calculator, taking into account a margin error of 5%, a confidence level of 95%, and an estimated population size of 2,000, resulting in an expected sample size of 377. Data were collected through a prevalidated questionnaire, capturing sociodemographic information, such as age, gender, occupation, and education level, as well as details regarding the type of poison consumed and the reasons behind the poisoning. Additionally, educational materials in the form of pamphlets were prepared to raise awareness about poisoning among the participants. The collected data were analyzed using GraphPad Prism version 8.05, employing descriptive statistics, including frequencies and percentages, to present the characteristics of poisoning cases.

## Inclusion and Exclusion Criteria

The study included individuals of all genders, encompassing male, female, and transgender individuals, across different age groups: children (0–12 years), adolescence (13–18 years), adults (19–49 years), and senior adults (50–60 years). Cases involving animal bite, snake bite, or insect bite were excluded, and individuals who did not consume any poison were excluded.

## Results and Discussion

Poisoning cases impose significant socioeconomic burdens on communities, and it is important to regularly address the changing trends associated with poisoning. Despite notable advancements in the field of medicine, poisoning remains a leading cause of illness and death in India.<sup>13</sup>

In the present study, a total of 381 patients were included, with the majority of 367 (96.3%) cases involving intentional poisoning, while 14 (3.7%) cases involved unintentional poisoning. Similarly, another study conducted by Ramya et al<sup>14</sup> reported that out of 557 cases, the majority of patients experienced intentional poisoning (64%), followed by accidental or unintentional poisoning (35%), and other causes (1%). The unrestricted availability of drugs without prescription or OTC at pharmacies may contribute to the occurrence of poisoning in these patients.

According to the gender-wise distribution, the majority of patients in the study were females, accounting for 253 (66.4%) cases, while the remaining participants were males, with 128 (33.5%) cases. The findings indicate a higher prevalence of poisoning admissions among female patients compared to male patients. This observation aligns with the results of a study conducted by Mittal et al,<sup>15</sup> which reported that 116 of 166 (69.8%) patients were females and 50 of 166 (30.1%) patients were males, demonstrating consistency with the present study's gender distribution. The higher proportion of female patients could potentially be attributed to various factors, such as family issues, including spouse abuse, stress from family members, and new challenges in daily life.<sup>16</sup>

The study revealed that the majority of patients belonged to the age group of 21 to 30 years, with 134 (35.1%) being students. This was followed by 71 (18.6%) patients in the age group of 31 to 40 years and 59 (15.4%) patients in the age group of 11 to 20 years. Hence, it can be concluded that a significant number of intentional poisoning cases occurred among individuals aged 21 to 30 years. A possible explanation for this trend is that the average age for marriage falls within this range, which may contribute to increased interpersonal marital conflicts and subsequent stress. Additionally, factors such as high unemployment rates and the constant peer pressure faced by students were cited as contributing reasons. These factors can collectively lead to heightened stress levels. Similar findings have been reported in studies conducted by Ramya et al<sup>14</sup> and Tyrrell et al.<sup>17</sup>

As mentioned in ► **Table 1**, the present study shows that out of 381 patients, the largest occupational group was daily wage workers (156, 40.9%), followed by homemakers (72, 18.8%), students (42, 11.02%), unemployed individuals (35, 9.1%), those in private jobs (25, 6.5%), individuals with their own businesses (20, 5.2%), farmers (15, 3.9%), government employees (2, 0.5%), and toddlers and preschoolers (14, 3.67%). A similar study conducted by Ramesha et al<sup>18</sup> yielded comparable results, indicating that farmers and students were more likely to commit suicide. The study attributed these findings to the specific study location and other familial circumstances.

As shown in ► **Table 2**, in this present study, among the 381 patients, the most common type of poisoning was by

**Table 1** Demographic characteristics

Sl. no.	Demographic characteristics	No. of patients (n = 381), n (%)	Intentional poisoning (n = 367), n (%)	Unintentional poisoning (n = 14), n (%)
1.	<b>Occupational status</b>			
	Business	20(5.25%)	20(5.44%)	–
	Government job	2(0.52%)	2(0.54%)	–
	Private job	25(6.56%)	25(6.81%)	–
	Unemployed	35(9.19%)	35(9.53%)	–
	Student	42(11.02%)	42(11.44%)	–
	Daily wager	156(40.95%)	156(42.5%)	–
	Farmer	15(3.94%)	15(4.08%)	–
	Homemaker	72(18.90%)	72(19.61%)	–
Toddlers and preschoolers	14(3.67%)	–	14 (100%)	
2	<b>Socioeconomic status</b>			
	Upper	–	–	–
	Upper-middle	–	–	–
	Middle	32 (8.3%)	26 (7.08%)	6 (42.85%)
	Upper-lower	286 (75.0%)	285 (77.65%)	1 (7.14%)
Lower	63 (16.5%)	56 (15.25%)	7 (50%)	
3	<b>Source of poison</b>			
	Pharmacy	103 (27.0%)	103 (28.06%)	–
	Departmental shops	80 (21.0%)	80 (22%)	–
	Household	131 (34.38%)	119 (31.2%)	12 (85.7%)
	Working sites	16 (4.1%)	14 (4%)	2 (14.3%)
	Agricultural shops	51 (13.3%)	51 (14%)	–

tablets (95, 24.9%), followed by rat killer poisoning (80, 20.9%), corrosives (49, 12.8%), cow dung powder (37, 9.7%), organophosphorus compounds (32, 8.3%), oleander seed (29, 7.6%), ant killer powder (23, 6.3%), mosquito coil and liquid poisoning (10, 2.6%), petroleum (8, 2.09%), Celphos (3, 0.78%),

and other products (15, 3.93%). Therefore, the study concluded that tablets and rat killer were the most commonly used substances in cases of poisoning. A similar study conducted by Suganthi and Raja,<sup>19</sup> involving 106 patients, found that the majority of poisoning cases had a suicidal tendency (86.8%),

**Table 2** Distribution of patients based on the type of poisoning

Sl. no.	Type of poisoning	Total no. of patients (n = 381), n (%)	Intentional poisoning (n = 367), n (%)	Unintentional poisoning (n = 14), n (%)
1	Tablet poisoning	95 (24.9%)	94 (25.6%)	1 (7.14%)
2	Corrosive poisoning	49 (12.8%)	43 (11.71%)	6 (42.85%)
3	Rodenticide poisoning	80 (20.9%)	77 (21%)	3 (21.4%)
4	Oleander seed poisoning	29 (7.6%)	29 (7.9%)	–
5	Mosquito coil and liquid poisoning	10 (2.6%)	10 (2.7%)	–
6	Celphos (aluminum phosphide) poisoning	3 (0.78%)	2 (0.5%)	1 (7.14%)
7	Ant powder poisoning	23 (6.03%)	23 (6.3%)	–
8	Datura poisoning	–	–	–
9	Organophosphorus poisoning	32 (8.3%)	32 (8.7%)	–
10	Petroleum poisoning	8 (2.09%)	6 (1.6%)	2 (14.28%)
11	Cow dung powder poisoning	37 (9.7%)	36 (9.8%)	1 (7.14%)
12	Batteries (disk/button)	–	–	–
13	Hair dye, cosmetics	–	–	–
14	Alcohol, illicit drugs/nicotine	–	–	–
15	Others	15 (3.93%)	15 (4.0%)	–

**Table 3** Distribution of patients based on travel time period to reach hospital

Sl. no.	Travel time period to reach hospital	Total no. of patients (n = 381)			Intentional poisoning (n = 367), n (%)	Unintentional poisoning (n = 14), n (%)
		Male	Female	Total		
1	Within 30 min	65	121	186	178 (48.5%)	8 (57.1%)
2	Within 1 h	51	89	140	135 (36.7%)	5 (35.8%)
3	Within 1.5 h	12	43	55	54 (14.7%)	1 (7.1%)
4	> 2 h	–	–	–	–	–

with tablet poisoning being the most prevalent (35.8%), followed by corrosive poisoning (17.9%) and organophosphorus poisoning (13.2%), which aligns to some extent with the findings of the present study.

As shown in ►Table 3, in this present study, 186 of 381 patients reached the hospital within 30 minutes; of these 65 were males and 121 were females, out of which 178 (48.5%) were found to be intentional poisoning and 8 (57.1%) were unintentional poisoning. In the study, 140 patients reached the hospital within 1 hour; of these, 51 were males and 89 were females, out of which 135 (36.7%) cases were found to be intentional poisoning and 5 (35.8%) were found to be unintentional poisoning. In the current study, 55 patients reached the hospital within 1.5 hours; of these, 12 were males and 43 were females, out of which 54 (14.7%) were found to be intentional poisoning and 1 (7.1%) was found to be unintentional poisoning.

The majority of patients (201, 55%) mentioned in ►Table 4 reported having family issues as the primary reason for intentional poisoning. This was followed by 70 patients (18.9%) who had relationship issues, 52 patients (14.1%) who had financial problems, 22 patients (6%) who had health issues, and 11 patients (3%) who had academic and career issues. The study concluded that family issues were the main contributing factors to intentional poisoning. Among the patients, a significant proportion were young adults, particularly college students, who attempted suicide. The main triggers for their suicidal behavior were failures in both academic and personal lives. Additionally, poisoning was more prevalent among homemakers, who faced family problems such as spousal abuse, stress from family members, and new challenges in their daily lives, leading them to attempt suicide. These findings

**Table 4** Distribution of patients based on reason for poisoning

Sl. no.	Reason for poisoning	No. of patients (N = 367), n (%)
1	Academic issue	11 (3%)
2	Relationship issues	70 (18.9%)
3	Career	11 (3%)
4	Family issues	201 (55%)
5	Financial issues	52 (14.1%)
6	Health issues	22 (6%)

are consistent with a study conducted in Ethiopia by Ahmed et al.<sup>20</sup>

The total number of patients received in the hospital was found to 381. Of these, 25 (6.5%) patients were given first aid before reaching hospital, while the rest (356, 93.4%) were not.

In the study, out of 25 (6.5%) patients who received first aid, 20 (5.4%) patients were cases of intentional poisoning and 5 (35.7%) were unintentional poisoning. Out of 356 (93.4%) patients who did not receive first aid, 347 (94.6%) were intentional poisoning and 9 (64.2%) were unintentional poisoning.

As mentioned in ►Table 5, the study was conducted in 367 patients; of these, 55 patients had the history of poison ingestion, while the remaining 355 patients did not have any history of poison ingestion. Every patient who had a history of poison ingestion was given treatment or counseling for their previous poisoning and it was also found that they had previously taken poison for the same reason. In all, 35.7% of patients had a safe storage for the poisonous household substances and the remaining 64.3% of patients did not have a safe storage for the poisonous household substances.

**Table 5** Common poison ingestion history and storage safety of poisonous household substances

Sl. no.	Yes/no	No. of patients (n = 367)	Percentage
<b>Poison ingestion history</b>			
1.	Yes	12	3.3
	No	355	96.7
<b>Treatment/counseling received on their previous poisoning</b>			
2	Yes	12	100
	No	–	–
<b>Whether they have previously poisoned for the same reason</b>			
3	Yes	12	100
	No	–	–
<b>Storage safety of poisonous household substances</b>			
5	Yes	5	35.7
	No	9	64.3

## Conclusion

Our study findings highlight that intentional poisoning was more common, primarily driven by family issues. Vulnerability to intentional poisoning was observed among female patients, individuals aged 21 to 30 years, those residing in semi-urban areas, illiterate individuals, married individuals, and specific occupational groups. Tablets and rat killer poisoning were the predominant types of poisoning observed. These results underscore the need for comprehensive approaches to address mental health issues, including family support, education, and access to appropriate health care services. It is important to raise awareness and provide counseling on the safe usage and potential hazards of products and substances that can cause poisoning, such as cosmetics, disinfectants, rodenticides, pesticides, and agrochemicals. Strategies should be implemented to educate those at higher risk of unintentional poisoning on treatment options.

## Limitations

This study has a specific focus on a single tertiary care hospital, limiting the ability to report the overall incidence of poison consumption in the population of the entire district. However, our research distinguishes itself from previous studies by exploring different types of poisoning, including intentional and unintentional cases, while also considering various socioeconomic factors that may contribute to incidents of poisoning. It is important to note that our study primarily concentrates on poison consumption through oral ingestion, and future investigations could expand the scope to include accidental poisonings such as animal bites, snake bites, and insect bites. By broadening the scope of research in this area, a more comprehensive understanding of the patterns and causes of poison exposure can be achieved.

### Funding

None.

### Conflict of Interest

None declared.

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