

## **A retrospective analysis of acute poisoning cases admitted to a tertiary care hospital in South India**

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### **ABSTRACT**

**Background:** Acute poisoning is a medical emergency and a global public health problem. The poisoning pattern varies across countries and even between different regions within a country. The aim of this was to explore the demographic, etiological, and clinical characteristics of acute poisoning cases admitted to a tertiary care hospital in Puducherry, South India.

**Methods:** This was a retrospective hospital record based study of acute poisoning cases admitted to our hospital during the period from January 2015 to December 2017. The patients' demographic, etiological and clinical characteristics were analyzed.

**Results:** Of the total of 275 cases of acute poisoning, majority of them were in the age group of 21- 30 years (32%) and were females (58.5%). Most of the cases were suicidal in nature (75.3%). Majority of the patients consumed a single poisonous agent (92.7%) and the route of poisoning was oral in all of them. Majority of the patients (56.7%) reached the hospital within 2 hours of exposure to the poison with median duration of hospital stay of 2 days, and mortality of 2.9%. Majority of the suicidal poisonings were associated with abuse of insecticides (39.4%), rodenticides (19.7%) and plant seeds (14.4%); whereas the accidental poisonings were mostly due to household agents (79.1%).

**Conclusions:** Our study shows that the majority of the poisoning cases occurred with a single poisonous agent consumed orally, for suicidal purposes in young age group and women. Pesticides and plant seeds were commonly abused for committing suicides and household agents dominated the list of causes for accidental poisoning.

**Keywords:** Acute poisoning, Emergency, Pesticides, Suicide

### **INTRODUCTION**

Acute poisoning is a medical emergency and is a common problem worldwide. Poison is a substance that causes injury to the body or causes death, when administered by any route. Acute poisoning refers to exposure to the poisonous substance within a period of less than 24 hours.<sup>1</sup> In India, the incidence of poisoning cases is found to be increasing every year. The average incidence of acute poisoning cases was 1.60 per 1000 population, while the average case fatality rate and

mortality rates were 40.51 and 0.07, respectively in a tertiary care hospital in South India.<sup>2</sup>

The most common cause of acute poisoning in south India is organophosphorous poisoning.<sup>3,4</sup> Other common cause of poisoning includes poisoning with yellow oleander, tablets (paracetamol and sedatives), corrosives, rat killer, organocarbamate, datura and phenol.<sup>3</sup> The intention for acute poisonings could be suicidal or accidental. Majority of the cases encountered in a tertiary care hospital in South India were due to suicidal intentions.<sup>5</sup> In another study it was found that the most

common intention of acute poisonings was suicidal in adults and accidental in children.<sup>6</sup> However, the poisoning pattern varies from one region to another based on ease of availability of the poison, cultural diversity and socioeconomic factors. As per the Statistics of National Crime Records Bureau the Suicidal rate for the year 2015 were 43.2 and 22.8 per lakh for Puducherry and Tamil Nadu respectively.<sup>7</sup>

Knowledge about the pattern of acute poisoning cases in our hospital, especially with regard to their demographic, etiological, and clinical characteristics will provide us insights about early diagnosis and management of these cases. It will also help us to create awareness in the community about the methods for prevention of accidental poisonings. Also, it will aid the hospital administrators to take regulatory decisions regarding management of acute poisoning cases in our hospital. Thus, the present study was formulated to explore the demographic, etiological, and clinical characteristics of acute poisoning cases admitted to a tertiary care hospital in Puducherry, South India.

## METHODS

This was a retrospective cross sectional study, conducted in Sri Manakula Vinayagar Medical College and Hospital, a tertiary care hospital in rural Puducherry, India. It is a 900-bedded referral hospital which caters to both rural and urban people from Puducherry and the nearby districts of Tamil Nadu like Villupuram and Cuddalore. The study was commenced after obtaining approval from our Institutional Ethics committee, who also granted a consent waiver. Data was collected from the hospital records of all patients admitted to our hospital with diagnosis of acute poisoning due to any drug/chemical during the period of January 2015 to December 2017. All the data were collected from the Medical Records Department and confidentiality was ensured. Poisonings due to both accidental and suicidal intention was included in the study. However, cases of poisoning due to snake bite, scorpion sting, drug allergy and food poisoning were excluded from the study. Patients' data regarding gender, age, place of residence, circumstance of poisoning (accidental or suicidal intention), number of pharmacological agents/chemicals causing poisoning (one or more agents), name of poison(s), route of exposure, time of presentation to hospital after poison consumption, previous suicidal attempts, cause for suicidal poisoning, duration of hospital stay, and outcome of the poisoning were recorded with the help of a pre-structured data collection form.

### Statistical analysis

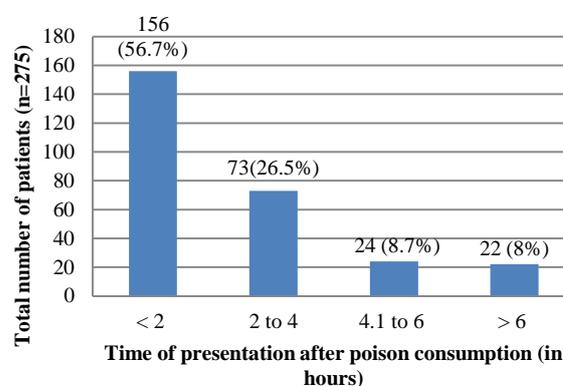
Data was entered in Microsoft Excel spreadsheet and analyzed using SPSS software version 24. The continuous variables were presented as mean±standard deviation, or median (minimum value, maximum value),

and the categorical variables were expressed as frequencies and percentages.

## RESULTS

In the present study, a total of 275 acute poisoning cases were retrospectively analyzed. Of these, majority of the cases were females (n=161, 58.5%), and most of them were in the age group of 21 to 30 years (n=88, 32%). It was also seen that all the patients hailed from nearby districts of Tamil Nadu and Puducherry. Most of the patients came from the nearby Villupuram district of Tamil Nadu (n=163, 59.3%), followed by Puducherry (n=102, 37.1%). A minority of only 10 patients (3.6%) came from Cuddalore district of Tamil Nadu. Analysis of the circumstance of poisoning showed that there was a high preponderance of suicidal cases (n=207, 75.3%) compared to accidental cases (n=68, 24.7%). Of the 207 suicidal cases, only 8 (3.9%) had a history of previous suicidal attempts. It was found that the route of exposure to the poison was oral in all the cases. The median duration of hospital stay for these patients was 2 days, with the minimum stay of 1 day to a maximum of 15 days. The outcomes of the patients included recovery in majority of them (n=262, 95.3%), with 5 patients (1.8%) being referred to another hospital due to lack of beds and the remaining 8 patients (2.9%) succumbed to the poisoning (Table 1). All the 8 patients who died were cases of suicidal poisoning. Seven of them consumed a single agent and one of them consumed a combination of alcohol and organophosphorous compound. Two of the 7 patients consumed rat killer; another 2 patients had cypermethrin (cockroach killer); one patient took laundry detergent; one drank paraquate (herbicide); and yet another took organophosphorous compound.

As shown in Figure 1, majority of the patients (n=156, 56.7%) presented to the hospital within 2 hours of exposure to the poison. Seventy three patients (26.5%) presented between 2 to 4 hours, 24 (8.7%) presented within 4.1 to 6 hours, and the remaining 22 (8%) patients presented later than 6 hours.



**Figure 1: Time of presentation to the hospital after poison consumption (n=275).**

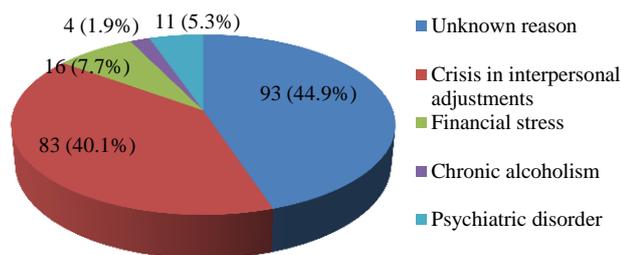


Figure 2: Reasons for suicidal poisoning (n=207).

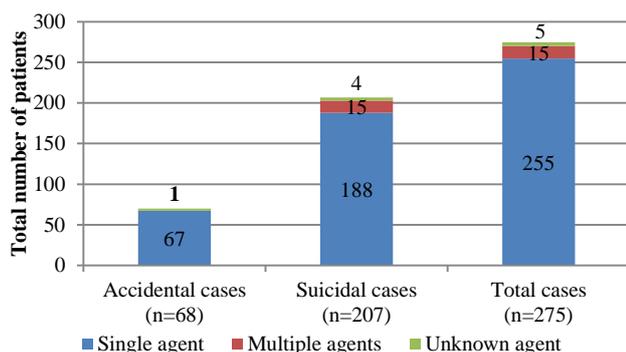


Figure 3: Number of causative agents consumed and circumstance of poisoning.

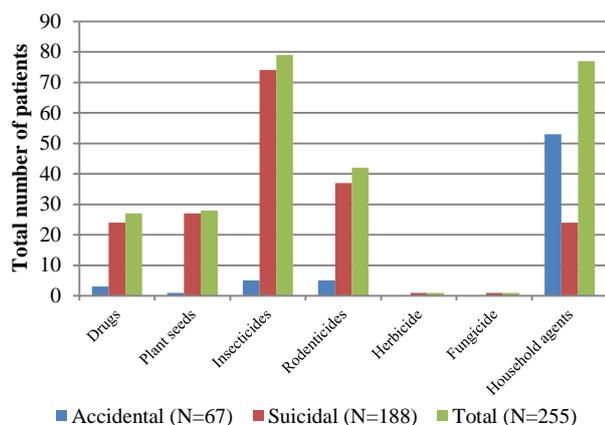


Figure 4: Broad types of single causative agents and circumstance of poisoning.

The various reasons for suicidal poisoning are shown in Figure 2. Of the total 207 cases of suicidal poisoning, it was found that for majority of them (n=93, 44.9%), the cause was unknown. Crisis in interpersonal adjustments was seen in 83 (40.1%) patients; financial stress in 16 (7.7%) patients; chronic alcoholism in 4 (1.9%) patients; and psychiatric disorder in 11 (5.3%) patients.

Regarding the number of causative agents used (Figure 3), out of 275 patients, 255 consumed single causative agent (188 were suicidal cases and 67 were accidental cases), 15 patients (all suicidal cases) consumed multiple causative

agents, and in 5 patients (one of accidental and 4 suicidal cases), the causative agent was unknown.

Among the broad types of single causative agents consumed (Figure 4), insecticides topped the list (n=79, 31%), followed by household agents (n=77, 30.2%); rodenticides (n=42, 16.5%); plant seeds (n=28, 11%); drugs (n=27, 10.6%); and herbicides and fungicide (each n=1, 0.4%). However, the distribution of causative agents differed with the circumstance of poisoning. In suicidal cases, insecticides (n=74, 39.4%) were the leading causes followed by rodenticides (n=37, 19.7%); plant seeds (n=27, 14.4%); household agents and drugs (each n=24, 12.8%); and herbicides and fungicide (each n=1, 0.5%). However, it was found that among the accidental cases, household agents (n=53, 79.1%) were the most common causes, followed by insecticides and rodenticides (each n=5, 7.5%), drugs (n=3, 4.5%) and plant seeds (n=1, 1.5%).

Table 1: Characteristics of patients with acute poisoning (n=275).

Patient characteristics	N (%)
<b>Gender</b>	
Male	114 (41.5)
Female	161 (58.5)
<b>Age (years)</b>	
≤10	56 (20.4)
11-20	74 (26.9)
21-30	88 (32)
31-40	23 (8.4)
41-50	14 (5.1)
51-60	12 (4.4)
61-70	3 (1.1)
>70	5 (1.8)
<b>Place of residence</b>	
Puducherry	102 (37.1)
Villupuram, Tamil Nadu	163 (59.3)
Cuddalore, Tamil Nadu	10 (3.6)
<b>Circumstance of poisoning</b>	
Accidental	68 (24.7)
Suicidal	207 (75.3)
<b>Previous suicidal attempts in case of suicidal cases (n=207)</b>	
Absent	199 (96.1)
Present	8 (3.9)
Duration of hospital stay*(in days)	2 (1,15)
<b>Outcome of poisoning</b>	
Recovered	262 (95.3)
Died	8 (2.9)
Referred to other hospital	5 (1.8)

\*Data expressed as median (minimum value, maximum value).

Table 2 shows the distribution of various single causative agents consumed by the patients in both accidental and suicidal circumstances. Among the single causative agents, it was found that the most common cause of

poisonings in our locality were rat killer (n=41, 16.1%), kerosene (n=30, 11.8%), ant killer (n=28, 11%), yellow oleander seeds (n=24, 9.4%), organophosphorous compounds (n=18, 7.1%), and cockroach killer (n=15, 5.9%).

Of the 15 cases of multiple causative agents, all of them were suicidal in nature and Table 3 shows the distribution of the multiple causative agents. Combination of drugs were most commonly implicated causative agent (n=12, 80.4%).

**Table 2: Distribution of single causative agent(s) and circumstance of poisoning.**

Causative agent	Cases of poisoning N (%)		
	Accidental (n=67)	Suicidal (n=188)	Total (n=255)
<b>Drugs</b>			
Paracetamol	0	7 (3.7)	7 (2.7)
Metformin	0	3 (1.6)	3 (1.2)
Alprazolam	0	3 (1.6)	3 (1.2)
Clonazepam	1 (1.5)	2 (1.1)	3 (1.2)
Levothyroxine	0	2 (1.1)	2 (0.8)
Diazepam	0	2 (1.1)	2 (0.8)
Ferrous sulphate	1 (1.5)	1 (0.5)	2 (0.8)
Cetirizine	0	1 (0.5)	1 (0.4)
Lorazepam	0	1 (0.5)	1 (0.4)
Diphenhydramine syrup	1 (1.5)	0	1 (0.4)
Cephalexin	0	1 (0.5)	1 (0.4)
Phenytoin	0	1 (0.5)	1 (0.4)
<b>Plant seeds</b>			
Yellow oleander seed	1 (1.5)	23 (12.2)	24 (9.4)
<i>Abrus precatorius</i> seeds	0	4 (2.1)	4 (1.6)
<b>Insecticides</b>			
Ant killer	0	28 (14.9)	28 (11)
Organophosphorous poison	1 (1.5)	17 (9)	18 (7.1)
Cockroach killer/ cypermethrin (pyrethroid)	1 (1.5)	14 (7.4)	15 (5.9)
Liquid mosquito repellent (pyrethroids)	0	6 (3.2)	6 (2.4)
Carbofuran (carbamate)	2 (3)	2 (1.1)	4 (1.6)
Lamda cyhalothrin (pyrethroid)	0	3 (1.6)	3 (1.2)
Permethrin solution (pyrethroids)	1 (1.5)	1 (0.5)	2 (0.8)
Deltamethrin (pyrethroids)	0	1 (0.5)	1 (0.4)
Flubendiamide (organofluorine)	0	1 (0.5)	1 (0.4)
Thiamethoxam (neonicotinoids)	0	1 (0.5)	1 (0.4)
<b>Rodenticides</b>			
Rat killer	4 (6)	37 (19.7)	41 (16.1)
Thalium	1 (1.5)	0	1 (0.4)
<b>Herbicide</b>			
Paraquate dichloride	0	1 (0.5)	1 (0.4)
<b>Fungicide</b>			
Hexaconazole	0	1 (0.5)	1 (0.4)
<b>Household agents</b>			
Kerosene	25 (37.3)	5 (2.7)	30 (11.8)
Phenol	3 (4.5)	8 (4.3)	11 (4.3)
Ala liquid (Fabric stain remover)	9 (13.4)	2 (1.1)	11 (4.3)
Lysol disinfectant	2 (3)	2 (1.1)	4 (1.6)
Varnish liquid	3 (4.5)	0	3 (1.2)
Camphor	3 (4.5)	0	3 (1.2)
Paint thinner	2 (3)	2 (1.1)	4 (1.6)
Super vasomol (hair dye)	0	2 (1.1)	2 (0.8)
Sabena powder (dishwasher detergent)	1 (1.5)	0	1 (0.4)
Toilet cleaner (acid)	1 (1.5)	0	1 (0.4)
Engine oil	1 (1.5)	0	1 (0.4)

Continued.

Causative agent	Cases of poisoning N (%)		
	Accidental (n=67)	Suicidal (n=188)	Total (n=255)
Disc battery	1 (1.5)	0	1 (0.4)
Petrol	1 (1.5)	0	1 (0.4)
Liquid paraffin	1 (1.5)	0	1 (0.4)
Comfort (fabric conditioner)	0	1 (0.5)	1 (0.4)
Laundry detergent	0	1 (0.5)	1 (0.4)
Calamine lotion	0	1 (0.5)	1 (0.4)

**Table 3: Distribution of multiple causative agent(s) (n=15).**

Causative agent	Total cases of poisoning, N (%)
<b>Drugs</b>	
Aceclofenac + paracetamol	1 (6.7)
Paracetamol + ciprofloxacin + bromhexine + amoxicilin	1 (6.7)
Lorazepam + cefixime	1 (6.7)
Clonazepam + etizolam	1 (6.7)
Chlorpheniramine + theophylline	1 (6.7)
Doxofylline + Pantoprazole + Folic acid	1 (6.7)
Diazepam + cetirizine + chlorpheniramine	1 (6.7)
Amoxicillin + ofloxacin + metronidazole + ornidazole + diclofenac	1 (6.7)
Salbutamol + vitamin B12	1 (6.7)
Escitalopram + econazole	1 (6.7)
Ferrous sulphate + Folic acid	1 (6.7)
Paracetamol + unknown tablets	1 (6.7)
<b>Non-medical substances</b>	
Organophosphorous pesticide + alcohol	1 (6.7)
Chlorpheniramine + cypermethrin insecticide	2 (13.3)

## DISCUSSION

The present study showed a female preponderance (58.5%). This finding is in agreement with some published studies.<sup>8-11</sup> However, other studies have shown that suicidal rates are higher in males.<sup>2,6,12</sup> Also, the findings of the present study revealed that majority of the poisonings were in young adults, in the age group of 21 to 30 years and around three fourth of the cases were suicidal in nature. This finding is in consensus with many other similar studies.<sup>2,5,6,9-12</sup> It is disheartening to note that the young adults are more susceptible to suicidal tendencies since it is at this period that they face major life stressors like academic challenges, recruitment to a job, entering into married life, meeting parental expectations etc. Also, it is at this period that they start taking life decisions independently and some of them might be unable to cope with the burden and resort to impulsive suicidal ideations and actions. The results of our study clearly illustrate the causes for suicidal poisonings in South India. Although, in majority of the cases (44.9%) of suicidal poisonings, the cause was unknown, interpersonal adjustments (40.1%); financial stress (7.7%); psychiatric disorder (5.3%); and chronic alcoholism (1.9%) were implicated in the remaining cases. Similar observations have been made by other researchers.<sup>5,6</sup> It was also seen that more than half of the patients (59.3%) came from the Villupuram districts of

Tamil Nadu, followed by Puducherry (37.1%). This could be due to the characteristic location of our hospital on the outskirts of Puducherry and in the vicinity of Villupuram district of Tamil Nadu.

In line with the previous studies<sup>9,10</sup> showing that majority of the poisonings occurred via the oral route, our study found that exposure to the poison was oral in all cases. This could be attributed to the unrestricted sale, easy availability and low cost of pesticides, household agents and drugs, all of which can be abused orally for committing suicide.

According to our results, the median duration of hospital stay for these patients was 2 days. This was in congruence with the results of a similar study in Iran.<sup>9</sup> Majority of the patients (n=262, 95.3%) recovered and the overall mortality during study period was 2.9%. As per the previous published studies, the mortality rate in acute poisonings in India varied between 0.4% and 8.3%.<sup>3,5,6,12</sup> The mortality rate depends on many factors like type of poison consumed, its dose, the time of presentation to the hospital after consumption of poison, and availability of adequate facilities in the hospital. The low level of mortality in our study could be linked to the fact that majority of patients reached the hospital early (within 2 hours of exposure) and the good quality of care provided in our hospital to these patients.

More than half of the patients presented to the hospital within 2 hours of exposure to the poison, which was similar to the observation made by Dogan et al in Turkey.<sup>8</sup> This positive finding could be because of the availability of good transportation facilities to our hospital in rural Puducherry. On the contrary, a similar study done in Uttar Pradesh, North India revealed that only 27.85% of the cases presented within 2 hours of poison exposure due to poor transport facilities.<sup>6</sup> Studies have shown that hospital transportation time has a significant impact on the prognosis of the patients with poisoning; morbidity and mortality increases with rising time lapse.<sup>3,6</sup>

Similar to a study by Zohre et al majority of the patients (n=255, 92.7%) in our study consumed a single agent.<sup>9</sup> Multiple agents were implicated only in suicidal cases. In accidental poisonings, except for one which was unknown, in all the other cases, only a single causative agent was implicated. Among the single causative agents, the top 5 causes of poisonings in our locality were rat killer (16.1%), kerosene (11.8%), ant killer (11%), yellow oleander seeds (9.4%), and organophosphorous compounds (7.1%).

There are remarkable differences in the type of causative agents implicated in suicidal and accidental poisonings; and also variations are observed across different countries. From our study results, it is evident that the most common causes of suicidal poisonings in our locality were insecticides (39.4%) like ant killer, organophosphorous compounds and cockroach killer; rodenticides (19.7%) like rat killer; and plant seeds (14.4%) like yellow oleander seeds. This is because the main profession of people in rural India is agriculture and damage to crops by pests is an important problem faced by them. Thus, pesticides like insecticides, rodenticides, herbicides, and fungicides are procured by the farmers and stored in their houses. This makes pesticides an easily available poison for committing suicide in rural parts of India. Also, yellow oleander is an ornamental plant widely found in India and most of the farmers are aware of the poisonous potential of its seeds, thus making it a common causative agent for committing suicides. Similar studies done in India,<sup>3,5,6,11,12</sup> revealed that pesticides (especially the organophosphorous compounds) and plant seeds were the leading causes of suicidal poisonings; unlike in countries like United Kingdom, Palestine, Turkey and Iran, where drugs topped the list of suicidal poisons.<sup>8,9,13,14</sup>

In contrast to the causes of suicidal poisonings, majority (79.1%) of the accidental poisonings were due to household agents like kerosene, fabric stain remover, phenol, varnish, camphor, Lysol disinfectant, paint thinner, dishwasher detergent, toilet cleaning acid, engine oil, disc battery, petrol and liquid paraffin. The results are comparable to similar studies conducted in South India showing that household agents were the most common causes of accidental poisonings, especially in children.<sup>15,16</sup> These household items are usually stored

unsafely at places which is easily accessible to children, like under the sink, in bathrooms and toilets. Moreover, these products are not adequately labeled, mentioning its potential toxic effects or the precautions to be undertaken during its usage.

### **Limitations**

Since in our study, the data was collected retrospectively from patient case sheets, the patients whose data was missing were excluded from the study. Also, collection and analysis of other demographic details of the patients like marital status, educational background, socio-economic status and occupation would have further enriched the study results.

### **CONCLUSION**

Our study shows that the majority of the poisoning cases occurred with a single poisonous agent consumed orally, for suicidal purposes in young age group and women. The four most common groups of agents implicated in poisonings were pesticides, household agents, plant seeds and drugs. Majority of the suicidal poisonings were associated with abuse of pesticides, plant seeds and drugs; whereas the accidental poisonings were mostly due to household agents. Majority of the patients reached the hospital within 2 hours of exposure to the poison with median duration of hospital stay of 2 days, and mortality of 2.9%. The most common known causes of suicidal poisonings were crisis in interpersonal adjustments, financial stress, psychiatric disorder and chronic alcoholism.

The results of our study can be used for appraising the doctors and general public regarding the pattern of acute poisoning cases in our locality and would also be of immense help to our hospital administrators in taking regulatory decisions on our hospital practices. Based on the results of our study, we suggest that young adults and women form the target groups for initiation of preventive measures to mitigate the threat of escalating cases of poisonings in our locality. Awareness and training programs can be conducted among them in order to equip them with the necessary psychosocial skills like conflict resolution, stress relaxation, meditation techniques, problem solving capacity and improvement of self-esteem etc. Also, there is a need to ensure that mechanisms are in place to check the unregulated marketing of pesticides and drugs. Also, education of the public regarding the hazards of poisonous substances like pesticides, household poisons and their safe handling practices is essential. Also, there is a need to establish poison information centre in our hospital to prevent and manage cases of acute poisonings.

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