

A Prospective Observational Study Ondemographic Profile and Clinical Outcomes of Acute poisoning Cases in a Tertiary Care Hospital in Southern India

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Abstract

Background: The profile of acute poisoning cases is fast changing in last few years, due to advancements in agriculture, construction, sanitation, cosmetic industry and not the least in pharmacology. The advancements and invention of new chemical agents in these industries have increased the access to wide range of materials with quite varied chemical nature, which is reflected in the profile of acute poisonings.

Methods: The study is a prospective observational study for a period of 18 months. The study population included all the patients presenting to the emergency department with history of acute poisoning excluding accidental non-self-poisoning.

Conclusion: In the current study, highest proportion of subjects in the overall study group was between 26 to 40 years. The proportion of males and females were almost equal whereas in OPC poisoning group the proportion of males was much higher than females. Majority of the affected population were married, living in urban areas, educated, belonged to lower class. Highest proportion was constituted by housewives and students. Organophosphorous poisoning was the most common poisoning reported followed by benzodiazepines and rat killer in the study. The overall mortality rate in the study was 10.53%. Mortality was highest when the subjects were presented beyond 6 hours. Among the type of poisons OPC poisoning had highest mortality.

Key words: acute poisoning, outcomes, demographic profile, organophosphorous

Introduction

Poisoning cases are increasing day-by-day due to changes in lifestyle and social behavior. It has been estimated that some form of poison directly or indirectly is responsible for more than 1 million illnesses worldwide annually. This figure could be just the tip of the iceberg since most cases of the poisoning actually go unreported, particularly in the third world countries. The

problem is getting worse with time as newer drugs and chemicals are developing in huge numbers. Deliberate self-poisoning has reached epidemic proportions in parts of the developing world where the toxicity of available poisons and sparse medical facilities ensure a high fatality rate.^{1,2}

Nearly a million people die each year as a result of suicide, and chemicals account for a significant number of these deaths. For example, it is estimated that deliberate ingestion of pesticides causes 370,000 deaths each year.^{3,4} According to a recent report, poisoning with organophosphate pesticides (OPs) only is estimated at some 3 million per year, and the number of deaths and casualties some 300,000 per year worldwide.⁵

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In India, as per national crime record bureau latest reported published in 2015, the means adopted for committing suicide varied from the easily available and effective means such as consumption of poison, jumping into the well etc. In the year 2015, poisoning constituted to 27.9% of all the suicides, second only to hanging. The proportional mortality rate due to poisoning has gone up by from 26.0% in 2014 to 27.9% in 2015. The number of male victims was more than females in all means of suicides except those who committed suicides by 'Fire/Self-immolation' where the share of female victims was more (5,832 out of 9,558).⁶

The profile of acute poisoning cases is fast changing in last few years, due to advancements in agriculture, construction, sanitation, cosmetic industry and not the least in pharmacology. The advancements and invention of new chemical agents in these industries have increased the access to wide range of materials with quite varied chemical nature, which is reflected in the profile of acute poisonings. Traditionally drugs are reported to be a most common substance used for acute poisoning in western societies, whereas in India pesticides and chemical used for various household purposes were reported to be more commonly used substances for acute poisoning.⁴ The mortality/morbidity due to acute poisoning also influenced by multitude of factors like "nature of poison, dose consumed, level of available medical facilities and the time of interval between intakes of poison and arrival at hospital, etc."⁷

Aims and Objectives

To study the demographic profile and clinical outcomes of acute poisoning cases.

Materials and Methods

The study is a prospective observational study, conducted in the department of general medicine for a period of 18 months after obtaining approval from the institutional ethical committee. The study population included all the patients presenting to the emergency department with history of acute poisoning.

Inclusion criteria:

1. Aged more than 18 years

2. Exposure to a drug or another agent in toxic amounts leading to hospital admission

Exclusion criteria: All cases considered to be accidental non-self-poisoning.

Mortality was considered as the primary outcome variable. ICU stay, duration of hospital stay was considered as the secondary outcome variable. Type of poison was considered as primary explanatory variables. Age, gender and other relevant were considered as others explanatory variables. The demographic profile and clinical outcomes were analysed separately for the three most common types of poisoning in our study

Results

A total of 304 subjects were included in the study. Among the study population, 85(27.96%) were 18 to 25 age group, 129(42.43%) were 26 to 40 age group, 54(17.76%) were 41 to 60 age group and 36(11.84%) were above 60 years. In our study males were predominant with 182(52.87%) followed by females 122 (40.13%).

Among the study population, 219 people were unmarried and 85 people were married. Majority of the subjects(64.14%) were hailing from urban areas. Our study had 182 literates and 122 illiterates. In the study majority of the patients were housewives(24.34%) followed by students(23.68%). There was no statistical difference in the incidence among different socioeconomic classes.

In the study population, 22 (7.24%) had depressive illness, 17(5.59%) had history of similar attempt in the past and 10 (3.29%) had other psychiatric illnesses.

About 161 cases (52.96%) presented to the hospital within 3 hours of consumption of the poisonous agent, 35.86% presented between 3 and 6 hours and 5.92% presented more than 6 hours.

The most common three compounds consumed were organophosphorus(OPC) (13.82%), benzodiazepines (12.50%) and rat killer (12.50%) and the most common three forms of compound consumed were as tablets(41.78%), liquids(21.71%) and powder(18.09%).

Out of 304 patients, 281 (92.43%) were initially admitted to the intensive care unit and 55 patients (18.09%) required mechanical ventilator. On presentation, 81 (26.60%) patients had low GCS. About 80.92% of the patients had a hospital stay of less than a week. Among 304 patients, 221 (72.7%) were discharged, 32 (10.53%) and 51 (16.78%) went against medical advise.

Among the mortality cases, the major age group was between 26 to 40 years. There was no statistical difference in mortality between the two genders (male 18 and female 14). Mortality was highest among the patients who consumed OPC compound (38.09%) followed by rat killer (26.31%).

In our study all three major poisoning OPC, benzodiazepines and rat killer was common in the age group of 26 to 40 years (33.33%, 50.75% and 36.84% respectively) and was predominant in males (69.05%, 50.75% and 57.89% respectively) and unmarried (73.81%, 64.18% and 78.95% respectively). All the 42 people (100%) who consumed OPC poisoning were living

in rural area and were illiterate and belonged to lower socioeconomic class. Among patients who consumed benzodiazepines, majority of the patients (76.12%) were hailing from urban area and were literates (58.12%) and were students (34.33%). In rat killer poisoning, about 76.32% were from urban area and were literates (73.68%).

In OPC poisoning, about 90.48% of the cases presented to Emergency department with low GCS. All patients in all three groups were admitted to the ICU. Among OPC poisoning 42.86% required mechanical ventilator and in benzodiazepines and rat killer the requirement was less (14.93% and 26.32% respectively). The duration of stay was more in people with OPC poisoning (42.86%) when compared to benzodiazepines (16.42%) and rat killer (26.32%) (table 3).

Mortality in our study population in OPC poisoning and rat killer were about 38.10% and 26.32% respectively and nil in benzodiazepine poisoning.

Table 1: Clinical outcome of three common types of poisoning

| Parameter | OPC (42) | Benzodiazepines(67) | Rat killer(38) |
|------------------|-----------|---------------------|----------------|
| GCS | | | |
| <9 | 38(90.48) | 10(14.93) | 4(10.53) |
| 9 to 15 | 4(9.52) | 57(85.07) | 34(89.47) |
| ICU | | | |
| Yes | 42(100%) | 64(95.52) | 38(100) |
| No | 0 | 3(4.48) | 0 |
| Ventilator | | | |
| Yes | 18(42.86) | 10(14.93) | 10(26.32) |
| No | 24(57.14) | 57(85.07) | 28(73.68) |
| Duration of stay | | | |
| <7 days | 24(57.14) | 56(83.58) | 28(73.68) |
| >7 days | 18(42.86) | 11(16.42) | 10(26.32) |
| Outcome | | | |
| Discharged | 20(47.62) | 56(83.58) | 22(57.89) |
| Dead | 16(38.09) | 0 | 10(26.32) |
| AMA | 6(14.29) | 11(16.42) | 6(15.79) |

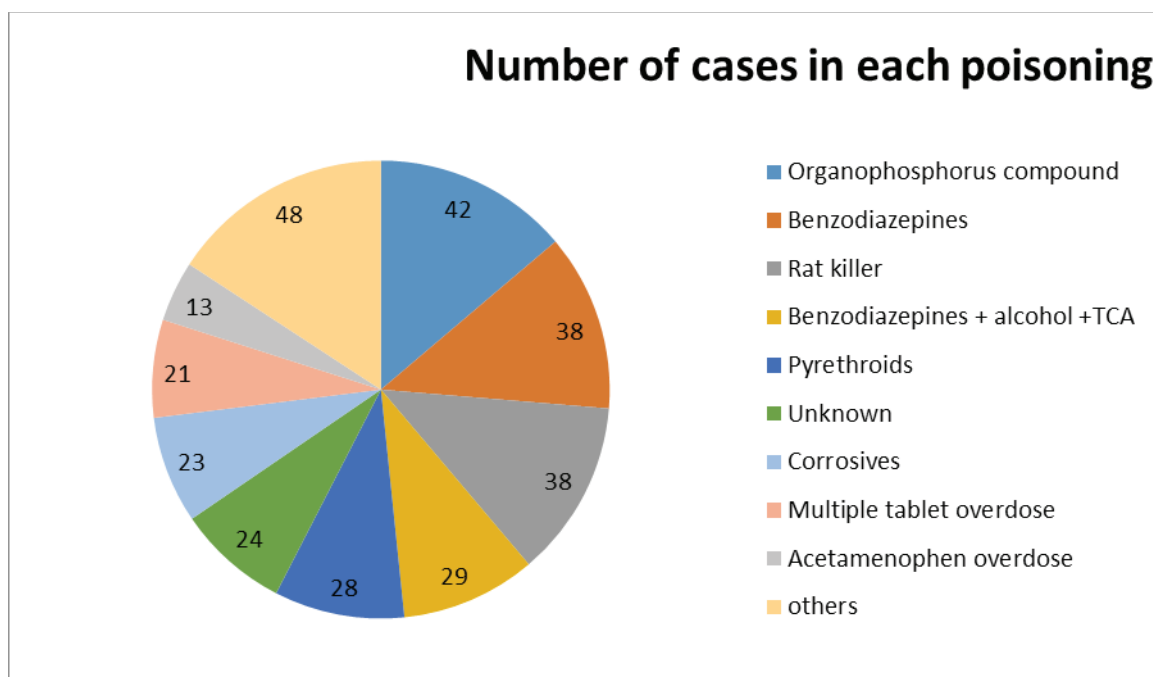


Figure 1: frequency of different types of poisoning

Discussion

Age and Gender Profile Of acute Poisoning:

In the current study, the highest proportion of subjects in the overall study group was between 26 to 40 years (42.43%). When the age profile of the most common three types of poison was assessed, 26 to 40 year was the most common age group affected. But in benzodiazepine poisoning group the proportion of younger subjects aged between 18 to 25 years was much higher with (35.82%) as compared to other poisoning groups and none were older than 60 years in this group. Many studies in the past have reported similar findings, where the acute poisoning was common among younger and economically more productive population. In a study by Nabih, Z., et al.⁸ the average age of patients was 24.63 +/- 10.29 years. Indu, T.H., et al.⁹ have reported the majority of cases to be among 21-30 age group (41.24%). Some studies as in the study by Jang, H.S., et al.¹⁰ from Korea have reported 40.0 +/- 20 years to the average age. In spite of these minor variations the overall conclusions of bulk of literature have reported people aged between 21 to 40 years to be the population group at highest risk of acute poisoning as this age group is affected by many issues like lack of employment, break-up in the family support system, failure of love affair, an

individual's frustrations, inadequacy to cope with some immediate situation, impulsive behaviours, stress due to job and family, etc.¹¹

In the current study, the proportion of males and females were 59.87% and 40.13% respectively. In OPC group the proportion of males were much higher than females (69.05% vs 30.95%). But in benzodiazepine poisoning group the proportion of males and females (50.75% Vs 49.25%) were almost similar. In rat killer poisoning group also the proportion of males was slightly higher than females (57.89% Vs 42.11%). Many studies in the past like study by Singh, B. et al.⁷, Sharma, B.R., et al.¹² etc have revealed a higher incidence of poisoning in males than in females. Indu, T.H., et al.¹³ reported 62% of the participants affected by poisoning to be males. In a study by Nabih, Z. et al.¹⁴ male/female ratio was 2.2:1. This finding was supported by many other Indian studies conducted in different states, both from rural and urban localities.¹⁵⁻¹⁷ But the findings from by Tufekci, I.B., et al.¹⁸, Jang, H.S., et al. and Yamashita, M., et al.¹⁹ etc conducted in other Asian and European countries have revealed findings contrary to the current study findings, where there was a more female preponderance. The male preponderance appears to be due to more exposure to occupational hazards, and

stress or strain as compared to females in this part of the world.

Other Demographic Parameters:

Among the study population, 219(72.04%) people were unmarried and 85(27.96%) people were married. Among the study population, 195(64.14%) were urban and 109(35.86%) were rural. In our study, 182(59.87%) were literates and 122(40.13%) education status were illiterates. Majority 70(23.03%) subjects belonged to lower class, followed by lower middle class 66(21.71%), upper middle class 63(20.72%) and middle class 61(20.07%) respectively. Majority 74(24.34%) subjects were housewife, followed by students 72(23.68%), a farmers 57(18.75%) and businessmen 51(16.78%).

Out of 42 people with OPC poisoning, 31 (73.81%) were unmarried, all 42 people were living in rural area and were illiterates. Majority of the OPC poisoning subjects belonged to lower class. Out of 42 people with OPC poisoning, 28 people presented within 3 hours of consumption. All the 42 people were farmers. Majority of OPC poisoning subjects (38 out of 42) had reported with GCS of less than nine. Out of 67 people with benzodiazepine poisoning 43 (64.18%) were unmarried, 51(76.12%) were hailing from urban area and a significant number were 39(58.12%) literates, 18 (26.87%) belonging to lower middle class and 23 cases were students. Out of 67 people with benzodiazepine poisoning, 36 people presented to ER within 3 hours of consumption of the tablet. Out of 38 people with rat killer poison, 30 (78.95%) were unmarried. Out of 38 people with rat killer poisoning, 29(76.32%) were living in the urban area and 28(73.68%) were literates. 15(39.47%) people among 38 cases of rat killer poisoning were housewives. Majority of rat killer poisoning 34 cases had reported with GCS between 9 to 15.

Type of Poison:

As in the current study, many studies published from India have reported morbidity and mortality mainly due to agrochemicals, which appear to be a by-product of the "green revolution" in South Asia.²⁰ The present study revealed that the maximum cases of self-poisoning due to organophosphorus pesticides in South India, which is different from the results of North Indian studies.

In North India, the majority of poisoning was due to aluminum phosphide.²¹ A prospective study (559 cases) conducted at medical college hospital Rohtak, Haryana North India revealed that aluminum phosphide was the primary substance accounting for approximately 67.8% of all poisoning cases.²⁵ This is contrary to the findings of Western countries, where pharmacological agents were most common.^{22,23} There are few published studies of agrochemical poisoning in developed countries. A review of pesticide poisoning deaths in England and Wales found that pesticides were responsible for only 1.1% of poisoning deaths over a 44-year period.²⁴ A Minnesota regional poison center consulted on 1428 cases in 1988 in which a pesticide was the primary substance, accounting for approximately 4.5% of all poisoning cases.

Followed by OPC, our study had predominantly pharmacological agents, which is similar to the study conducted by Kavalci, G., et al.²⁸ Among the pharmaceuticals, antidepressants were involved most often, followed by analgesics. Ahuja, H., et al.⁴ have reported pesticides were the most commonly employed poison, notably organophosphorus compounds (22 patients, 32.8%) and aluminum phosphide (14 patients, 20.9%).

Our study reported older people more than 60 years of age had higher mortality 13.88% which is similar to the study done by Ye, Y. M., et al.²⁹ which had 14.25%. The patients with an older age and a longer length of hospital stay tended to have higher hospital costs.

Outcome:

In the study population, 281(92.43%) were admitted to ICU. In the study subjects, 55(18.09%) required a ventilator. Also in our study, 246(80.92%) had a duration of hospital stay of less than 7 days and 58(19.08%) had a duration of hospital stay more than 7 days. In a study by Kavalci, G., et al.²⁸ The mean length of hospital stay was 6.4 +/- 4.3 days. Among the study population, 221(72.70%) patient were discharged, 32(10.53%) patients were dead and 51(16.78%) patients have left the hospital against medical advice (AMA) respectively. In a study by Ye, Y. M., et al.²⁹ after treatment, 64.1% achieved improvements, whereas 1.3% died. Out of 85

people who consumed poison in 18 to 25 years age, 10 (11.76 %) patients died. Out of 129 people in 26 to 40 age group, 13 (10.07%) patients died. Out of 54 people in 41 to 60 age group, 4 (7.407%) patients died. Out of 129 people above 61 years of age, 5 (13.88%) patients were dead. The difference outcome proportion across study groups was statically not significant (P -value 0.17).

Among the 304 cases ,OPC poisoning cases required maximum number of ventilator support 18 (42.86%), similar findings were observed in Ahuja,H,etal followed by rat killerand benzodiazepine poisoning.. Ahuja,H.,etal. have reported overall mortality from all poisonings was (18%),while our study had overall mortality of 10.53%.

Factors Affecting Mortality:

In the current study, out of 182 male subjects, 18 (9.890%) were dead. Out of 122 female subjects,14 (11.47%) female patients were dead. The difference gender proportion across study groups was statistically not significant. (P -value 0.88). No statistically significant differences were observed in mortality between different age groups. Mortality was highest at 22.2%, when the subjects were presented beyond 6 hours as compared to people presenting less than 3 hours (9.316%) and 3to6 hours(8.256%), but the differences were statistically not significant (P -value 0.39). Among the type of poisons Organophosphorus compound poisoning had highest mortality (38.09%) followed by Rat killer poisoning, (26.31%). None of the subjects with benzodiazepine poisoning met with mortality. This is similar to the report of the other researchers.²¹ The factors responsible for this may be because of easy availability, no regulation on sale and use of these agents.²¹

If treatment is delayed the initial peak blood level of poison may induce irreversible tissue damage to the organs, but death may not occur immediately. Death may then ensue from the damage already initiated. Delay in the transfer of the patients from remote places to hospital leads to delay in treatment, which may cause more damage the organs andlead to death. There are some reports showed that thedelayed admission might be a factor for high mortality rate in cases of poisoning.^{26,27}.

Hence at the end of the review it can be summarized that the toxicological profile of acute poisonings is a dynamic process and depends on the developments in many fields, including agrochemical industry, pharmaceutical industry and cosmetic industry etc. Physicians need to be updated themselves about the chemical nature of these agents and their impact on human body and effective ways to manage them. Appropriate measures including regulatory and monitoring interventions to restrict the availability of toxic agents to general population also is the need of the hour to reduce the burden of poisoning at community level at large. Public awareness and enhanced transport facilities to quickly promote early management is also required.

Conclusions

In the current study, highest proportion of subjects in the overall study group was between 26 to 40 years. The proportion of males and females were almost equal whereas in OPC poisoning group the proportion of males was much higher than females. Majority of the affected population were married,living in urban areas, educated ,belonged to lower classand lower middle class. Highest proportion was constituted by housewives and students .

|OPC poisoning was the most common poisoning reported in the study population. Tablet form was the most common type of poisoning .After the poisoning majority of the subjects presented within 3 hours of consumption. The proportion of people admitted in ICU was 92.43% and proportion of people requiring ventilator support was 18.09%.The overall mortality rate in the study was 10.53%.No statistically significant differences were observed in mortality between different age groups and genders.Mortality was highest when the subjects were presented beyond 6 hours. Among the type of poisons OPC poisoning had highest mortality followed by Rat killer poisoning. Benzodiazepine poisoning group had zero mortality.

Limitations

1.Considering the smaller sample size and also further reduction in the effective sample size while analyzing the individual poisoning, only the descriptive analysis could be done from many variables.

2. The proportion of subjects who left against medical advice forms a significant group. Since the nature and reason for the same has not been assessed, the conclusions drawn about the final outcome may have been biased.

Recommendations

1. There is a strong need to establish a poisoning registry at different levels of care, to gauge the changing trends of acute poisoning in India.

2. Appropriate regulatory interventions to restrict the access to pesticides, over the counter medication (Considering the high proportion of Benzodiazepine poisoning in the study) and other measure to minimize the availability of common poisons is vital in reducing the incidence of poisoning.

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