Section: General Medicine

Original Research Article

OUTCOME OF RODENTICIDE POISONING AND ITS ASSOCIATED FACTORS AMONG ADULTS ADMITTED IN GOVERNMENT GENERAL HOSPITAL, ONGOLE, ANDHRA PRADESH STATE

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Abstract

Background: Rodenticides are the chemicals used to eliminate rodents. Its poisoning is a common poisoning prevalent in India which leads to visit to emergency department and hospitalization. We conducted a study among adults who were admitted due to rodenticide poisoning in a tertiary care hospital of Ongole, Andhra Pradesh, India to evaluate its outcome and factors associated with it. **Materials and Methods:** This was a prospective study done on the patients with rodenticide poisoning in a tertiaty care hospital between the period of 10th March 2023 to 10th June 2023. A total of 58 cases were included in the study after applying exclusion criteria. Socio-demographic details, baseline and clinical characteristics and complications were noted in all patients. The outcome was seen as recovered, poor outcome, death or LAMA (left against medical advice). All these data were entered in SPSS software version 20.0 and analysed. **Result:** Most cases were from lower socio-economic class with male female ratio of 1: 1.32. Out of all, 89.7% patients were cases of Deliberate self-poisoning (DSP) and rest were accidental. Mental stress due to problem in family, marital disharmony, break-ups and failure in exams was seen to be the reason of self-poisoning. Complication was seen in 60.3% of the cases and hepatitis was the most common complication. Majority of the patients (79.3%) recovered while 3.4% cases of rodenticide poisoning finally died. Among all, 8.6% survived with some disability and same proportion left against medical advice. **Conclusion:** Deliberate self-poisoning forms majority of the cases of rodenticide poisoning. Proper counselling and family-oriented services are required to make people strong so that they can cope up with every mental stress.

INTRODUCTION

Poisoning is a global health issue which is commonly suicidal and rarely accidental. In India it contributes to 1/4th -1/3rd of emergency care admission.[1] Its incidence is even growing these days due to change in lifestyle and social behaviour. However as compared to organophosphorus poisoning, only few literatures are available for rodenticide poisoning.[2]

Rodenticide or Rat killer are the chemical agents used to eliminate small rodents. Commonly they are used to kill household rats, mice, gophers etc. Controlling rodents sometimes become very important as they act as vectors for spread of many diseases, destroy crops and grains, and multiply rapidly.[3]

According to the American Association of Poison Control Centers (AAPCC), rodenticides are responsible for 75,514 cases, 66,362 of which are unintentional and 1598 of which are intentional, with 29 persons dying as a result.[4] India is an agricultural country, so rodenticides are widely used and freely available as various formulations like cereal baits, blocks, powders, pastes, pellets etc.[5] It is commonly available in almost every household to protect the stored grains from rodents. Being easily available and cheaper than other insecticide in the market, it is often taken with suicidal intent or taken accidentally.[6,7]

On the basis of their toxicity, rodenticides are classified as: Highly toxic with LD 50 (median lethal dose) ranging from 0 to 50 mg/kg body weight (e.g. Elemental phosphorous, Metal phosphides, Strychnine, Arsenic, Thallium, Alphanaphthyl thiourea, Sodium monofluoroacetate,), Moderately toxic: with LD 50 ranging from 50 to 500 mg/kg (Warfarin, Cholecalciferol) and Less toxic with LD 50 ≥ 500 mg/kg (Superwarfarins— brodifacoum, bromadiolone, chlorophacinone, difenacoum, and diphacinone, Bromethalin, Red squill).[3]

In India, however, the common agents implicated are the metal phosphides, particularly aluminium phosphide as depiced by a retrospective study done

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in PGI, Chandigarh.[8] Its toxicity is attributed to release of phosphine gas which is a cytotoxic compound that causes free radical injury and is corrosive to the tissue.

There are only few studies done on the clinical outcome and factors of rodenticide poisoning in India. This study aimed at evaluating outcome and factors associated with rodenticide poisoning among adults who were admitted due to the same reason in Government General Hospital, Ongole, Andhra Pradesh, India.

MATERIALS AND METHODS

This was an institutional based prospective study done on patients aged 15 years and above admitted with history or signs of rodenticide poisoning. The study was conducted between the period of 10th March 2023 to 10th June 2023 in Government General Hospital, Ongole, Andhra Pradesh, India. After obtaining approval from institutional ethics committee, data and information pertaining to the patients were collected from family member. Mixed poison patients, patients with cardiac and liver disease and relatives of those not willing to participate in the study were excluded. In 5 months period a total of 58 patients came to the hospital with rodenticide poisoning. Socio-demographic details, baseline and clinical characteristics and complications were noted. A complete Hemogram, renal function tests, liver function tests, prothrombin time, ECG were done for all the patients to see comlications. Finally, following operational definitions system were used to describe outcome of the patients.

1. **Recovered:** When patient was discharged without disability.
2. **Poor outcome:** When survived with disability (Disability: Referred to physical or psychological disability leading to a new morbidity or another organ failure, following rodenticide poisoning, which was confirmed by laboratory investigation or suspected by clinicians, based on the clinical complaints of patients).
3. **Death:** patient died
4. **LAMA:** Left against medical advice

Data were entered in SPSS (Statistical Package for Social Science, IBM Corp.) software version 20 and analysis was done. Descriptive analysis was done by mean±SD. For categorical variables frequency and proportions were used. Socioeconomic status of patients was determined by modified BG Prasad classification.

RESULTS

The study included total 58 patients who were admitted to Government General Hospital, Ongole, Andhra Pradesh, India with rodenticide poising between the period of 10th March 2023 to 10th June 2023. Of the total cases 25 (43.1%) were males while 33 (56.9%) were females with male: female ratio of 1 : 1.32. Age of the patients varied from 16 years to 54 years with mean age of 34.26±4.36 years. Most common age group of patients was 21-40 years which comprised of 28 (48.3%) patients. 2nd most common group was >40 years of age which had 22 (37.9%) patients. Rodenticide poisoning was least common among <20 years group having 8 (13.8%) patients. Out of all patients 22 (37.9%) were unmarried, 32 (55.2%) were married and 4 (6.9%) were Divorced/Widow/Widower. Socio-economic status as per BG Prasad classification revealed that most of the belonged to class IV (16, 27.6%) and class V (20, 34.5%).

[Table 2] shows the baseline characteristics of the patients. It can be seen that 52 (89.7%) patients were cases of Deliberate self-poisoning (DSP). 6 (10.3%) of them were accidental cases. Out of all patients, 65.5% reached hospital by some rented vehicle or auto-rickshaw. Ambulance was used by 11 (19.0%) patients. 5 (8.6%) reached by assisted walk and 4 (6.9%) reached on their feet. 36 (62.1%) patients took less than 2 hours to reach hospital while 22 (37.9) reached after 2 hours of rodenticide poisoning. When they arrived hospital, 12 (20.7%) among them were Unconscious while majority i.e. 79.3% (46) were in Conscious state. When we tried to elicit reason of deliberate self-poisoning (suicidal) cases, it was founded that in 36.2% cases clash with family was the reason. Marital disharmony was the factor in 16 (27.6%) cases. Seven (12.1%) students opted for deliberate self-poisoning due to failure in exams. Unplanned pregnancy was the reason in 2 (3.4%) cases while conflict in work are was also responsible for 4 (6.9%) adults trying to commit suicide. 8 people tried self-destruction due to break-up with girl friend or boy friend.

Clinical characteristics of the patients can be seen in table 3. Majority (72.4%) of the patients were having normal blood pressure at the time of admission while rest were having low blood pressure. Gastrointestinal symptoms like pain abdomen and vomiting was present in almost all patients (94.8%). Pulse rate was found to be normal in 42 (72.4%) patients and there was tachycardia in 16 (27.6%) patients. Average length of stay in the hospital was 83 hours. For 17 (29.3%) patients length of stay was < 1 day and for 41 (70.7%) it was > 1 day. Complications was seen to be very common (60.3%) in rodenticide poisoning. [Table 3]

[Figure 1] shows types of complications in rodenticide poisoning. As depicted, total 35 (60.3%) complications were seen. Out of all cases, 19 (32.7%) had features of hepatitis. Hepatic encephalopathy was found among 4 (6.9%) cases. Bleeding and cardiogenic shock developed in 5 (8.6%) cases each. Seizure was also a complication which occurred in 2 (3.4%) patients.

Final outcome of rodenticide poisoning is being shown in [Figure 2]. As can be seen, Majority of the patients (46, 79.3%) recovered after rodenticide poisoning. Proportion of death was only 3.4% (2) among total cases. 5 (8.6%) patients survived with

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some disability like any physical (organ failure) or psychological disability and 5 (8.6%) patients left against medical advice.

Table 1: Socio-demographic profile of patients (n=58)

Characteristics	Category	Frequency (n)	Percentage (%)
Sex	Male	25	43.1
	Female	33	56.9
Age	≤20 years	8	13.8
	21-40 years	28	48.3
	>40 years	22	37.9
Marital status	Unmarried	22	37.9
	Married	32	55.2
	Divorced/Widow/Widower	4	6.9
Socioeconomic status*	Class II	9	15.5
	Class III	13	22.4
	Class IV	16	27.6
	Class V	20	34.5

*modified BG Prasad classification

Table 2: Baseline characteristics of adult patients admitted with rodenticide poisoning

Characteristics	Category	Frequency (n)	Percentage (%)
Mode of poisoning	Accidental	6	10.3
	Suicidal	52	89.7
Mode of hospital arrival	Rented vehicle/Auto	38	65.5
	Ambulance	11	19.0
	Public shoulder	5	8.6
	On foot	4	6.9
Time of arrival	Less than 2 hours	36	62.1
	After 2 hours	22	37.9
Admission status	Conscious	46	79.3
	Unconscious	12	20.7
Reason for suicidal poisoning	Quarrel with family	21	36.2
	Marital disharmonies	16	27.6
	Failure in exam	7	12.1
	Unplanned pregnancy	2	3.4
	Conflict in work area	4	6.9
	Break-up with girl friend/boy-friend	8	13.8
Reason for accidental poisoning	Mental disorder	4	6.9
	Eating food	2	3.4

Table 3: Clinical characteristics of patients admitted with rodenticide poisoning

Characteristics	Category	Frequency (n)	Percentage (%)
Blood pressure at admission	Normotensive	42	72.4
	Hypotensive	16	27.6
Gastro intestinal symptoms	Yes	55	94.8
	No	3	5.2
Pulse rate	Normal	42	72.4
	Tachycardia	16	27.6
Respiratory rate	Normal	49	84.5
	Tachypnea	9	15.5
Length of stay	< 1 day	17	29.3
	> 1 day	41	70.7
Complication	Yes	35	60.3
	No	23	39.7

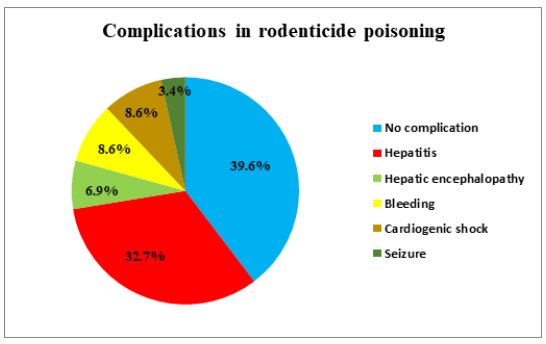

Figure 1: Complications in rodenticide poisoning

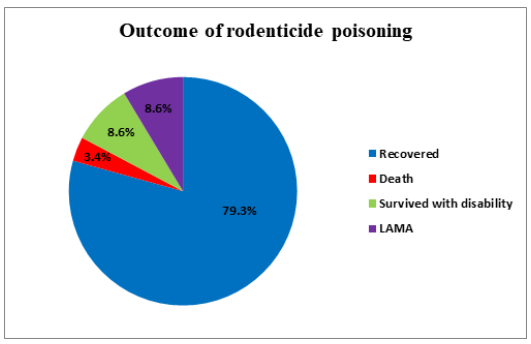

Figure 2: Outcome of rodenticide poisoning in patients

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DISCUSSION

Rat poison was the 2nd most common poison in this hospital (after organophosphorus) due to its easy availability. Rodenticide poisoning was seen to be common in both sexes. In the current study, out of total 58 cases, 25 (43.1%) were males while 33 (56.9%) were females. The mean age of poison consumption was seen to be 34.26±4.36 years. The age group which was most prone to poison was seen to be 21-40 years which consisted of nearly half of the patients. This is similar to the study by Tassew et al in which females were more than males and the most common age group was 20-40 years.[9] However contrast to this, Shashidhara KC et al. found in their study that males were more common although the most common age group was 21-30 years.[10] Study done by Balasubramanian K et al, at Pondicherry shows below 30 years (65.80%) was the most common age followed by 31-40 years (21.7%).[11] In our study married people contributed 55.2% of cases which is similar to the other study.[12] In this study Most of the patients belong to a low socio-economic group which is similar to many other studies.[13-15] People from lower socio-economic class are prone to social deprivation and economic instability leading to a stressful life. Furthermore, people from the upper socio-economic class don't want to get admitted to government hospitals. This may be the reason that people of the upper socio-economic class are less in number in this study.

Deliberate self-poisoning (DSP) or Suicidal poisoning was the main reason of rodenticide poisoning as it constituted 89.7% of the cases. Accidental cases contributed only 10.3%. This is similar to the other studies by Lokesh NK who also found that suicidal cases formed 96.42% of all rodenticide poisoning.[16] In a study by Tassew SF et al. also three-fourth of the cases were related to suicidal poisoning.[9] Many studies demonstrated that patients with suicidal poisoning were found to have poor outcome than those with accidental poisoning, as in case of suicidal poisoning, person deliberately takes maximum dose of rodenticide.[17]

More than 60% of the patients arrived hospital within 2 hours of poisoning. In those cases outcome was found to be good due to early start of treatment. When reason of suicidal poisoning was explored, it was found that quarrel with family and marital disharmonies were the main contributors causing 36.2% and 27.6% respectively. Students also tried to harm themselves due to failure in exams in 12.1% cases. Break-up with girlfriend/boy-friend also caused 13.8% of the cases. Rare causes were conflict in work area and unplanned pregnancy. This is more or less similar to the findings by Bhattacharjee B et al,[13] Kurihara T et al,[18] and Desalew M et al.[19]

In the current study, complications were seen in nearly 3/5th of the total patients. Most common complication found was hepatitis which is similar to the study by Lokesh NK et al.[16] As far as outcome is concerned, proportion of death was 3.4% among patients. This finding is much lower than other studies done in Morocco and Egypt, which stated a death rate of 49.0% and 45.5% respectively.[20,21] Studies conducted at Felege Hiwot Referral Hospital Bahir Dar and Tehran-Iran also found a higher mortality rate of 31.2% and 24.06%, respectively.[22,23] This disparity could be attributed to differences in study period, study population, medication availability. The proportion of patients survived with some disability like any physical (organ failure) or psychological disability and LAMA patients was 8.6% each.

CONCLUSION

Our study included 58 patients of rodenticide poisoning to see its outcome and associated factors among adults. Rodenticide poisoning was found common and in most of the times it was deliberate self-poisoning cases due to mental stress. Prognosis depends upon time of arrival in the hospital after poisoning. Overall, rodenticide poisoning has a bad outcome as complication was significant. So, it is needful to gather proper information on the complications and mortality of rodenticide poisoning and suicidal rate all over India. Proper counselling and family-centred services is required so that people develop coping mechanisms. There should be standard protocol for the management of rodenticide poisoning in all levels of health care.

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