

A PROSPECTIVE OBSERVATIONAL STUDY ON POISONING CASES IN A TERTIARY CARE HOSPITAL IN TAMILNADU

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ABSTRACT

BACKGROUND

High incidence of encounters with agricultural poisons, and lack of data from Indian scenario, necessitate studies in this regard. Our study aims at investigating the pattern of acute poisoning cases in a tertiary care hospital in Tamil Nadu.

METHODS

Our prospective observational study enrolled 228 participants who presented with acute poisoning to casualty or general medicine department during 2014-2018. Unwilling participants and envenomation (snakes & scorpions) were excluded. Sociodemographic data, aetiology, type of agent used, duration of hospitalization, and outcome of hospitalization were recorded. Institutional ethics committee approved the study, and written informed consent was obtained from all study participants. Data was analysed using RTM; ANOVA was used as test of significance and descriptive statistics was used to describe parameters.

RESULTS

The mean age of participants was low (28 years) with significantly lower age among females. Depression was the most common etiological factor; rat poison, organophosphates and ant powder were commonly used. No significant difference in duration of hospital stay between participants with various types of poison was seen. 37% participants had clinical improvement.

CONCLUSIONS

Timely intervention and early recognition can prevent deliberate and accidental harm. The recognition of signs and symptoms of locally available poisons is important in reaching an early diagnosis.

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BACKGROUND

Poisoning has been defined as 'an individual's medical or social unacceptable condition as a consequence of being under influence of an exogenous substance in a dose too high for the person concerned'¹ and a 'poison' is, for human beings and their non-pathogenic and non-harmful biological environment, an electromagnetic or corpuscular radiation, or a non-infectious chemical agent, structured no larger in size than a small particle or fibre that, after being generated internally or after contact, penetration and/or absorption by a live organism, in sufficiently high dose, can produce or produces a direct or indirect adverse effect unrelated to its temperature or measurable electrical potential difference.² From the inception itself death due to poisoning has been known. Poisoning is a major global issue, although the type, associated morbidity and mortality varies according to the geographical distribution. World Health Organization (WHO) estimates nearly 2 lakh people died worldwide due to

unintentional poisoning in 2016 and nearly a million died due to 3.8 lakhs due to intentional ingestion of pesticides.³ The use of pesticides for deliberate self-harm, homicidal use and accidental exposure are considered age old and acute pesticide poisoning is considered one of the most common causes global intentional deaths.⁴ There is a marked difference in the agents used for intentional harm among industrialized and 3rd world countries. High dose analgesics, tranquillizers or antidepressants are the agents of choice in industrialized nations which agro chemical pesticides are commonly used agents in the impoverished nations.⁵ While narcotic, analgesic and tranquilizer overdose is associated with high case fatality rates, agrochemical pesticides use is associated with a fatality rate of 10-20%.⁶

The general trend in poisoning is that accidental poisoning is more common among children while suicidal poisoning is more common among young adults⁷ and an increasing trend of self-poisoning among young adults have been noted from South India.⁸ A third of the global suicides is attributable to pesticide self-poisoning. India due to its agricultural expansion, widespread availability of insecticides and being inexpensive nature, poisoning with organophosphate compounds (OPC) is very extensive, especially in South India. Official data from India grossly underestimates the burden due to large number of undocumented cases. The proportion of suicidal attempts using pesticides varies from 4 and 50% in the European and

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Western Pacific region respectively. Household items such as zinc phosphide, phenol, detergents etc., drugs such as benzodiazepines, anticonvulsants etc. and poisonous plants such as Datura.⁹ With advancements in industrial, agricultural and medical sciences a vast number of insecticides have become available, which on exposure may produce severe toxicity.

According to the legal system of our country, all poisoning death cases are recorded as unnatural death and a medico-legal autopsy is routine. Attempted self-administration of poisonous agents have to reported as a medico-legal case was punishable under section 309 IPC up until very recently which is one of the reasons for the high rates of under reporting. Information available in our country is limited, with regard to acute poisoning in adults, including hospitalized patients,⁸ and the necessity arises in aspect to the severity of the damages produced, complications, emotional turmoil and the sequel. From a medical perspective, it is important to know the nature, severity and etiology of poisoning in order to take appropriate preventive measures. Studies of this nature will be a useful tool in planning and management of critically ill acute poisoning cases. In this context the present study was carried out with the objective to investigate the pattern of acute poisoning cases in a tertiary care hospital in Tamil Nadu.

METHODS

Our prospective observational study enrolled 228 participants who presented with acute poisoning to casualty or general medicine department of Aarupadai Veedu Medical College, Pondicherry during a period of 4 years between 2014 and 2018. Participants not willing to participate in the study, envenomation from snakes and scorpion were excluded. Data were collected using structured case record forms which included MRD no: , age, gender, name of the ingested substance, educational status, occupation, site of the incident, whether accidental, suicidal or homicidal, symptoms associated with ingestion, time of consumption, time of admission to hospital, duration of hospital stay and the outcome of hospital stay. Since our study is an exploratory study all participants presenting with poisoning (suicidal, homicidal or accidental) were enrolled in our study. Institutional ethics committee approved the study and written informed consent was obtained from all study participants. Data were analysed using free to use software R™ and values are rounded off to the nearest decimal and are expressed as frequency and mean (standard error of mean (SEM)). One-way analysis of variance (ANOVA), post hoc Bonneferoni, was used as test of significance. Descriptive statistics were used for analysis of other parameters.

RESULTS

The mean age of the study participants was 28.2 (0.9) years, significantly higher age was observed among male participants (30.6 (1.6)) when compared to female participants (26.9 (1)) (p=0.04). 63.6% (n=145) were

females. Depressive disorder attributed to 28.5% (n=65) attempted suicides (table 1). 94.3% (n=215) subjects got exposed at home, 3.9% (n=9) got exposed at remote area and 1.8% (n=4) got exposed at workplace. 84.6% (n=193) were suicidal attempts, 14.9% (n=34) were accidental exposures and 0.4% (n=1) was homicidal.

Aetiology	n (%)
Depressive Disorder	65 (28.5)
Conflict with Family Members/Neighbours	36 (15.8)
Recent Loss of Family Member	7 (3.1)
Alcohol Dependant Syndrome	3 (1.3)
Deliberate Self-Harm	18 (7.9)
Problems at School	2 (0.9)
Assault	1 (0.4)
Failure in Relationship	2 (0.9)
Adjustment Disorder	17 (7.5)
Stress	1 (0.4)
Schizophrenia	6 (2.6)
Premenstrual Syndrome	3 (1.3)
Physical Pain	4 (1.8)
Dissociative Disorder	1 (0.4)
Impulsive Consumption	1 (0.4)
Borderline Personality Disorder	1 (0.4)
Reason Unspecified	60 (26.3)

Table 1. Aetiology of Poisoning Among Study Participants

Poison	n (%)
Insecticides	
Organophosphates	19 (8.3)
Pyrethroid Insecticide	15 (6.6)
Ant Killer Powder	20 (8.8)
Pharmaceuticals	
Multiple Drug Combinations	16 (7)
Anticonvulsants	3 (1.3)
NSAID	13 (5.7)
Benzodiazepines	16 (7)
Antihistamines	7 (3.1)
Drugs Used for Cardiovascular Conditions	2 (0.9)
Vitamins & Dietary Supplements	6 (2.6)
Antidiabetics	2 (0.9)
Miscellaneous	3 (1.3)
Ayurvedic Product	2 (0.9)
Plant Toxins	15 (6.6)
House Hold Items	37 (16.2)
Unknown Poison	15 (6.6)
Acid- Ingestion & Fume Inhalation	2 (0.9)
Zinc Phosphide	29 (12.7)
Sodium Hypochlorite	1 (0.4)
Ant Powder+ Zinc Phosphide	1 (0.4)
Alcohol Binge	1 (0.4)
Food Poisoning	1 (0.4)
Cyanates	2 (0.9)

Table 2. Etiological Agents of Poisoning Among Study Participants

Common plant products utilized for poisoning were Abrus precatorius (4.4%, n=10) and Thevetia peruviana

(2.2%, n=5). Paracetamol was the most commonly used (3.5%, n=8) NSAID followed by diclofenac (0.9%, n=2), acyclofenac (0.4%, n=1), paracetamol diclofenac combination (0.4%, n=1) and paracetamol acyclofenac combination (0.4%, n=1). Benzodiazepines used were alprazolam (3.9%, n=9), clonazepam (1.3%, n=3), diazepam (0.9%, n=2) and lorazepam (0.9, n=2). Antihistamines used were pheniramine maleate (0.9%, n=2), cetirizine (0.9%, n=2), promethazine (0.4%, n=1), hydroxyzine (0.4%, n=1) and levocetirizine (0.4%, n=1). The common house hold items used for poisoning were phenol (4.8%, n=11), kerosene (0.9%, n=2), detergent (1.8%, n=4), alum (4.8%, n=11), paint (0.4%, n=1), vermivash (0.4%, n=1), glass cleaner (0.4%, n=1), Dettol (0.4%, n=1), Ujala (0.4%, n=1), Harpic (0.4%, n=1) and Lakshmana Rekha Chalk (0.4%, n=1).

Symptom	n (%)
Giddiness	83 (36.4)
Vomiting	121 (53.1)
Burning Sensation in Throat	15 (6.6)
Abdominal Pain	70 (30.7)
Nausea	26 (11.4)
Headache	9 (3.9)
Disorientation	1 (0.4)
Breathlessness	9 (3.9)
Burning Sensation in Chest	6 (2.6)
Loose Stools	13 (5.7)
Cough	1 (0.4)
Loss of Consciousness	7 (3.1)
Dysphagia	4 (1.8)
Burning Micturition	1 (0.4)
Sweating	1 (0.4)
Itching	1 (0.4)
Palpitation	3 (1.3)
Shivering	1 (0.4)
Seizure	2 (0.9)
Hyper Salivation	1 (0.4)

Table 3. Symptoms Associated with Poisoning

Poison	Giddiness n (%)	Vomiting n (%)	Nausea n (%)	Abdominal Pain n (%)
OPC	7 (36.8)	16 (84.2)	1 (5.3)	8 (42.1)
Zinc Phosphide	15 (51.7)	22 (75.9)	0	7 (24.1)
Phenol	3 (27.3)	6 (54.5)	4 (36.4)	5 (45.5)
Ant-Killer	6 (30)	12 (60)	3 (15)	9 (45)
Unknown Agent	7 (50)	8 (57.1)	1 (7.1)	3 (21.4)
Alum	3 (27.3)	11 (100)	2 (18.2)	3 (27.3)
Abrus Precatorius	1 (10)	6 (60)	1 (10)	4 (40)
Pyrethroid Insecticide	1 (11.1)	3 (33.3)	2 (22.2)	3 (33.3)
Paracetamol	3 (37.5)	1 (12.5)	0	3 (37.5)
Alprazolam	7 (77.8)	0	2 (22.2)	0

Table 4. Comparison of Symptoms Associated with Common Poisons

Poison	N	Mean (SD)	p
OPC	19	5.3 (0.9)	0.09
Pyrethroid Insecticide	9	3 (0.4)	
Phenol	11	3 (0.4)	
Zinc Phosphide	29	4.2 (0.5)	
Ant Powder	20	3 (0.5)	
Unknown poison	15	3.7 (0.6)	
Alum	11	3.8 (0.7)	
Abrus Precatorius	10	4.6 (0.9)	
Paracetamol	8	2.4 (0.5)	
Alprazolam	9	3.2 (0.8)	

Table 5. Comparison of Duration of Hospitalization Between Various Poisons

No significant difference in duration of hospitalization was observed between the commonly used poisons. Mean duration of hospitalization was 3.8 (0.2) days.

Time of Consumption	n (%)
6 AM-12.00 Noon	70 (30.7)
12.00 Noon-6.00 PM	61 (26.8)
6.00 PM -12.00 Midnight	81 (35.5)
12.00 Midnight – 6.00 AM	10 (4.4)
Time of Consumption Unknown	6 (2)

Table 6. Time of Consumption of the Poison Among Study Participants

Outcome	n (%)
Absconded	7 (3.1)
Discharge at Request	94 (41.2)
Improvement	86 (37.7)
Discharge Against Medical Advice	32 (14)
Referred to Higher Centre	8 (3.5)

Table 7. Outcomes of Poisoning Among Study Participants

DISCUSSION

Higher proportion of female participants were enrolled in our study which has been previously reported.¹⁰ This is partly attributable to the gender based differences in religious, social, cultural believes and the roles, responsibilities, status and power¹¹ among Indian females and partly due to the higher incidence of depression among females.¹² Since depression is a predominant etiological factor for self-harm and suicides,¹⁰ higher prevalence of depression indicates higher rates of suicides among females. The mean age of study participants was ~28 years indicating an already described grim situation. Survey by Government of India in 1999 describes >65% suicides as committed by youth aged 15-24 years.¹³ Lower mean age among female participants similar to previous reports¹¹ was observed in our study. 28.5% of the participants suffered from depressive disorders. ~ 60% of suicidal attempts has been attributed to major depressive disorders,¹⁴ because our study involves

accidental and homicidal poisoning could explain the finding. Conflicts in family was another important etiology for suicide, intergeneration conflicts and explicit and veiled violence has been observed as important contributors to suicidal attempts.¹⁵ The common contributors among participants with suicides due to issues in family were feelings of abandonment, isolation, sadness, absence of manifestations of affection and or respect, incomprehension of the victims' desires by family members. These individuals expect to be welcome, accepted, comprehended and free in making their minor wishes and to participate in family decisions. Other commonly seen etiologies were deliberate self-harm (7.9%) and adjustment disorder (7.5%). Deliberate self-harm are mostly considered non suicidal though some commit suicide during the act.¹⁶ Adjustment disorder has been described to be associated with suicidal thoughts and ideation.¹⁷

Etiological agents in poisoning included insecticides (23.7%), pharmaceutical agents (29.8%), plant toxins (6.6%), household items (16.2%), corrosive acids (0.9), rodenticides (12.7%) and miscellaneous agents (10.1%). Though India is an agricultural predominant country, the use of insecticides especially organophosphates (8.3%) were lower compared to the use of pharmaceutical agents. This might indicate the increasing knowledge and knowhow of high-risk individuals regarding various options available, enabling them to resort to these agents. An alarmingly high use of rodenticides was observed among participants indicating the easy availability of these agents and its utilization. Among the pharmaceutical agents used multiple drug combinations and benzodiazepines were the commonly used agents. This is due to possible misconception among the low socioeconomic strata that multiple drug combinations might be even more toxic than single agent administration and also that benzodiazepines can cause death while those agents have very high therapeutic margin and rarely cause death.

Abrus precatorius and *Thevetia peruviana* were the plants commonly used for poisoning. *Abrus precatorius* otherwise known as 'Kundumani' in Tamil contains a toxalbumin 'Abrin' that inhibits protein synthesis and cause cell death.^{18,19} Abrin is considered one of the most toxic poisons known to mankind with an estimated lethal dose of 0.1-1 µg/kg. Common clinical features associated with this poisoning are gastrointestinal such as nausea, vomiting, diarrhoea, abdominal pain and gastrointestinal bleeding. Other uncommon features include arrhythmia, encephalopathy and renal failure.²⁰ Classical feature is bloody diarrhoea is attributed to capillary leak syndrome and direct irritant effect of the toxin on intestinal mucosa. Intentional poisoning with this agent is very common in South India and crushed seeds ingested orally was the most common mode of poisoning. *Thevetia peruviana* or yellow oleander is an ornamental tree found in tropical and subtropical regions, whose sap and seeds contain cardiac glycosides which on ingestion can cause fatal cardiac arrhythmias. Among the pharmaceuticals used, NSAIDs were commonly used of which paracetamol was the most

commonly used probably due to easy availability in the household. Paracetamol poisoning is associated with fatal hepatic and renal necrosis due to microsomal metabolism (minor) product N-acetyl P benzoquinone imine which is excreted via conjugation with glutathione. In overdose, microsomal enzyme products predominate due to saturation of normal metabolising enzymes and depletion of glutathione leading to circulation of toxic metabolite resulting in hepatic necrosis and renal necrosis. Benzodiazepines especially alprazolam was a commonly used agent for ingestion, probably due to the belief that hypnotics can produce death at overdose though these agents are considered extremely safe. Antihistamines were also used; the rationale is not very clear and has not been described so far. Phenol and alum were the commonly used house hold items for poisoning. This again could be due to the easy availability of these agents.

The most common symptoms associated with poisoning was vomiting (53%), abdominal pain (31%) and giddiness (36%). Vomiting could be due to the anxiety associated with poisoning triggering sympathetic nervous system and causing emesis. Also, poisons have direct effect on the vomiting centre or by the indirect effect on gastrointestinal tract can trigger vomiting. Central nervous system toxins can cause giddiness and abdominal pain could be due to cholinergic, serotonergic or local irritant effects of toxins. No significant difference in duration of hospitalization was seen among various poisoning agents. Maximum number of participants consumed poison between 6.00 P.M evening and 12.00 Midnight. Maximum proportion of participants requested for discharge and 38% participants showed improvement after treatment. The request for discharge could be attributable to the stigma and medico legal issues associated with poisoning.

CONCLUSIONS

Depression was commonly associated with poisoning. Organophosphates and zinc phosphide were the most commonly used single agent for poisoning. *Abrus precatorius* was the most common plant used for poisoning. NSAIDs, benzodiazepines and antihistamines were the commonly used pharmaceutical agents for self-harm. Vomiting was the most common symptom and maximum proportion of participants consumed poison from 6.00 P.M to midnight.

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