Profile and outcome of patients with acute toxicity admitted in intensive care unit: Experiences from a major corporate hospital in urban India

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ABSTRACT

Background and Aim: There is scarcity of data from the Indian subcontinent regarding the profile and outcome of patients presenting with acute poisoning admitted to intensive care units (ICU). We undertook this retrospective analysis to assess the course and outcome of such patients admitted in an ICU of a tertiary care private hospital. **Methods:** We analyzed data from 138 patients admitted to ICU with acute poisoning between July 2006 and March 2009. Data regarding type of poisoning, time of presentation, reason for ICU admission, ICU course and outcome were obtained. **Results:** Seventy (50.7%) patients were males and majority (47.8%) of admissions were from age group 21 to 30 years. The most common agents were benzodiazepines, 41/138 (29.7%), followed by alcohol, 34/138 (24.63%) and opioids, 10/138 (7.2%). Thirty-two (23%) consumed two or more agents. Commonest mode of toxicity was suicidal (78.3%) and the route of exposure was mainly oral (97.8%). The highest incidence of toxicity was due to drugs (46.3%) followed by household agents (13%). Organ failure was present in 67 patients (48.5%). During their ICU course, dialysis was required in four, inotropic support in 14 and ventilator support in 13 patients. ICU mortality was 3/138 (2.8%). All deaths were due to aluminium phosphide poisoning. **Conclusions:** The present data give an insight into epidemiology of poisoning and represents a trend in urban India. The spectrum differs as we cater to urban middle and upper class. There is an increasing variety and complexity of toxins, with substance abuse attributing to significant number of cases.

Key words: Acute poisoning, intensive care unit, toxicology

INTRODUCTION

Toxicology is integral to critical care practice in India and worldwide. It contributes to significant proportion of intensive care unit (ICU) admissions. The patients who are admitted to ICU may pose an immense diagnostic and therapeutic challenge for the intensivist as a high index of suspicion for intoxication is warranted. The profile of patients with acute poisoning and their choice of agents not only depend upon the socioeconomic, religious and cultural status, but it also greatly varies between different countries.[1-5] This may be attributed to the easy availability of a particular agent.[1-3] The clinical course and ultimate outcome, in turn, is related to the agent, the dose, pre-existing comorbidities, the time from exposure to presentation to a healthcare facility and the experience of care provider.[1,6,7] However, there is scarcity of data from the Indian subcontinent regarding the epidemiology and outcome of patients presenting with acute poisoning, especially from those patients admitted to ICU. Hence, we aimed to determine the profile and outcome of acute toxicology in patients admitted to ICU of a tertiary care hospital in the cosmopolitan city of New Delhi, India.

METHODS

The study was conducted in a 28-bedded critical care department of a tertiary care private hospital in the metropolitan city of New Delhi, catering primarily to urban population. Relevant data were collected

retrospectively from the patient records. Data on patient demographics, psychological analysis, toxins involved and use of toxicology screen were collected for all the patients admitted to the ICU with acute poisoning between July 2006 and March 2009. In addition, data on presence of organ failure, need for organ support and ICU mortality were also collected. Patients admitted to ICUs out of critical care department and those admitted in cardiac critical care unit were not included. Patients whose stay was less than 24 hours and those who were less than 18 years old were also excluded from the study.

Patients were admitted to ICU according to ICU admission policy for toxicology patients based on international recommendations.[8] Disease severity at admission to ICU was assessed by means of acute physiology and chronic health evaluation (APACHE) II score.[9] Organ failure assessment was done by sequential organ failure assessment (SOFA) score,[10] with SOFA score greater than three for any organ system denoting its failure. They were managed according to the standard protocols including the "ABCs" (airway, breathing, circulation), resuscitation with intravenous fluids, inotropes (if mean arterial pressure was less than 60 mm Hg, in spite of fluid resuscitation) and use of renal replacement therapy (RRT) (if serum creatinine was progressively increasing, with worsening of acidemia, with or without hyperkalemia or to clear the toxins) as required. Patients were intubated to secure the airway or when otherwise indicated. Similarly, the patterns of weaning from inotropes and mechanical ventilation were as per standard ICU protocols. Prevention of absorption of toxin was attempted, with gastric lavage and activated charcoal, in selected patients presenting within 4 hours of oral ingestion of toxin. Blood toxin levels, urine toxicology screen and gastric lavage for toxins were sent as and when indicated. Specific antidotes were administered where indicated.

Abstracted patient data were entered into Microsoft Excel and further analysed using SPSS 16.0 (SPSS Inc., Chicago, IL, USA) software. Unpaired Student's *t* test was used to compare continuous data between two groups and categorical data were evaluated using Chi-square or Fisher's exact test, as appropriate. All tests were two-tailed and a *P* value of less than 0.05 was considered to be statistically significant.

RESULTS

Of the total 1478 patients admitted to ICU during the study period, 138 (9.3%) presented with acute poisoning. Patient characteristics are given in Table 1. The most common mode of poisoning was suicidal (78.26%), with the commonest route being oral (97.8%). The highest incidence of poisoning was due to drugs (46.3%), with benzodiazepines being the commonest [Table 2]. Thirty-two patients (23%) consumed either two or more toxins or there was a history of alcohol co-ingestion. In 26.1% patients, the agent of poisoning remained unknown.

Table 1: Patient characteristics	
Parameter of interest	**N = 138**
Sex	
Males (%)	70 (50.7)
Females (%)	68 (49.3)
Age, years	34.5 (range 18-78)
Less than 21 years	3 (2.2)
21-30 years	66 (47.8)
31-40 years	34 (24.6)
More than 40 years	35 (25.4)
Mean APACHE II score	10.8 ± 5.5 (range 5-34)
APACHE II predicted death rate	14.5% ± 11.9
Mean SOFA score	3.9 ± 3.2 (range 1-16)
Time of admission	
Day time (9 am – 9 pm)	49 (35.6)
Night time (9 pm – 9 am)	89 (64.4)
Time to presentation after consumption	
Less than 2 hours	58 (42)
2 – 6 hours	49 (35.5)
More than 6 hours	31 (22.5)
Mode of poisoning	
Suicidal	108 (78.3)
Accidental	20 (14.5)
Criminal intent	10 (7.2)
Route of exposure	
Oral	135 (97.8)
Intravenous	2 (1.4)
Skin	1 (0.7)

Except for range values, all other values in parentheses are in percentages

Table 2: Agents of poisoning*	
Drugs	64 (46.4)
Benzodiazepines	41
Opioids	10
Barbiturates	5
Salicylates	4
Beta blockers	2
Calcium channel blockers	2
Alcohol	34 (24.6)
Household agents	18 (13)
Industrial chemicals	6 (4.3)
Agricultural pesticides	6 (4.3)
Organophosphorus compounds	3
Aluminium phosphide	3
Plant products	6 (4.3)
Cannabis	6
Unknown	36 (26.1)

*The total percentage is more than 100 as there were 32 cases who had consumed more than one poison, Figures in parentheses are in percentage

Many of them had history of psychological disorders, majority (34.8%) being depression followed by anxiety (11.6%). Urine toxicology screen was used in 66/138 (47.8%) and was positive for 45/66 (68.2%) [Table 3]. Organ failure, as assessed by SOFA score equal to or more than three for a particular organ system, was present in 67 patients (48.5%) [Table 3]. During their ICU course, RRT was used in four patients, two each for organ support and toxin removal. One patient each of methanol poisoning and salicylate overdose required haemodialysis for toxin removal. Out of the four patients receiving RRT, three received haemodialysis and one received continuous RRT (CRRT) as the patient was hypotensive. The ICU mortality was 3/138 (2.8%). All deaths were secondary to aluminium phosphide poisoning. Characteristics of the three patients who died during the study period are given in Table 4. Cause of death in all three patients was refractory hypotension with severe metabolic acidosis. RRT was required in all three patients but only one could receive CRRT as the other two were too haemodynamically unstable, in spite of high vasopressor support, to receive any kind of RRT.

DISCUSSION

Acute poisoning constitutes a significant proportion of ICU admissions and even though the overall mortality may be low, they may utilise considerable ICU resources.[11,12] ICU course and outcome varies, but mortality may be high in patients with acute pesticide poisoning, especially aluminium phosphide poisoning.

Characteristic clinical syndromes, called toxidromes, may be associated with certain poisonings and, hence, may aid in diagnosis of an unknown poison. However, all patients may not have all features associated with a particular toxin and toxidromes may overlap in patients who have consumed more than one agent. Hence, a high index of suspicion is required to identify and diagnose acute poisoning.

Urine toxicology screening can provide direct evidence of intoxication, can identify a specific toxin for which an antidote may be available and can also quantify a toxin allowing for titrated therapy.[13,14] However, as only a few drugs can be detected, a negative screen does not rule out the possibility of poisoning. In addition, certain drugs which the patient might have taken in therapeutic amounts, like opioids or benzodiazepines, may also be detected even though they are causing no toxic symptoms and the timing of sampling can also affect the results. As it rarely alters the course of management, urine screening may not be indicated routinely. Drugs which we assessed in urine toxicology screen were amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, opioids and phencyclidine. We used toxicology screen in only 47.8% of our patients and it was positive in 68% of these patients.

Surprisingly, we observed a slight male preponderance in our cohort, but higher suicide rates among men has been reported in many other Indian studies too.[15-17] Other studies have also observed that the maximum number of patients belonged to 21-30 years age group and the most common cause for poisoning was suicidal, as in our cohort.[16]

Table 3: Course in intensive care unit	
Urine toxicology screening	*N* = 66 (47.8%)
Positive	45/66 (68.2%)
Benzodiazepines	28/45
Cannabinoids	6/45
Opioids	6/45
Barbiturates	5/45
Organ failure*	*N* = 67 (48.5%)
CNS failure	52
Failure	28
Respiratory failure	21
Renal failure	6
Liver failure	2
Organ support	*N* = 22 (15.9%)
Inotropic support	14
Ventilatory support	13
Renal replacement therapy	4
Duration of ICU stay, days	2.64±3 (range 1 - 16)
ICU mortality	3/138 (2.8%)

*Organ failure was defined as sequential organ failure assessment score of more than two for that particular organ system. ICU: Intensive care unit, CNS: Central nervous system

Table 4: Characteristics of the patients who died during the study period										
Age	Sex	Time of presentation (in hrs.)	Agent	Associated toxin	APACHE II score	SOFA score	Inotropic support (days)	RRT (days)	MV (days)	Days in ICU
34	F	5.5	AP	Nil	29	13	Y (1)	N	Y (1)	1
32	M	6	AP	Alcohol	26	13	Y (3)	Y (2)	Y (3)	3
49	F	10	AP	Nil	34	16	Y (1)	N	Y (1)	1

APACHE: Acute physiology and chronic health evaluation, SOFA: Sequential organ failure assessment, RRT: Renal replacement therapy, MV: Mechanical ventilation, ICU: Intensive care unit, F: Female, M: Male, AP: Aluminium phosphide, Y = Yes, N = No

Pesticide self-poisoning accounts for about one-third of the world's suicides, with developing countries like India accounting for a major portion of it.[18] Understandably, due to their easy availability, pesticides have been reported as the most common agent for acute poisoning from the Indian subcontinent and drugs being more common in western countries. However, most of the Indian data have emerged from the rural background and the scenario in urban cities may resemble western countries.[17] This may explain the fact that drugs were the most common agents of poisoning in our cohort of patients, which basically represent urban India.

Even though organ failure was present in almost 50% of the patients, only 15% required organ support in the form of RRT, vasopressor or invasive ventilatory support. This may suggest that the organ failure is generally mild and self limiting and early aggressive care can reverse organ failure in most of these patients and, in turn, may reduce mortality. In advanced centres, the case fatality rate for self-poisonings is approximately 0.5%, but it is as high as 10 to 20% in the developing countries where critical care resources are lacking.[19] We observed a mortality rate of 2.8% as our centre is well equipped with advanced life and organ support systems.

Even though the commonest agents for poisoning in our group of patients were the drugs, all three patients who died had consumed pesticide poison (aluminium phosphide). Drugs like analgesics, sedatives and antidepressants which have been associated with maximum mortality in case series from western countries[20] may become secondary to pesticide poisoning in Indian context where exposure to agricultural poisons is rampant and is associated with higher mortality.[21] In addition, among the various pesticides, the majority of deaths occur due to exposure to organophosphates, organochlorines and aluminium phosphide.[22]

Aluminium phosphide is a commonly used, low cost, easily available rodenticide used as a grain preservative in northern India. Hence, it is commonly abused for poisoning. Although the case fatality with aluminium phosphide poisoning has reduced in the recent years secondary to advanced intensive care management, it is still associated with high mortality rates.[23] Mortality with acute aluminium phosphide poisoning exceeds 60% and can reach up to 100%.[24] We observed 100% mortality in our three patients, who presented with aluminium phosphide poisoning,

which may be attributed to their poor condition on admission reflected by their high APACHE II and SOFA scores [Table 4]. Presence of shock has been reported as an independent predictor of mortality,[25] and all three of our patients presented with profound shock not responding to vasopressor therapy. Other factors related to poor outcome in aluminium phosphide poisoning like poor sensorium and presence of metabolic acidosis,[25,26] were also present in our patients, contributing to poor outcome in spite of aggressive management.

Limitations
This retrospective study was conducted in a single centre equipped with high-end facilities located in a metropolitan city; hence, the results cannot be generalised. In addition, because of a small cohort size and low mortality rate, assessment of factors predicting outcome could not be done.

CONCLUSIONS

The present data give an insight into epidemiology of poisoning and represents a trend in urban India. Acute poisoning comprises of a significant proportion of ICU admissions. The spectrum differs as we cater to urban middle and upper class. Substance abuse attributed to a significant number of cases. There is an increasing variety and complexity of toxins and hence a high index of suspicion is warranted because early diagnosis and aggressive therapy can reduce mortality rate.

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