Original Article

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Paediatrics Section

Clinical Spectrum and Severity of Poisoning in the Paediatric Intensive Care Unit of a Tertiary Care Centre in Uttarakhand: A Retrospective Cohort Study

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ABSTRACT

Introduction: Acute poisoning causes significant mortality and morbidity among children worldwide. However, the pattern of poisoning and causative substances varies significantly in geo-demographic areas.

Aim: To describe admissions due to acute poisoning in the Paediatric Intensive Care Unit (PICU) of a tertiary care centre in terms of demographics, clinical profile, specific agents involved and severity of poisoning.

Materials and Methods: This was a retrospective cohort study conducted in PICU of a tertiary care level teaching institute of Uttarakhand, India, over a period of three years on subjects of age group from one month to 18 years. Data was collected and analysed for demography, clinical presentation, substance, management, complications, and outcome. Poison Severity Score (PSS) was used to assess the severity of poisoning. Data was analysed using Statistical Package for the Social sciences (SPSS) software version 21.0.

Results: During the study period, out of total 751 PICU admissions, 45 were due to poisoning. Organophosphates 20 (44%) and aluminium phosphide 12 (26%) were the most common substances used. Accidental poisoning was common 6 (46%) among less than five years of age. However, suicidal attempts were noted more frequently 20 (64%) among >15 years of age group. Vomiting 31 (69%), altered sensorium 23 (51%), and pain abdomen 16 (35%) were the most common presentations. Nine (20%) patients required ventilatory support as well. Three (6.6%) patients died; all associated with aluminium phosphide poisoning.

Conclusion: The most common poison consumed is organophosphate. Aluminium phosphide is the most lethal poison, accounting for all the deaths in the study. Accidental poisoning is common in children less than five years of age. Suicidal poisoning is common among adolescents which must be prevented by early detection of stress. Primary health care facility hesitates to intervene even for basic poisoning care before referring.

Keywords: Aluminium phosphide, Organophosphate, Suicide

INTRODUCTION

Acute drug poisoning is a common paediatric emergency worldwide. About 3% of all paediatric emergency department visits are attributed to poisoning [1,2]. Worldwide rate of poisoning in children less than 20 years of age is 1.8 per 10,000 population [3]. Children may ingest poisonous substances due to ignorance, curiosity, or stress. Incidences of childhood poisoning commonly occur either at home or in surroundings familiar to the child. Poisoning, accidental or intentional, has immediate risk to life [4,5]. According to World Health Organisation (WHO) 3,45,814 people died due to poisoning in 2004, of which 13% were below 20 years of age [3].

Survivors of childhood poisoning may be scarred for life considering the young age in which these injuries were sustained. Studies done in India have documented household products such as insecticides and kerosene as common poisons consumed by children. The pattern and severity of poisoning is affected by the socio-economic and educational status of the parents. Hospital admissions due to poisoning depend not only on the severity of poisoning but also on the cultural practices and health care seeking behaviour of the community as well as the availability and ease of access to health care facilities [6-10]. In order to develop effective preventive strategies it is important to have data on the pattern and causes of paediatric poisoning.

Data regarding poisoning pattern in children in sub-Himalayan area is less explored. Paediatric Intensive Care Unit (PICU) caters to sick paediatric population from sub-Himalayan terrain and adjoining plains. The spectrum of poisoning and the outcome of these cases need analysis for this population. Knowledge about these parameters will guide us to prepare a consensus plan accordingly. This data would help in educating parents about the common modes of poisoning among children and adolescents and the basic care and precautions they need to take to protect their children from such mishaps. Knowledge of prevalence, clinical presentation, spectrum, severity and outcome analysis of paediatric poisoning will not only help to devise better social intervention strategies for prevention of such cases in community but also better preparedness by emergency departments. Hence, the present study was undertaken to describe and better understand the profile of poisoning in paediatric age group.

MATERIALS AND METHODS

This was a retrospective study done on patients admitted to a 15 bedded PICU of Himalayan Institute of Medical Sciences, which is a tertiary care level teaching institute of Uttarakhand, India. The study period extended between May 2016 to April 2019 and the data collected was analysed in September 2019. The study was approved by the Institutional Ethical Committee (HIMS/RC/2019/189).

Inclusion criteria: All patients in the age group of one month to 18 years admitted in the PICU with acute poisoning were included in the study.

Exclusion criteria: Patients who were managed on Outpatient Department (OPD) basis or in the general paediatric ward were excluded from the study.

Data was collected from electronic records and physical files regarding demography, clinical presentation, poison type and amount consumed time lag, baseline vital parameters, systemic findings, management details and outcome. Severity of poisoning was assessed by PSS as proposed by Persson HE et al., [11]. This score is simple chart of organ system wise effects of poisoning with scores varying from 0 to 4. PSS is a retrospective scoring system which takes into account the most severe symptomatology and was done at the time of data analysis.

STATISTICAL ANALYSIS

Data analysis was done using SPSS software version 21.0. Continuous variables were analysed by univariate summary while categorical variables by frequency chart.

RESULTS

In the three years of the study period, a total of 751 patients were admitted in PICU for variable reasons, out of which 45 (5.9%) admissions were due to proven poisoning. The epidemiological profile of patients according to the type of poisoning is given in [Table/Fig-1]. Mean age of patients was 12.8±5.3 years with a male:female ratio of 1:2. Mean time elapsed from consumption of poison to reach the hospital facility was 9.18±10.3 hours. Mean timing of noticing poisoning and reporting to a health care facility was 5.2 hours. Only 24 (53%) patients received a type of symptomatic management at primary centres and nearly half of the patients 21 (47%) received no treatment before referral. One patient was admitted in the intensive care facility at some other hospital before being referred to the study centre.

Adolescents of age >15 years constituted 47% of all cases, while the most common group of poison consumed was organophosphates with 20 (44%) patients. It was found that in the age group less than five years, home utility products/environmental exposure was the most common type of poison due to accidental contact. Subset analysis revealed no gender biasing until age of 10 years but female preponderance was seen after 10 years of age group. Eight cases in suicide cohort informed poor exam performance as the trigger for attempt of suicide. Other causes of suicide noted were family dispute and quarrel with parents. There was a history of sexual assault in two cases of suicidal attempt.

The most common clinical feature was vomiting, seen in 31 (69%) cases followed by altered sensorium in 23 (51%) and pain abdomen in 16 (35%). Out of 23 cases with altered sensorium, 12 were with the poor Glasgow Coma Scale (GCS score) (<7/15) [Table/Fig-2]. Ten cases required intubation and assisted ventilation while two were supported with Bilevel Positive Airway Pressure (BiPAP). Ionotropic support was required among 11 cases. PSS was noted as 2, 3 and 4 among 19, 15 and four cases, respectively. Median stay for the cohort was four days (range one day to 10 days). Median stay in the PICU was one day (range one to six days) [Table/Fig-3].

Variables		Organo-phosphates (n=20)	Phosphide (n=12)	Dhatura (n=1)	Nerium (n=1)	2-4-D (n=1)	Gamma benzene (n=1)	Cor-rosive (3)	Etizolam (n=1)	Halo-peridol (n=1)	Barbi-turate (n=1)	Carbam-azepine (n=1)	Mor-phine (1)	Alcohol (n=1)	Total n (%)
Age (years)	<5	3	0	0	0	0	0	2	1	1	0	0	0	0	7 (15%)
	5-10	0	0	1	1	0	1	0	0	0	0	0	0	0	3 (7%)
	11-15	10	2	0	0	0	0	0	0	0	1	0	1	0	14 (31%)
	>15	7	10	0	0	1	0	1	0	0	0	1	0	1	21 (47%)
Sex	Male	4	4	1	1	0	0	2	0	0	0	1	1	1	15 (33%)
	Female	16	8	0	0	1	1	1	1	1	1	0	0	0	30 (67%)
Suicide		14	12	0	0	1	0	0	0	0	1	1	1	0	30 (67%)
Homicide		1	0	0	0	0	0	0	0	0	0	0	0	0	1 (2%)
Accident		5	0	1	1	0	1	3	1	1	0	0	0	1	14 (31%)
Time to first medical aid (hours)		4.34±5.76	5.91±6.49	2	15	24	3	-	3	4	3	10	6	2	5.2±6.2
Home treatment		3	0	0	0	0	0	0	0	0	0	0	0	0	3 (7%)
Treatment received at some other medical facility		11	7	1	0	1	0	1	1	0	1	0	1	1	25 (55%)
Time to presentation in emergency (hours)		6.42±5.65	13.75±16.25	11	15	24	3	2±1.7	3	4	16	10	24	4	9.18±10.4
Poison severity score	1 (minor)	4	1	0	0	0	0	1	1	0	0	0	0	0	7 (15%)
	2 (moderate)	10	4	1	0	0	1	2	0	1	0	0	0	0	19 (42%)
	3 (severe)	5	4	0	1	1	0	0	0	0	1	1	1	1	15 (33%)
	4 (fatal)	1	3	0	0	0	0	0	0	0	0	0	0	0	4 (9%)

[Table/Fig-1]: Epidemiological profile of patients according to the type of poison.

Variables	Organo-phosphates (n=20)	Phosphi-de (n=12)	Dhatura (n=1)	Nerium (n=1)	2-4-D (n=1)	Gamma benzene (n=1)	Corrosive (3)	Etizolam (n=1)	Haloperi-dol (n=1)	Barbiturate (n=1)	Carbam-azepine (n=1)	Morphine (n=1)	Alcohol (n=1)	Total n (%)
Presenting complaints														
Pain abdomen	8	4	0	0	0	1	1	0	0	0	1	0	1	16 (36%)
Vomiting	15	9	0	1	0	1	2	1	0	0	1	0	1	31 (69%)
Altered sensorium	11	4	0	1	1	0	0	1	1	1	1	1	1	23 (51%)
Seizures	2	0	1	0	0	0	0	0	0	1	1	1	0	6 (13%)
Complications														
Hypotension	3	6	0	0	0	0	0	0	0	1	0	0	1	11 (24%)
Oliguria	0	4	0	0	0	0	0	0	0	0	0	0	0	4 (9%)
Acute liver failure	0	3	0	0	0	0	0	0	0	0	0	0	0	3 (7%)
Coagulopathy	0	2	0	0	0	0	0	0	0	1	0	0	0	3 (7%)
Metabolic acidosis	1	7	0	0	0	0	0	0	0	1	0	0	1	10 (22%)

[Table/Fig-2]: Clinical profile of patients according to type of poisoning.

Management/outcome indices	Number of cases n (%)
Ventilator support	10 (22.2%)
BiPAP (Bilevel Positive Airway Pressure) support	2 (44.4%)
Ionotropes	11 (24.4%)
Blood product transfusion	3 (6.6%)
Haemodialysis	1 (2.2%)
Stay in hospital (median/range)	4 days (1-10 days)
Death	3

[Table/Fig-3]: Management and outcome indices.

Three deaths were noted in PICU, all from aluminium phosphate poisoning. Two cases left the hospital against medical advice. They were contacted telephonically on the number provided in the file. One of them with organophosphate poisoning was critical at the time of leaving hospital and could not survive at home while the other patient was informed to be healthy at the time of telephonic contact.

DISCUSSION

This study analysed three year data of paediatric poisoning cases admitted in PICU. In developed countries with variable cultural and religious practices, urbanisation poisoning characteristics are different than in developing countries. Agricultural pesticides such as organophosphorous, organochloride, zinc and aluminium phosphide are commonly used for intentional poisoning in Asian countries due to their easy availability while misuse of pharmaceutical agents like paracetamol, opioids, benzodiazepines and tranquilizers is common in industrial and developed countries [12,13]. This study was done to analyse the clinical characteristics and severity of poisoning in paediatric age group. Studies regarding childhood poisoning in India have noted variability in demography, age group, mode of poisoning and substance used [Table/Fig-4] [6-10,13,14].

Year/Author	Region	Type of study	Age range	Number of cases	Male: female	Most common poison	Mode of poisoning	Death
2005/ Basu K et al., [6]	Kolkata	Retrospective	0-18 years	421	3:1	Kerosene	Accidental (100 %)	2.3%
2008/ Kohli U et al., [9]	North India	Retrospective	0-12	111	2:1	Kerosene	Accidental (96.9 %)	3.4%
2011/ Jayashree M, Singhi S [13]	North India	Retrospective	0-12	225	2.2:1	Kerosene	Accidental (96.9 %)	8.9%
2011/ Bhatt NK et al., [8]	Uttarakhand	Retrospective	0-18	117	1.4:1	Insecticide	Accidental (68.38 %)	3.4%
2013/ Ghosh VB et al., [7]	Jammu	Retrospective	0-5	52	M>F	Kerosene	Accidental (100%)	7.7%
2014/ Rama P et al., [10]	South India	Retrospective	0-15	81	1.02:1	Kerosene	Data of 43.2% available, 23/35 were accidental	7.4%
2020/ Saikia D [14]	Delhi	Hospital based cross-sectional study	0-12	153	100/53	Household chemical	Accidental (94.1 %)	6%

[Table/Fig-4]: Comparison of Indian studies on paediatric poisoning [6-10,13,14]

Recent study in North Taiwan on Emergency Department admissions of poisoning in children concluded that accidental poisoning due to ingestion of some household poisonous material was common in young children whereas intentional poisoning with pharmaceutical ingestion was the leading cause in female adolescents [15]. Similar age related poison consumption trend was found in an Indian study amongst 27 poisoning children admitted in PICU [16]. Kerosene poisoning which was noted as the main poisonous substance in India and other Asian studies was seldom noticed in studies from other continents [17-22].

Female predominance and suicide as the most common mode indicates social stress and female inability of coping. Suicide attempts were noted in 30 (67%) cases in this study. All these patients were in the age group of 10-18 years. History and subsequent psychiatric examination noted failure to clear school exams as the precipitating factor for attempted suicide in eight cases. Trend of suicide attempts is worrying. Initiatives like screening and counselling of teens and teen age stress management must be invoked in the school curriculum [23,24]. Aluminium phosphate is a commonly used pesticide for grain storage and is easily available. This is of concern as the study noted significant poisoning due to its consumption. Fatality was also high in this poisoning group. Similarly, unsafe storage of kerosene, organophosphorus and use of rat and mosquito repellents in areas which can be easily accessed by children is dangerous. Study has noted association of history of poisoning and availability of poison as independent risk factor of childhood poisoning [25]. Activity and curiosity are high in the toddler age group and inadvertent ingestion is common. Studies regarding childhood poisoning have noted variability in demography, mode of poisoning and substance [6-10]. Unintentional poisoning has been noted to be the main cause of childhood poisoning. This study noted high suicide rate contrary to other studies [26-28]. Similar study from Uttarakhand state by Bhatt NK et al., also noted high suicide rate [8]. A broader epidemio-social study is needed to analyse this finding. The study also noted self-ingestion on household substances as the most common poisoning in this age group.

This study was done in sub-Himalayan terrain where travel time is often long. Delay in presentation might be attributed to that. Studies from other geographical regions of India have found similar delay in presentation [6]. This study noted no intervention by primary centres in 21 (47%) cases. Fear of medicolegal formalities and fear of deterioration leading to family aggression might be a reason for not installing even symptomatic care in such cases. Basic poisoning protocols and interventions have been advocated to reduce mortality [3].

Outcome of childhood poisoning depends on substance, amount and rapid treatment including intensive care. In this study the severity of poisoning was graded according to the PSS [11]. Severity was high in organophosphate and phosphide poisoning. A PSS of >2 was seen in 16/20 (80%) and 11/12 (92%) cases of organophosphate and phosphide poisoning, respectively. In this study, three cases succumbed due to respiratory failure and persistent hypotension in the PICU all associated with aluminium phosphide ingestion. One patient with organophosphate poisoning, left hospital in critical condition and expired at home.

Limitation(s)

The main limitation of the study is the small sample size and statistical inference about various associations is difficult to draw. Another limitation is the absence of long term data. Long term follow-up of suicide attempting children is needed to see the effect of such attempts and their coping mechanisms.

CONCLUSION(S)

Suicidal and accidental ingestion of poisonous substances are the common mode of poisoning in the paediatric age groups. While timely detection of stress and counselling can prevent suicidal cases, stringent regulations about the storage and handling of poisonous substances must be enforced even at household level. A basic poisoning management is required to be instituted at the primary centres before referral of such cases.

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