Clinicoepidemiological profile of childhood poisoning in the pediatric unit of a tertiary care hospital in north india

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Abstract

Background: This study was conducted to find out the pattern of poisoning cases among the pediatric population in Srinagar and its northwestern suburbs and compare it with what occurs elsewhere in India. Thereby we aimed to provide practical knowledge in dealing with these pediatric patients.

Methods : The hospital records of children between the ages of 0-19 years admitted to the pediatric emergency ward of SKIMS Medical College Hospital Srinagar with poisoning from july 2016 to june 2018 were evaluated.

Results: A total of 154 cases of poisoning were admitted in the study period, of which 89(57%) were males and 69(43%) were females. In the 0-12 year age group the poisonings were mostly in boys(68.26%) and were accidental whereas in the 13-19 year age group poisonings were mostly in girls(64%) and due to suicidal attempts. Organophoshorus poisoning was the most commonly ingested poison across all age groups(44.8%) followed by rodenticides(16.23%), kerosene(13.63%) and medications(11.68%). Interventions mostly commonly done were gastric lavage, induced vomiting. Mortaliy was seen in 2 cases over 2 years(1.29%).

Conclusion : Knowledge on epidemiological and clinical features of poisoning in children according to age groups , establishing safety standards for sale and storage of harmful chemicals, and parental education can help to decrease the burden of childhood poisoning.

Introduction

Ingestion of potentially poisonous substances is commonly seen from young childhood till adolescence. This age group is particularly vulnerable to different poisonous substances depending upon their social and physical milestones[1] In India the incidence of poisoning cases reported to the National Poisons Information Centre was very high in children and adolescents aged 1 to 18 years.[2] Children <12 years old are usually involved in accidental poisonings whereas 12-18 year olds mostly have these substances intentionally. Ingestion of substances may also be due to factors such as imitation of parental behaviors and parental carelessness.

The type and incidence of substance ingested vary from place to place and over time.[3 4 5 6 7 8] In Egypt, most of the accidental ingestions by infants and young children were of pesticides and medications in a study conducted among children below 12 years of age.[9] In USA a 5

year retrospective review of poisonings requiring PICU level care at an academic medical center showed that poisoning due to opioids and atypical antidepressants are on the rise.[10] In Romania investigators found pediatric poisoning as a serious health issue with 37.3% of pediatric patients treated in emergency department for poisoning, including medication (35%), alcohol (26%), chemical products (19%) and carbon monoxide (14%).[11]
In Nigeria, a study conducted at the emergency room of a teaching hospital revealed that kerosene is the major agent of poisoning followed by medicines, insecticides and caustic soda.[12] Kerosene oil poisoning, pyrethroid based mosquito repellants and organophosphrus pesticides are some of the most commonly encountered ingestions among children in India.[2] [13] Accidental poisoning in children decreased in many developed countries due to introduction of strict regulatory policies. These may include changing the patterns of drug prescriptions, packaging of dangerous drugs and chemicals being made safer, and altering the appearance and smell of dangerous substances like hydrocarbons.[8] In India and some other countries restricting sales of pesticides for occupational uses showed a decrease in the suicide rate and overall mortality resulting from these agents.[14] This study was conducted to find out the pattern of accidental childhood poisoning in Srinagar and its northwestern suburbs and compare it with what occurs elsewhere in India.

Materials and Methods

This was a retrospective study that involved the children admitted to the Emergency Paediatric Unit of the SKIMS Medical College Hospital, Srinagar from July 2016 to June 2018. This tertiary institution provides basic and tertiary health care to residents of Srinagar city as well as other cities and rural areas around it. Srinagar is an urban area with most inhabitants living on local businesses, tourism and handicrafts. There are few industries within and around the city. There are many surrounding villages whose main occupations are farming and trading.

Before the commencement of the study, ethical clearance was sought and obtained from the hospital's Ethics Committee. The admission registers were used to identify all the children who presented with complaints of accidental ingestion of the substance. After that, the case records of the identified children were extracted from the records and necessary data obtained. Information obtained included child's age, sex, residence whether rural or urban, date of presentation, poison ingested, the duration between ingestion and presentation and home remedy or treatment received at the medical facility before reaching to our hospital. Furthermore,duration of admission, symptoms and signs as well as the outcome of treatment were obtained. The place of ingestion and the cause of ingestion, whether accidental or suicidal was also checked. The treatment received and the ultimate outcome was also seen. The information was analyzed using SPSS version 19, 2010 (IBM Inc., Chicago, Illinois, USA). The analysis was mainly descriptive and results presented as prose and tables. Pearson's Chi-square was used to test for significance at a *P* value level of 0.05.

Results

A total of 40533 children presented to the pediatric emergency ward during the 2-year period, of which, 154 were cases of childhood poisoning that needed hospitalisation. This gives a prevalence rate of 380 per 100,000 children. Most of the children were below 3 years or above 12 years of age. Males were more affected, with a male:female ratio of 1.36:1. Table 1 shows the age and sex distribution of the subjects. Most (72.7%) of the children came from rural areas.

Table 1: Age and sex distribution of patients

AGE	MALE	FEMALE	TOTAL (Percent)
0-12 MONTHS	4	6	10(6.49%)
12-23 MO	19	9	28(18.18%)
24-35 MO	21	9	30(19.48%)
36-47 MO	8	4	12(7.79%)
48-59 MO	9	3	12(7.79%)
6yr-12yr	10	2	12(7.79%)
12yr-19yr	18	32	50(32.46%)
Total	89	65	154

Organophosphorus insecticides (44.80%) were the most common agents responsible for poisoning in both rural and urban populations. This was followed by rodenticides that constituted 16.23% and hydrocarbon compounds mainly kerosene(13.63%). Medications comprised the fourth most common group (11.68%).

Table 2: Substances responsible for the accidental poisoning

AGENT	FREQUENCY	PERCENTAGE	RURAL	URBAN
Organophosphorus	69	44.80%	49	20
Hydrocarbons	21	13.63%	13	8
Rodenticide	25	16.23%	19	6
Medications	18	11.68%	13	5
Non corrosive cleaner	3	1.94%	3	0
Corrosive cleaner	3	1.94%	3	0
Fertilisers	2	1.29%	2	0
MISCELLANEOUS	13	8.44%	10	3

Table 3 shows the various interventions applied before the presentation. Of the 154 cases of poisoning, only 73 (48.41%) had information on home intervention before the presentation. Salt water ingestion(37.66%) and induction of emesis (6.49%) were the most commonly used interventions before presentation.

Table 3: Home interventions done before presenting to our hospital

INTERVENTION	FREQUENCY	PERCENTAGE
Induction of emesis	10	6.49%
Ingestion of milk	5	3.24%
Ingestion of salt water	58	37.66%
None or not known	81	52.59%

Respiratory features predominated and include cough, fast and difficulty in breathing as well as abnormal chest findings on examination. Other presenting features include vomiting and diarrhea, drooling of saliva and difficulty in swallowing, restlessness, weakness, and fever. One child presented with loss of consciousness while another presented with dyskinesia. Table 4 shows the interval duration between the ingestion of the poison and presentation in the hospital.

Table 4. Duration between ingestion and presentation

Time (in hours)	Number of patients
<2 hours	65
2-12 hours	82
12-24 hours	7
>24 hours	0

All the patients who presented from urban areas came directly to our hospital. However among the 112 patients coming from rural areas, only 96 (85.7%) had sought treatment at their local health facilities.

Table 5 shows the treatment received by these patients before coming to our hospital.

Intervention	No. of patients
Induced vomiting	61
Nasogastric tube lavage	25
Antidote	49
Intravenous fluids	66
Airway secured	Nil

Table 6: Cause of ingestion of poisons

Age	Accidental	Suicidal

	ingestion	ingestion
0-10 yrs	96	2
10-19 yrs	4	52
Total	100	54

96 patients had consumed the poisonous substance accidentally whereas the remaining 58 had consumed with a suicidal intent. All except two of the patients with suicidal poisoning were adolescents. The two children with suicidal poisoning were 8 and 9 yrs years old and both had consumed organophosphrus compounds. Most of the accidental ingestions were in younger age groups. Only 4 of them were adolescents among whom one was a mentally retarded 15 years old adolescent. Two had consumed fruits contaminated with organophosphorus compounds and one had applied organophosphorus to her hair for pediculosis(lice).

Table 7: treatments received by patients in our hospital

Treatment Received	Number of pts	Discharged	Picu referral
OBSERVATION ONLY	13	13	0
STOMACH WASH	55	48	7
ANTIDOTE	85	78	7
SUPPORTIVE CARE	154	154	10
ANTIBIOTICS	19	13	10

Among the adolescent children who attempted suicide 37 percent consumed the poison after a quarrel with someone at home, 18.5 percent said they had been scolded by elders in the family, 25 percent attempted suicide after academic underachievement, 9.25% reported bullying and 16.6% reported stress related to exams.

Table 8: Trigger for suicidal attempt among adolescents

Trigger for suicidal intent	Number of patients (n=54)	Percentage
Quarrel	20	37.03%
Scolded	10	18.51%
Academic underachievement	14	25.92%
Bullying at home	5	9.25%
Stress during exams	9	16.66%

Table 9: Place of ingestion of poison among children (0-10 years) with accidental poisoning

Place	Number (n=100)	Percentage
Home	64	64%
Playground	16	16%
Fields	14	14%
Unknown	6	6%

The young children who had consumed the poisonous substances had ingested mostly at home(44%). Sixteen percent of the children had ingested at playgrounds and 14 percent had ingested at fields. In six percent the place of ingestion could not be ascertained.

Among all these patients who were hospitalised for poisoning only two patients died giving a mortality rate of 1.29 percent patients. One had consumed organophosphorus compound whereas another had consumed rodentide. Both the patients were adolescents who had consumed large amounts of poison with a suicidal intent.

Discussion

The paediatric age group comprises all the children from birth till 19 years of age. Among all the cases of ingestion of potentially toxic substances most are seen in the paediatric age group. All over the world, accidental childhood poisoning is an important paediatric emergency. The frequency and pattern of poisoning can vary between different places, depending on the environmental factors. In this study, it accounted for 7.73% of the emergencies seen in the pediatric emergency ward at the SKIMS Medical College Hospital. This rate is very high as studies from other parts of india show poisoning cases constituting as low as 0.6 percent of pediatric ED visits.[15] Another comparative study showed that in a community hospital the percentage was 1 % compared to 2.3% in a tertiary care hospital. [16] Data from other developing countries like Turkey and Pakistan with values of 0.34% and 0.58% respectively also show a lesser morbidity due to poisoning cases.[17][18] It is also similar to what obtains in developed countries like the United States where the rate is about 0.43% was reported in hospital emergency room presentations in 2004.[19] The figure is however in accordance with a study from Saudi Arabia where value was found to be 7.2%[20] In our study, these figures may be higher as compared to other countries because of the lack of better healthcare facilities in the rural areas because of which most patients have to seek treatment from tertiary care. Like in all other similar studies[3 4 5 6 7 8 18 19 20], male children were more affected than female children. This may be related to the more aggressive and inquisitive nature of male children. In contrast, the adolescent age group comprised mainly of the female population. This is related to the globally higher incidence of attempted suicide in adolescent females than males.[21] Toddlers were affected most as they are still the explorative phase of learning and do so by putting things into the mouth. This is also in agreement with most other studies.[4 5 6 18]

The nature of the substance ingested reflects what is commonly found in the child's environment. In this study, organophosphorus compounds were by far the most common agents responsible for accidental childhood poisoning. Being a predominantly agricultural province, availability of pesticides is common among households. This finding is similar to studies from india and Egypt[9] (zagazig) and Nigeria[22] (shwe) Among the children less than 10 years of age kerosene ingestion was the second most common. Kerosene is found in most homes in Kashmir as it is a commonly used fuel for cooking. It is mostly available as a a bluish coloured fluid and mostly is stored in soft drink bottles in homes. Other studies from India have also reported kerosene, organophosphorus pesticides and rodenticides as the most common agents responsible for poisoning. [2, 24] Our findings are different from studies in Nigeria,[5] Pakistan[18] and Saudi Arabia [20] which found kerosene to be the most common substance causing accidental childhood poisoning. In Turkey[17] and United States[19], medications were the most common agent of accidental childhood poisoning. Organophosphates in form of pesticides and insecticides as well as medications such as

paracetamol, antibiotics and antiepileptic drugs, household agents such as bleach, soap, disinfectants as well as cosmetics were among the agents of poisoning in children from our study. These reflect the nature of objects of interaction between the child and his/her environment. Dhatura (*Datura stramonium*) poisoning was also seen in some patients as this plant is a commonly growing weed in unused lands all over the Indian subcontinent. The seeds as well as flowers of the plant are poisonous and children consume it owing to its attractive appearance. It produces typical anticholinergic symptoms and children often present with delirium. This poisoning has been reported by many studies from the Indian subcontinent.[2] Caustic soda poisoning has also been documented from other parts of India.[23] Unlike some other Indian studies [2] where alcohol featured prominently as a cause of childhood poisoning, no case was due to alcohol in our study. This may be due to the fact that 96 percent of population in this province belongs to a religion that forbids alcoholic drinks. There were however two cases of tobacco ingestion, which is very commonly available here. This points towards the sociocultural and religious connection between childhood poisoning and its causative agents. In India, there are no proper functional regulatory policies for secured packaging of dangerous household chemicals, use of childproof container for prescription drugs. Furthermore, the easy access to medications which are easily purchased over-the-counter makes them readily available in homes.

Most mothers and caregivers usually resort to the administration of salt water and induction of emesis as a first aid treatment which may cause aspiration and thereby making an asymptomatic child symptomatic or worsen an already bad situation. This practice may also delay presentation. In this study, a higher proportion presented between 2 and 12 h, by which time symptoms may have manifested. The symptoms depended on the agent of poisoning and the type of injury to the tissues. The severity of symptoms could be significantly influenced by the type of home remedy used as well as the interval between accident and admission.[24] Respiratory symptoms predominated as a result of the high prevalence of organophosphorus and kerosene poisoning, which usually results from pneumonitis from inhalation or aspiration of this volatile hydrocarbon. The greatest morbidities were from the two cases of caustic soda ingestion, which resulted in several surgical interventions. The only deaths were as a result of organophosphorus poisoning and rodenticide poisoning which were also related to late presentation and ingestion of larger amounts of the substance. The mortality rate in our study was 1.29%. this is similar to that found in other parts of india.[25] Higher mortality rates have been reported by some other studies but most of these have accounted for the mortality rate in PICU only.[26 27]

CONCLUSION

Accidental childhood poisoning is common in Kashmir, just like in many other regions of the country, with some differences in the pattern when compared to some other regions. There is thus, the need for public enlightenment on the proper storage of organophosphorus pesticides, rodenticides and kerosene oil as well as the need for immediate presentation if accidental ingestion occurs. Also there should be emphasis on educating the parents about the potential of fatal poisoning among young kids if they are not properly looked after in the home and outside home. There is also the need to discourage the use of home remedies that may cause both delay in presentation and worsening of symptoms. We strongly advocate for regulatory policies on safer ways of keeping dangerous household chemicals and drugs to reduce the morbidity and mortality associated with childhood accidental poisoning. We also advocate eliciting child/parent psychosocial histories adequately and whenever a pediatric health professional notices any adverse information, especially from adolescents he should consider suicide potential and the need for emergency mental health assessment. From this study we

have made these proposals to reduce/prevent childhood poisoning; however, if these strategies are really effective has not been directly demonstrated, which is inherent to the observational study. Further studies are needed to confirm effective strategies to prevent and treat pediatric poisoning.

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