Original Article

Corrosive Ingestion in Children

Frequency, Types and Immediate Outcome of Corrosive Ingestion in Children

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ABSTRACT

Objective: To determine the frequency, types of common corrosives ingested & assess their immediate outcome in terms of survival, admission to intensive care unit and mortality in children presenting with acute poisoning.
Study Design: Cross-sectional study.
Place and Duration of Study: This study was conducted at the Department of Pediatric Medicine, National Institute of Child Health, Karachi, from 6 Oct 2010 to 5 Apr 2011.
Materials and Methods: A total of 105 children with history of ingestion of poisoning substance were enrolled in the study after informed consent on justification of inclusion and exclusion criteria. Children were evaluated for frequency of corrosive ingestion and the type of corrosive substance ingested. Immediate outcome in terms of discharge, admission within 24 hours and death were also recorded. The data was analyzed by using SPSS version 16.
Results: Mean age of children was 3.9±2.9 years including 56(53.3%) males and 49(46.7%) females. Corrosive ingestion was found in 14 (13.3%) of children. Ingestion of sodium hypochlorite was found in 8 (57.1%) children followed by NaOH in 4 (28.6%) and sulphuric acid in 2 (14.3%) children. Ten (71.4%) of the children were discharge from ED while 3 (21.4%) children admitted in ICU and 1 (7.1%) child was died. Although the frequency corrosive ingestion with respect to age and gender was insignificant (P-value>0.05).
Conclusion: Proportion of corrosives ingestion was high (13.3%) in this study. Sodium hypochlorite was the most common corrosive substance ingested while sulphuric acid was the least common. Regarding the outcomes, survival rate was high (92.9%) with relatively high death rate 7.1%.
Key Words: Corrosive ingestion, Acid, Alkali, NaOH

Citation of article: Bashir A, Abid k, Baig NN, Parkash O. Frequency, Types and Immediate Outcome of Corrosive Ingestion in Children. Med Forum 2017;28(6):84-87.

INTRODUCTION

An unsafe environment is a substantial risk factor for child injury and violence. In this manner speaking to a huge reason of child death and disability especially in developing countries, where 95% of all youngster injury deaths occur.[1,2] Among those injuries that are caused by an hazardous situation, the accidental ingestion of corrosive substances is declining in high-income countries3–5 but not in developing countries,[6] where it is very huge, particularly among uneducated individuals with poor financial status.
Accidental poisoning was found in 41.8% of children, 86.5% cases were found to use the poison orally where as 13.4% of cases were found due to inhalation.

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Received: April 01, 2017; Accepted: May 04, 2017

Half of the poisoning cases (50.7%) had to be admitted because of their seriousness but 37.3% were discharged from emergency after emergency treatment.[7]
Corrosive ingestion in a local study was found to be 11% in children attending emergency of a tertiary care hospital.[8] A three year study from 2005-2008 showed that among the children with corrosive ingestion the age range was 14 months to 15 years, 58.4% were male and 41.6% females, there were 19.6% of admission within 24 hours and the rest 80.4% discharged after giving emergency treatment and only 2(6.8%) died.[9] In a study by Al-Binali et al, reported that mean age of patients was 28 ±20 months. Different types of corrosives were encountered. The most common type were sodium hypochlorite (Bleach) in 50%[10] caustic soda (NaOH) 48% and sulphuric acid 39%.[11]
The present study is planned to estimate the burden of corrosive poisoning its type and immediate outcome, so that the data generated could be used for planning and resource allocation for management and awareness program so as to cut down its morbidity and mortality.

MATERIALS AND METHODS

This cross-sectional study was carried out at the Department of Pediatric Medicine, National Institute of Child Health, Karachi, from 6 Oct 2010 to 5 Apr 2011. The sample size was calculated by using WHO sample

size calculator, based on frequency of corrosives ingested as 11%[8], margin of error as 6%, n= 105 children. Non- probability consecutive sampling was done. All pediatric patients of 6 months to 12 years of age of either gender with history of acute poisoning were included in the study. Patients with known other substance like drugs, kerosene oil ingestion, organ phosphorus poisoning, animal or insect bite were excluded.

Approval from ethical committee and an informed consent from the attendant were taken. All children brought to the emergency department of National Institute of Child Health fulfilling the inclusion criteria were included in the study. Children were labeled as a case of Corrosive ingestion and the type of corrosive substance ingested. Immediate outcome in terms of discharge, admission within 24 hours and death was also being recorded at 24 hours. These findings along with the demographic data were recorded in proforma.

All the data were analyzed through Statistical Package for Social Sciences (SPSS) version 16. All quantitative variables were presented as mean and standard deviation while qualitative variables were presented as frequency and percentages. Chi square test was applied with 95% confidence interval & p-value≤0.05 was taken as significant.

RESULTS

A total of 105 Children brought to the emergency department of National Institute of Child Health with history of ingestion of poisoning substance from 6 months to 12 years were included in the study. Out of 105 children, 56 (53.3%) were male and 49 (46.7%) were female. The Mean±SD of children age was 3.9±2.9 years. Majority 72 (68.6%) of children had age between 1–5 years (Table 1).

Table No.1: Characteristics of Children (n=105)

Characteristics	No. of children (%)
Gender Male Female	56(53.3%) 49(46.7%)
Age in years (Mean±SD)	3.9±2.9years
Age Groups <1 years 1-5 years >5 years	19(18.1%) 72(68.6% 14(13.3%)

Table No.2: Mean volume ingested & time from ingestion to presentation to emergency (n=14)

	Min - Max	Mean ±SD
Estimated Volume Ingested (ml)	10-50	25.3 ±16.4
Time from Ingestion to Presentation to Emergency (Hours)	1.4 – 4.5	2.6 ±0.90

Table No.3: Immediate outcome of children with corrosive ingestion (n=14)

Outcomes	No. of children (%)	Time from ingestion to presentation to emergency (Mean ±SD)
Discharged Admit in ICU Died	10(71.4%) 3(21.4%) 1(7.1%)	2.3±0.7 2.9±1.2 4.2±1.5

Table No.4: Stratification of corrosive ingestion with respect to age and gender

Variable				P-value
Age	**<1 year** 2(10.5%)	**1-5 years** 11(15.3%)	**>5 years** 1(7.1%)	0.661
Gender	**Male** 9(16.1%)		**Female** 5(10.2%)	0.378

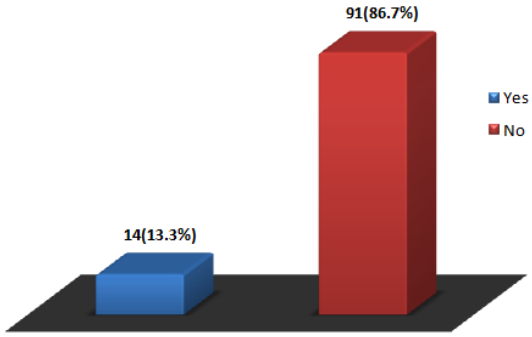

Figure No.1: Corrosives ingested (n=105)

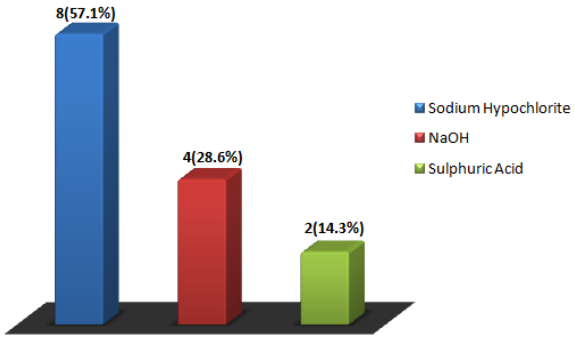

Figure No.2: Mean volume ingested & time from ingestion to presentation to emergency (n=14)

However 14 (13.3%) children were ingested corrosive substances while 91 (86.7%) of children ingested non-corrosive substances (Fig. 1). Sodium hypochlorite was the most common corrosive substance ingested in 8(57.1%) of children followed by NaOH in 4(28.6%) children and 2(14.3%) of children ingested sulphuric acid (Fig. 2).

Mean±SD of estimated volume ingested was 25.3 ±16.4 ml range from 10 – 50 ml while mean time from Ingestion to presentation to emergency 2.6 ±0.90 hours range from 1.4 – 4.5 hrs(Table 2).

Most 10 (71.4%) of the children with corrosive ingestion were discharge from emergency department while 3 (21.4%) children were admitted in ICU and 1 (7.1%) child was died. Mean time from ingestion to presentation to emergency according to immediate outcomes is shown in (Table 3).

Frequency of corrosive ingestion with respect to age & gender is shown in (Table 4). 9 (16.1%) children were male and 5 (10.2%) female. Frequency of corrosives ingestion was high in age between 1 – 5 years i.e. 11 (15.3%). However, corrosive ingestion with respect to age & gender are statistically in insignificant (P-value>0.05).

DISCUSSION

In children, corrosive substance injury is an important health problem that can cause severe complications and even death affecting upper gastrointestinal system, mainly esophagus, and adjacent tissues.[13] Generally, it occurs in pre-school childhood, but newborn cases with higher morbidity and mortality has also been reported.[14] More than 100,000 cases in children per year were reported in the USA[15] and thousands developed morbidity or mortality. The incidence is still under reported in Thailand. Children under the age of 5 years are most likely to unintentionally ingest these toxic agents.[16,17] They are prone to this incidence due to their unawareness of danger and their nature of curiosity. Most of the ingested agents are alkali and only about 20% are acidic agents.[17] According to Nuutinin et al, [18] the acidic agents cause burn injuries more often than alkali which more often develop into scars which is a result of coagulation necrosis of the tissue in contact. Severity may vary from no injury to a fatal outcome. One of the most important complications of corrosive acid injuries is gastric outlet obstruction.

In this study, 105 children with history of acute poison were included from emergency department over a period of six months. The mean age of cases was 3.9 (±2.9) years; the most frequent age of ingestion was between 1-5 years. 86.7% of children were under 5 years old. In a study by Al-Binali et al, reported that mean age of patients was 28 ±20 months.[10] Male to female ratio was found close to each other. Although corrosive ingestion has been reported a bit more frequently in boys, generally gender distribution is equal in the world.[19]A three year study from 2005-2008 showed that among the children with corrosive ingestion the age range was 14 months to 15 years, 58.4% were male and 41.6% females. [9]

Out of 105 children of acute poison, corrosive poisoning was seen in 13.3% children with mean age 3.5 (±2.3) years. Corrosive ingestion in a local study was found to be 11% in children attending emergency of a tertiary care hospital.[8] A study from Lahore reported corrosives poisoning in children was 23%.[20]

In a study from Hyderabad reported corrosive poisoning was 1.61% child who ingested detergent powder and presented with nausea.[21] A Brazilian study was reported the corrosive poisoning in children was 6.1%.[22]

Sodium hypochlorite was the most common corrosive substance ingested by 57.1% of children followed by NaOH in 28.6% children and 14.3% of children ingested sulphuric acid in this study. These results are in accordance with other national and international studies. A Saudi Arabian study reported the most common type was sodium hypochlorite (Bleach) in 50%[10] while a study from Nigerian reported that caustic soda (NaOH) 48% and sulphuric acid 39%.[11] In another study Bleach was the most ingested CS with the rate of 45.3% while NaOH was found in 10.8% of children.[23]

Regarding outcomes 71.4% of the children with corrosive ingestion were discharge from emergency department while 21.4% children were admitted in ICU and only one (7.1%) child was died. A study from Lahore reported that out of 70 children with corrosive admitted in emergency, 95.7% were discharged and only 4.3% expired. [24]

Another study from Lahore also reported that 91% of 22 children aged less than 15 years exposed to poisons were discharged due to immediate response of the parents and 9% children were dead this death rate is high as compare to this study.[20] Discharged rate reported in study from Hyderabad was 85.5% with 3.2% death rate.[21]

Death rate in different studies reported from Turkey was 0.4% that is much lower than in this study and in Indian study it was 4.66% that is also lower than in this study.[25,26] In Lahore and Multan revealed mortality rates were 8% and 15% respectively. [27,28] Results can be enhanced, by distinguishing the substance ingested, route of exposure, amount of time poison was since ingested, signs and symptoms and any related disease or injury, the name of item and quality, immediate access to emergency medical services (EMS).

In brief accidental corrosive ingestion is still one of the tragic incidences in children especially in developing countries, as the result of poor education and other socioeconomic problems. Other than the potential damage both physical and mental to the child, it leaves a permanent scar in the hearts of the parents. Therefore, no treatment in any modality is better than prevention. Education of parents, adequate storage of potentially hazardous substances and satisfactory parental supervision could be the most critical activities for prevention of childhood poisoning.

CONCLUSION

Proportion of corrosives ingestion was high (13.3%) in this study as compare to other national and international studies. Sodium hypochlorite was the most common corrosive substance ingested while sulphuric acid was

the least common corrosive ingestion. Regarding the outcomes in children with corrosives ingestion, survival rate was high (92.9%) with relatively high death rate (7.1%). To improve public awareness in this respect, Childproofing home and educational programs from the Ministry of Health and other Non-Governmental Organizations could be the most effective prevention methods to decrease morbidity and mortality from accidental poisoning in children.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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