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THE CLINICO-DEMOGRAPHIC PATTERN AND OUTCOME OF ACUTE CHILD-HOOD POISONING.

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ABSTRACT… Acute poisoning in children is the third most common emergency with significant economical burden. This study was carried out to elucidate the clinical and demographic pattern and outcome of acute poisoning in children at local University Hospital of South Punjab. **Study Design:** Retrospective study. **Setting:** Pediatric Medicine Department of Nishtar Medical University, Multan. **Period:** January 1st – December 31st 2016. **Materials and Methods:** This one year hospital based study included 74 children up to 12 years admitted with acute poisoning. The data was extracted from clinical charts. Clinical, demographic and outcome data was extracted and analyzed. Mean and standard deviation are calculated for continuous variables and frequencies with percentages for categorical variables. The data is presented in tables and figures. **Results:** A total of 74 children with poisoning were admitted during study period (total admission–3107) giving annual incidence of 2.38 %. Males predominated (n=49, 66 %) the study population. Fifty four percent (n=40) of the children were in 13 – 59 months age group. Majority of the children were admitted due to accidental poison ingestion (n=65, 87.8%), through emergency (n=68, 92%) department, brought from urban areas (n=38, 51.4%), and within 1 hour of exposure (n=41, 55.4%). Most common poisons ingested were pesticides (n=29, 39%), kerosene oil (n=13, 17.57%) and Paraphenylene diamine (Kala pathar) (n=11, 14.86%). Most common system specific symptoms belonged to cardiovascular system (54 %) followed by nervous system (51 %) and respiratory system (42 %). Median hospital stay of the poisoning cases was 2 days (min. 1, max. 17). Poisoning associated mortality rate was 16.2 % (n=12). Kala pathar ingestion was the only significant factor associated with mortality (p-value 0.04). **Conclusion:** Accidental ingestion of non – pharmacological agents at home is most common in children < 5 years of age at our set – up. Mortality rate due to acute poisoning is high in children. Parents education for safe placement of poisoning agents, set – up of regional poison control centers and healthcare workers training on management of such cases will help curtailing this problem.

Key words: Children, Kerosene, Organophosphates, Paraphenylene Diamine, Poisoning.

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INTRODUCTION

Inhalation, ingestion, injection or absorption of a toxic substance leading to destruction or injury of the cells defines the poisoning.[1] Both accidental and intentional poisoning in children is an important public health problem and constitutes fourth major cause of injury after road traffic injury, fires and drowning.[2] Curious and exploring nature of young children along with mental immaturity in adolescents makes them more vulnerable to acute poisoning.[3] According to World Health Organization estimates, fatal childhood poisoning cases in South East Asia occur at the rate of 1.7 / 100,000 population. Acute childhood poisoning in children and youth less than 20 years caused more than 45,000 deaths in 2004.[1]

Over the counter medications (iron, anti-inflammatory drugs), prescription medications (antidepressants, antihypertensive drugs), household products (bleach, cleansing agents), fuels (kerosene oil) and pesticides are some of the commonest poisoning agents in children.[3] The nature of toxic agent, its formulation, amount and route of exposure, nutritional status and age of the victim and underlying conditions are the factors determining the severity and outcome of acute poisoning.[4] Time lapse between exposure

and treatment along with availability and use of specific antidote also determines the outcome of poisoning cases. Disparity in socialization has put males at higher risk of poisoning compared to females throughout the world. Medicinal drugs are the major cause of poisoning in middle to high – income countries whereas ingestion of fuels like kerosene oil is common in low – income countries.[5]

Successful treatment of acute poisoning in children is challenging when substance is poorly identified, delay in seeking medical care, non-availability of trained poison control and management department and specific antidote.[6] This study was carried out with the objectives to establish the childhood poisoning burden, common pattern and outcome. This data will be helpful in assisting emergency departments on proper management of poisoning cases as well as instituting effective preventive measures at community level.

MATERIALS AND METHODS

We retrospectively reviewed the hospital charts of 74 children ≤ 12 years of age, with poison exposure, who had been treated at Department of Pediatrics Nishtar Hospital Multan during the period of January – December 2016. We defined "Poison exposure" as accidental or intentional ingestion of a pharmaceutical or a non – pharmaceutical substance that caused toxic response. Children with foreign body ingestion (i.e. batteries, coins and plastics) and insect bites including snake bite were excluded from the study.

For each patient we extracted data on age, gender, area (rural, urban) of residence, date of poison exposure, place (home, outside home) of poison exposure, type of poison ingested, reason (as described by parents/guardian–accidental, intentional) of poison ingestion, duration of poison ingestion to presentation at hospital, clinical presentation, duration of hospital stay and the outcome. We grouped clinical presentation on the basis of major organ system involved i.e. (a) Gastrointestinal symptoms (nausea, vomiting, abdominal pain); (b) Neurological symptoms (altered level of sensorium, seizures, headache); (c) Respiratory symptoms (cough, fast breathing, chest indrawing); (d) Cardiovascular symptoms (hypo/hypertension, brady/tachycardia and (e) Others (local burns, bleeding/bruising, tissue swelling, anaphylaxis).

Poisons were grouped under two major categories of pharmaceutical or non – pharmaceutical agents. The pharmaceutical group contained (a) Analgesics i.e. non-steroid anti-inflammatory drugs, acetaminophen; (b) CNS acting agents i.e. anticonvulsants, hypnotic/anxiolytic agents; (c) cardiovascular system drugs i.e. antihypertensive drugs; and (d) Nutrient agents i.e. iron. Non-pharmaceutical group included (a) Cosmetic agents i.e. hair dye, lotions; (b) Pesticides i.e. organophosphates, rat poison, wheat pills; (c) Cleansing agents i.e. bleach and detergents and (d) Kerosene oil.

The study was approved from institutional Ethics and Research committee. The data was entered in and analyzed through Statistical Package for Social Sciences (SPSS version 20). We calculated mean ± standard deviation for continuous variables like age, duration of hospital stay and interval between poison ingestion and hospital presentation. For qualitative variables like area of residence, type of poison, reason for ingestion and symptoms on presentation we calculated frequency and percentages. We used figures and tables to present the results.

RESULTS

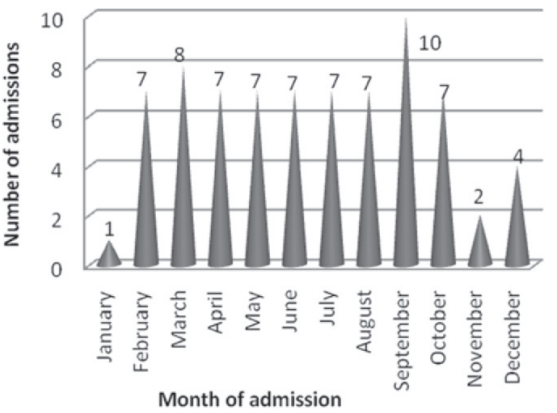
During one year study period (January–December 2016) 74 children were admitted due to acute poisoning. Annual incidence of acute poisoning was 2.38 % (total admissions 3107). The study population was dominated by male children (n=49, 66.2%). Median age of the children was three years (min. 7 month, max. 12 year). Eight percent of the children (n=6) were ≤ one year of age, 54 % were between 13–59 months, 32% between 5–10 years and only 5.4 % were > 10 years of age. Children brought from urban area were 51.4 % (n=38) whereas 48.6 % (n=36) belonged to rural area. Predominant mode of

admission was through emergency department (n=68, 91.9%), 6.8 % cases (n=5) were referred after first aid therapy and only one case was admitted through outpatient department Table-I. Highest number of poisoning cases were admitted during the month of September (n=10) followed by March (n=8) and least cases admitted during January (n=1) followed by November (n=2) and December (n =4) Figure-1. Median duration of hospital stay was 2 days (min. 1, max. 17 days). Sixty five percent of the cases (n=48) successfully survived the episode of poison ingestion and were discharged, 19% (n=14) were referred and 16% (n=12) cases expired Table-I.

Poison ingestion was accidental in 87.8 % (n=65) and intentional in 12.2% (n=9) of the cases. Poisoning agent was located in home in 81.1% (n=60) and outside home in 18.9% (n=14) of the cases. In 79.7% (n=59) of the cases poisoning occurred due to ingestion of non–pharmacological agent whereas pharmacologic agents were ingested in 20.3% (n=15) of the cases. Most common non–pharmacologic agent was pesticide (organophosphate) (n=29, 49.15%) followed by Kerosene oil (n=13, 22.03%), Paraphenylene diamine – Kala pathar (n=11, 18.64%) and cleansing agents (n=6, 10.17%). Most common of the pharmacological agent were central nervous system agents 40 % (n=6) followed by cardiovascular agents, metabolic agents and analgesics agents (n=3, 20% each) Table-II.

Forty one cases (55.4%) presented at hospital within one hour of poison ingestion, 25 cases (33.8%) between 1 – 3 hours, five cases (6.8 %) in 3 – 6 hours and only three cases (4.1 %) more than 6 hours. Most common category for presenting symptoms was miscellaneous (55.4%) that included local burns, bleeding / bruising, tissue swelling and anaphylaxis followed by CVS symptoms (54.1%), CNS symptoms (51.4%) respiratory symptoms (41.9%) and gastro-intestinal symptoms (37.8%) Table-II. CNS agents most commonly presented with nervous system symptoms (100%) i.e. altered level of consciousness, headache and seizures followed by cardiovascular symptoms (50%) i.e. impairment of heart rate and blood pressure and respiratory symptoms i.e. impaired breathing. Cardiovascular agent ingestion presented with CVS symptoms (100%) and analgesic agent ingestion with GI symptoms (100%) only. Metabolic agent ingestion presented with both CNS and GI symptoms (100%). Ingestion of cleansing agents presented with GI symptoms and local burns and tissue swelling (100%). Kerosene oil ingestion presented with respiratory symptoms (100%) i.e. cough, chest in drawing and rapid breathing. Ingestion of pesticides presented with multisystem involvement dominated by CNS symptoms (86%) and CVS symptoms (79%). Similarly ingestion of Paraphenylene diamine (Kala pathar) affected CVS, respiratory system and local tissue burn / swelling and anaphylaxis (100%) Table-III. Mortality was significantly higher in children with Kala pathar ingestion (p-value 0.04). Age, gender, area of residence and duration of exposure before reaching hospital were not significantly associated with mortality Table-IV.

Fig. 1 - Monthly admission of Acute poisoning cases (N=74)



DISCUSSION

Due to inquisitive and explorative nature, the surroundings of children can be hazardous owing to unintentional ingestion of poisonous substances. Aim of our study was to enlighten the clinical and demographic spectrum and outcome of acute poisoning in children presenting to tertiary care hospital in South Punjab. Total 74 children were admitted with acute poisoning in one year study period.

Variable	Frequency (%)
Age (Year, median)	**3.0 (min. 7 month, max. 12 year)**
7 – 12 months	06 (08.1)
13 – 59 months	40 (54.1)
5 – 10 years	24 (32.4)
> 10 years	04 (05.4)
Gender	
Male	49 (66.2)
Female	25 (33.8)
Area	
Urban	38 (51.4)
Rural	36 (48.6)
Mode of admission	
Emergency	68 (91.9)
Referred	05 (06.8)
Outpatient dept.	01 (01.4)
Duration of exposure*	
Within 1 hour	41 (55.4)
1 – 3 hours	25 (33.8)
> 3 – 6 hours	05 (06.8)
> 6 hours	03 (04.1)
Reason of poison ingestion ^	
Accidental	65 (87.8)
Intentional	09 (12.2)
Location of poisoning agent ^	
Home	60 (81.1)
Outside home	14 (18.9)
Duration of hospital stay (days, median)	2 (min. 1, max. 17)
Outcome	
Discharged	48 (64.9)
Referred	14 (18.9)
Expired	12 (16.2)

Table-I. Demographic characteristics of children admitted with acute poisoning (N=74)
***Interval between poison ingestion and presentation at hospital ^ Reported by parents**

Type of Poison	n (%)
A. **Pharmacological agents**	**15 (20.3)**
i. Nervous system agents	6 (40.0)
ii. Cardiovascular system agents	3 (20.0)
iii. Metabolic agents	3 (20.0)
iv. Analgesic agents	3 (20.0)
B. **Non-pharmacological agents**	**59 (79.7)**
i. Pesticides (Organophosphates)	29 (49.2)
ii. Kerosene oil	13 (22.0)
iii. Paraphenylene diamine (Kala pathar)	11 (18.6)
iv. Cleansing agents	06 (10.2)
Clinical Presentation	
CNS symptoms	38 (51.4)
CVS symptoms	40 (54.1)
Respiratory symptoms	31 (41.9)
GIT symptoms	28(37.8)
Miscellaneous symptoms	41 (55.4)

Table-II. Type of poison and clinical presentation of acute poisoning cases (N=74)

Symptoms / Type of Poison	CNS Symptoms	CVS Symptoms	Respiratory Symptoms	GIT Symptoms	Miscellaneous Symptoms
Pharmacologic Agents					
CNS agent (n=6)	6	3	3	0	0
CVS agent (n=3)	0	3	0	0	0
Metabolic agents (n=3)	3	0	0	3	0
Analgesic agents (n=3)	0	0	0	3	0
Non-pharmacologic Agent					
Cleansing agent (n=6)	0	0	0	6	6
Pesti-cides (n=29)	25	23	4	15	24
Kerosene oil (n=13)	0	0	13	1	0
Paraphenylene diamine (Kala pathar) (n=11)	4	11	11	0	11

Table-III. Distribution of symptoms according to Poison type in Acute poisoning cases(N = 74)

The annual incidence of acute poisoning in our study was 2.38% which almost matches with the incidence reported in other studies.

Our study population was dominated by male children as was in other studies showing general tendency to be more prevalent in male children.[7] Cultural and social factors contribute towards this aspect e.g. less family care and vigilance for male children leading to increased liberty in their routine activities with lesser supervision.[8] Majority of the cases was between 13-59 months of age followed by 5-10 years of age. In previous studies, acute poisoning has been observed more in children aged up to 5 years and peak at 2 to 3 years of age.[9] As younger age group children are more eager and curious to know things so they are more vulnerable to such mishaps.

Factors	Expired	Dis-charged	p-value*
Age Groups			
< 5 years (up to 59 months)	06	33	0.45
≥ 5 years	06	15	
Gender			
Male	10	33	0.09
Female	02	15	
Area of Residence			
Urban	06	26	0.84
Rural	06	22	
Duration of Poison Ingestion Before Reaching Hospital			
≤ 3 hours	12	42	0.58
> 3 hours	00	06	
Major Poisoning Group			
Pharmaceutical	04	10	0.27
Non-Pharmaceutical	08	38	
Non-pharmaceutical Group			
Cleansing agent	01	03	0.04
Pesticide	02	19	
Kerosene oil	00	11	
Kala pathar	05	05	

Table-IV. Factors associated with mortality in Acute poisoning cases (N = 74)
*** Fisher's exact test is used where cell count was less than expected**

In this study, more percentage of children was from urban area and this is compatible with study conducted by Assar and Hatami.[10] This might be due to hasty life style of mothers in cities adding a factor of child neglect. Highest number of poisoning cases was admitted during the month of September and March in our study which is contrary to the study by Sahin and Carman[11] reporting January as the month with highest numbers admissions due to acute poisoning. We speculate that during months of September and March, intensity of seasonal temperature is less and children are more exposed to outdoor environment.

Fifty five percent of our cases presented within one hour of poison ingestion. A recent study from India reported majority of cases (47.3%) presented between 1-4 hours.[12] Better outcome is related to earlier presentation in emergency. In our study, poison ingestion was accidental in 87.8 % of the cases which is comparable to those reported by Mendonca et al.[8] We found that poisoning agent was located at home in 81.1% of the cases. Home is the place where children spend most of their time before school going age so it becomes the place with greater number of mishaps including poisoning.[13]

Organophosphates (pesticide) constituted most common non- pharmacological agent of poison ingestion in our study. The reason of pesticides being common exposure is that Pakistan is an agricultural country where pesticides are commonly found at homes and children have free access to it. Kerosene oil ingestion was second most common cause of poisoning in the non-pharmacological poison ingestion group. Kerosene oil is used as a common source of fuel and stored in cold drink bottles in kitchens causing accidental ingestion. Similar results were reported from Egypt where common etiological agent for poisoning was pesticides (28.6%), cleaning agents (17%) and petroleum products (13%).[14] Paraphenylene diamine (PPD) is an emerging poisoning agent and third most common non-pharmacologic agent of ingestion in our study (PPD– Kala pathar). PPD also called 'Kala Pathar' is usually mixed with henna and used as hair dye. Its use is frequent due to low cost and easy availability. So when used as suicidal agent or accidentally taken by children, death occurs in 6 to 24 hours owing to arrhythmias and angioneurotic edema. Increasing number of kala-pathar poisoning cases have been recently reported from a CMH and Bahawalpur Victoria Hospital.[15]

In pharmacological agents, most common in our study were central nervous system agents followed by cardiovascular, metabolic and analgesics agents. Alizadeh et al reported that common drugs involved in childhood poisoning cases were methadone, opium and benzodiazepines.[16]

Mortality linked to acute poisoning in children has been documented from 0.8% - 12.5% in several studies.[12,17,18] In our study, 65% cases successfully

survived the episode of poison ingestion and 16 % cases expired. Mortality in children with Kala pathar ingestion was significantly high (p-value 0.04). Having known the outcome status of referred patients (n=14, 18.9%) might have helped fully explaining the factors associated with mortality in acute poisoning.

CONCLUSION AND SUGGESTIONS

Acute childhood poisoning is a common calamity in Pakistan. To curtail the emerging and rapidly increasing cause of morbidity and mortality in children, we suggest the measures of compulsory utilization of child-resistant packaging of drugs & chemicals used at home, removal of toxic plants, keeping bottled kerosene away from children access and special supervision of children in an environment of exposure to poisonous agents.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Muhammad Khalid	Conception & design, Data analysis & interpretation, Drafting, critical revision and final approval of manuscript.	
2	Javaria Rasheed	Data collection & assembly, Data interpretation, Drafting and critical revision of manuscript.