Niger J Paediatr 2020; 47 (3):215 – 220

ORIGINAL

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Accidental childhood poisoning in Paediatrics department of a tertiary care facility: A retrospective review

DOI:http://dx.doi.org/10.4314/njp.v47i3.4

Accepted: 16th April 2020

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Abstract*: Background:* Accidental childhood poisoning is a recognized preventable cause of morbidity and mortality among children worldwide. This study was aimed at determining the prevalence, pattern, and outcome of childhood poisoning among children in Abakaliki, Ebonyi State.
Material and Methods: Medical records of all cases of accidental childhood poisoning admitted into Children's emergency room (CHER) of the health facility of study between January 2014 and December 2018 were retrospectively identified and relevant data extracted and analyzed using SPSS version 22.
Results: Out of the 7,700 children that presented to CHER over a 5-year period, 42 were cases of poisoning, giving prevalence rate of 0.5%. Of the 42 cases, only 20 case notes were retrieved. The male to female ratio was 2.3:1 while the ages ranged between 6months and 14 years with the mean age of 3.06±2.88. Kerosene poisoning had the highest proportion of 50.0% (10/20) with the overall mortality rate of 5.0% (1/20).The relationship between age, place of residence and outcome in poisoned children was statistically significant (p = 0.038, 0.045 respectively).
Conclusion: Accidental childhood poisoning is common in Abakaliki. Kerosene still remained the major agent while male toddlers were most vulnerable. There is need to intensify enlightenment campaigns and education of the public about the hazard of improper storage of kerosene and other implicated substances at home.

Keywords: Accidental poisoning, Childhood, Kerosene

Introduction

Childhood poisoning is a recognized preventable cause of morbidity and mortality among children worldwide.[1] Poisoning may be unintentional or intentional. Unintentional poisonings comprise 80%-85% of all reported cases, whereas intentional poisonings comprise remaining 10%-15%.[2] More than 50% occur in children less than six years old and reflect the propensity for young children to put virtually anything in their mouths. Majority of toxic exposures in children occur in the home involving mainly a single substance.[3] World health organization reported that low income and middle income countries have higher prevalence of childhood poisoning with kerosene, paraffin and pharmaceutical preparations.[4]

Childhood poisoning vary from agents to agents, one health facility to another and one country to another.[5–9] Studies done in different parts of the country had reported contributions from different agents like kerosene, alcohol, pharmaceutical agents and others.[5–7,10,11] Poison prevention education should be an integral part of all well child visits. Counseling parents and other caregivers about potential poisoning risks and what to do following its ingestion or exposure diminishes the likelihood of serious morbidity or mortality.[3]

A study by Ibekwe et al.,[10] carried out in Abakaliki more than a decade ago reported a prevalence rate of 0.3% with kerosene as the predominant agent and case fatality rate of 9.1%.Following this finding, public enlightenment campaign as well as behavioral change communication were initiated in order to reduce the prevalence and associated mortality of childhood poisoning in the State. Regular surveillance is required to recognize trends in variables related to childhood poisoning which will help in reinforcing prevention strategies as well as aiding the emergency department physicians to effectively identify and manage poisoning accordingly.[12]
This study was aimed at determining the prevalence, pattern and outcome of childhood poisoning among children presenting at CHER in a tertiary health institution in Abakaliki. The findings from this study will serve as

a guide for comparison of trends with earlier study and to consolidate on existing strategies to prevent and treat children in this region and beyond.

Subjects and Methods

Study design

This hospital-based retrospective study was carried out in the CHER of the Department of Paediatrics, Alex Ekwueme Federal University Teaching Hospital Abakaliki, (AEFUTHA) Ebonyi State, Nigeria. AEFUTHA is a new name for former Federal Teaching Hospital Abakaliki which is a merger of the former Federal Medical Centre, Abakaliki and Ebonyi State University Teaching Hospital, Abakaliki that took place on 1st Jan, 2012.

Children Emergency Room, is a complex consisting of a general ward, an isolation area, and the diarrhea treatment room. It also offers both clinical and laboratory services with the help of other ancillary health workers and is open for services twenty-four hours including public holidays. It receives its patients from the Children Out-patient Department of the hospital, some patients directly from home as well as referrals from other health institution within and outside the state.

The admission registers in CHER were used to identify all children who presented at CHER between January 2014 and December 2018 with complaints of accidental ingestion of a substance. Case files of identified children were retrieved and reviewed. Information extracted included study participants socio-demographic characteristics, place of residence, date of presentation, type of substance ingested, the duration between ingestion and presentation, home intervention used, duration of admission and outcome of treatment. Their parents' occupation and educational level were also retrieved. Socioeconomic status was derived using method modified by Oyedeji.[13] Cases of food poisoning were also included whereas folders with incomplete data were excluded.

Ethical approval for the study was obtained from Health Research and Ethics Committee.

Statistics

Data analysis was done with SPSS version 22 (IBM Inc., Chicago, Illinois, USA) and results presented as proportions and means. Cross-tabulations of variables were done with the chi-square or fishers exact test where appropriate. A value of $p< 0.05$ was taken as significant.

Results

Out of the 7,700 children that presented to CHER over a 5-year period, 42 were cases of poisoning, giving prevalence rate of 0.5%. Twenty folders were retrieved while 22 were missing. Of the 20 cases whose folders were retrieved, the mean age for childhood poisoning was 3.06 ± 2.88 with a range of 6 months to 14 years. A total of 14 out of 20 (70.0%) were males with a male to female ratio of 2.3:1. Kerosene poisoning had the highest prevalence of 50.0% (10/20), organophosphate had a prevalence rate of 15.0% (3/20), while only one child had anti-hypertensive poisoning and one had petrol poisoning giving prevalence rates of 5.0% and 5.0% respectively (Fig 1). A total of 5/20 (25.0%) were grouped under others; this comprise of poisoning from food, mixtures/concoctions and iron tablet.

Relationship between different types of poisoning and socio-demographic variables

Fifty percent (10/20) of children that had kerosene poisoning were within 1-3years of age and children in this age bracket also recorded the highest prevalence rate of poisoning. Male children had higher prevalence (75%) of poisoning compared to their female counterpart. The prevalence of kerosene poisoning was more in lower socio-economic class (65%). Higher prevalence rate of poisoning was observed in children from urban settlement (11/20) compared to children from rural settlement (4/20) (Table 1). There was no significant relationship between socio-demographic variables and type of poisoning ($p>0.05$).

Relationship between home intervention by caregivers and the types of poisoning

Ninety percent (18/20) of the caregivers gave interventions at home before going to the hospital. A total of 15% gave palm oil to their children with kerosene poisoning. Another 15.0% induced emesis in their children with kerosene poisoning and in addition gave palm oil and milk (Table 2). There was no statistically significant relationship between home intervention and type of poisoning ($p=0.380$)(Table 2).

Fig 1: Bar chart showing frequencies of the different types of poisoning

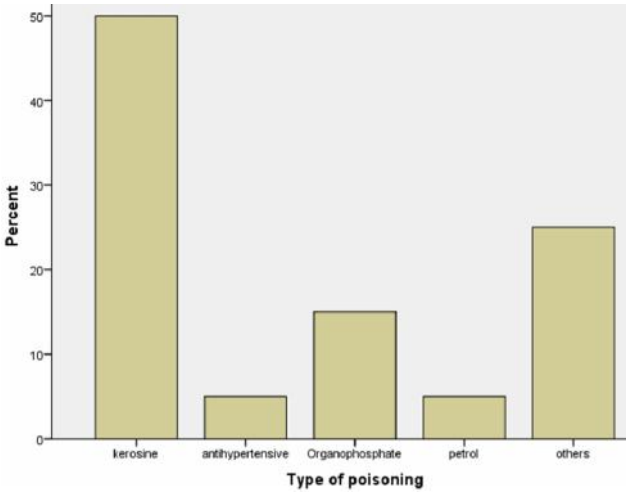

Table 1: Relationship between different types of poisoning and socio-demographic variables

Socio-demographics	Different types of poisoning n (%)				
	Kerosene	Antihypertensive	Organophosphate	Petrol	Others
Age (in years)					
0-1	3 (15.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
>1-3	5 (25.0)	0 (0.0)	1 (5.0)	1 (5.0)	3 (15.0)
≥4	2 (10.0)	1 (5.0)	2 (10.0)	0 (0.0)	2 (10.0)
Total	10 (50.0)	1 (5.0)	3 (15.0)	1 (5.0)	5 (25.0)
		X^2= 49.40	p = 0.266		
Gender					
Male	8 (40.0)	0 (0.0)	2 (10.0)	1 (10.0)	3 (15.0)
Female	2 (10.0)	1 (5.0)	1 (5.0)	0 (5.0)	2 (10.0)
Total	10 (50.0)	1 (5.0)	3 (15.0)	1 (15.0)	5 (25.0)
		X^2=3.49	p= 0.479		
Social class					
Upper	4 (20.0)	1 (5.0)	0 (0.0)	0 (0.0)	2 (10.0)
Lower	6 (30.0)	0 (0.0)	3 (15.0)	1 (5.0)	3 (15.0)
Total	10 (50.0)	1 (5.0)	3 (15.0)	1 (15.0)	5 (25.0)
		X^2= 8.11	p=0.423		
Place of residence					
Urban	7 (35.0)	1(5.0)	3 (15.0)	1 (5.0)	4 (20.0)
Rural	3 (15.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.0)
Total	10 (50.0)	1 (5.0)	3 (15.0)	1 (15.0)	5 (25.0)
		X^2= 3.53	p=0.473		

Table 2: Relationship between home intervention by caregivers and the types of poisoning

Poisoning	Home interventions by caregiver before hospital presentation (%)					
	Induction of emesis	Ingestion of palm oil	Ingestion of palm oil & milk	Induction of emesis, milk, palm oil	Others	No intervention
Kerosene	1 (5.0)	3 (15.0)	1 (5.0)	3 (15.0)	2 (10.0)	0 (0.0)
Anti-hypertensive	1 (5.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Organophosphate	1 (5.0)	1 (5.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.0)
Petrol	0 (0.0)	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)	0 (0.0)
Others	0 (0.0)	1 (5.0)	1 (5.0)	0 (0.0)	2 (10.0)	1 (5.0)
Total	3 (15.0)	5 (25.0)	3 (15.0)	3 (15.0)	4 (20.0)	2 (10.0)
		X^2= 21.29 p= 0.380				

Relationship between types of poisoning and outcome

Table 3 shows the relationship between types of poisoning and outcome. A total of 65% (13/20) of the children that had poisoning stayed in the hospital beyond 24 hours. Only one child died of kerosene poisoning, giving a case fatality of 5.0%. No statistically significant relationship existed between outcome of poisoning and type of poisoning (p=0.82)(Table 3).

Interval between poisoning and time of presentation at the hospital versus outcome

Eighty percent(16/20) of the subjects presented after an hour of ingestion of poisoning while twenty percent (4/20) of children who presented within an hour of ingestion of kerosene, antihypertensive, organosphosphate and 'others' were discharged within 24 hours. There was statistically significant relationship between duration of poisoning, time of hospital presentation and outcome (p=0.03) ((Table 4).

Relationship between socio-demographics and outcome

Table 5 shows the relationship between age, gender, social class, place of residence and outcome of accidental childhood poisoning. There was significant association between age, place of residence and outcome of the study participants (p<0.05).

Table 3: Relationship between types of poisoning and outcome

Outcome	Types of poisoning (%)					
	Kerosene	Antihypertensive	Organophosphate	Petrol	Others	Total
Discharged within 24 hours	2 (10.0)	1 (5.0)	1 (5.0)	0 (0.0)	2 (10.0)	6 (30.0)
Discharged after 24 hours	7 (35.0)	0 (0.0)	2 (10.0)	1 (5.0)	3 (15.0)	13 (65.0)
Died	1 (5.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.0)
		X^2= 4.34	p= 0.825			

Table 4: Interval between poisoning and time of presentation at the hospital versus outcome

Variable	Duration between poisoning and time of hospital presentation (in hours) (%)			
Outcome	<1 (%)	1-6 (%)	7-24 (%)	>24 (%)
Discharged within 24 hours	4 (20.0)	2 (10.0)	0(0.0)	0 (0.0)
Discharged after 24 hours	0 (0.0)	6 (30.0)	4 (20.0)	3 (15.0)
Died	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)
Total	4 (20.0)	9 (45.5)	4 (20.0)	3 (15.0)
	X^2= 13.96	P =0.03*		

*Statistically significant

Table 5: Relationship between socio-demographics and outcome

Socio-demographics	Outcome Discharged within 24hours (%)	Discharged after 24 hours (%)	Died (%)
Age (in years)			
0-1	0 (0.0)	2(10.0)	1 (5.0)
>1-3	4 (20.0)	6 (30.0)	0 (0.0)
≥4	2 (10.0)	5 (25.0)	0 (0.0)
	X^2 = 35.13	p =0.038*	
Gender			
Male	4 (20.0)	10 (50.0)	0 (0.0)
Female	2 (10.0)	3 (15.0)	1 (5.0)
	X^2 = 2.66	p= 0.264	
Social class			
Upper	2 (10.0)	4 (20.0)	0 (0.0)
Lower	4 (20.0)	9 (45.0)	1 (5.0)
	X^2 = 1.62	p = 0.804	
Place of Residence			
Urban	5 (25.0)	12 (60.0)	0 (0.0)
Rural	1 (5.0)	1 (5.0)	1 (5.0)
	X^2 = 6.22	p = 0.045*	

*Statistically significant

Discussion

The prevalence rate of childhood poisoning in this study was 0.5% which is slightly higher than 0.3% earlier reported by Ibekwe et al.[10] in the same locality. This rise in prevalence may be due to awareness created among the public leading to a better health seeking behavior following occurrence of poisoning in children. This is comparable to findings from studies done in other parts of the country and beyond with values ranging from 0.22%-0.94%.[7,11,14–17] This prevalence rate is lower than findings by other researchers in India, Qatar, Kosovo, with values ranging from 1.12%-11%.[1,8,18,19] The documented high prevalence rate of childhood poisoning in these countries may be attributed to better health seeking behaviour among the caregivers of the study participants.

All cases of poisoning in this study were accidental in nature and occurred at home. The observed finding may be that the agents were kept within the reach of the children in a familiar storage containers due to inadequate knowledge of the parents on ways of preventing occurrence of accidental poisoning in children. This is similar to findings by Edelu et al.[7] Ibekwe et al.[10] Imoudu et al., [14] and Adejuyigbe et al.[15] Males were more affected than females due to their curious and adventurous nature when compared to females who appear quieter, and better organized. The male gender predominance of children affected in this study is similar to that observed by other researchers.[1,10,19,20] However, Shwe et al.,[6] Ikhile et al.,[11] Tagwireyi et al.[21] reported more females than males involved in their studied cases. The retrospective nature of these studies may explain these varying observations.

In the present study, toddlers were affected most because of their inquisitive ways of learning and tendency to put objects into their mouths. This emphasizes the need to closely supervise this group of children. The age pattern of children affected in this study is similar to that observed by other researchers.[7,8,10] Abbas et al.[22] in Pakistan and Ahmed et al.[16] in Qatar reported children aged 2-3 years and 1-5 years respectively to be more affected while Abdulimhen-Iyoha et al.[1] reported predominance in children aged 0.5-7years old. This varying age affectation may be due to type of implicated agents such as pharmaceutical agents, organophosphate, alkali, acid and kerosene in these studies.

Poisoning occurred more in children from low socioeconomic status. This may not be unconnected to poor living arrangement, overcrowding, ignorance, low educational level, poverty as well as poor parental supervision common among people of low socioeconomic which may result in easy accessibility of these harmful chemicals to the children. Other studies in Nigeria made similar observation.[7,10,15,20]

Residence in urban area was found to be associated with higher prevalence of poisoning in this study. It is likely that poor living condition with associated overcrowding and lack of space seen in urban slums in addition to use of kerosene as major cooking fuel and its easy availability/poor storage system may predispose the children to it ingestion. In addition, the absence of coordinated preventive strategies bordering on packaging legislations in Nigeria may have contributed too. Edelu et al.[7] in Enugu noted same finding. However, Agarwal et al.[8] in India found poisoning more common in participants living in rural area. Large families seen in rural area may make supervision of active children challenging.

Predominately implicated agent in this study was kerosene. Kerosene is more common in developing countries where it is used as fuel for cooking, making it easily accessible to children. More so, being a colourless liquid and usually stored in containers similar to those used for storing water, are kept within the reach of children due to lack of space or ignorance, young children easily mistake it as drinking water when thirsty and this may explain the high ingestion rate. Ibekwe et al.[10] earlier reported kerosene as the predominant agent due to similar reasons above. No change is seen in the occurrence rate and thus more awareness creation on this is needed to reduce the frequency of kerosene poisoning in our environment. Similar predominance was reported from some centers in Nigeria and beyond.[7,9,11,20] In the northern part of the country, Shwe et al.[6] and Imoudu et al.[14] observed organophosphate agent especially pesticides as the most

implicated agent and attributed this to the agrarian nature of those communities where they are common household substance which are used to reduce rodents' accessibility to stored foods. In Qatar and Taiwan, pharmaceutical agents were predominantly seen in children presenting with poisoning.[16,17] The reasons for this difference in this study may be due to availability and easy accessibility of these substances to children resulting from lack of safe storage devices and product disposal practices in these locations. This highlights the importance of increased awareness among family members regarding this issue as well as relevant authorities such as the Ministry of Health and municipal councils in collaboration with consumer groups to ensure effectiveness of child resistant product packaging for household items and their safe storage.

Practice of home interventions by caregivers after ingestion of harmful substances in a child was observed in most studies conducted in Nigeria.[1,7,10,14,15,20] In this study, most of the study participants received some home remedies such as induction of emesis, ingestion of palm oil, milk, coconut and other agents prior to hospital visits. Such practices tend to delay early presentation to hospital and also worsen clinical state of the child. Emphasis on measures to address this such as education and counselling of parents during well child visit on the implication of poisoning, penalizing offenders may help reduce morbidity and mortality that is associated with ingestion of harmful substances in children.

Mortality rate resulting from kerosene poisoning was 5.0%. The index case presented between 1-6 hours after ingestion of kerosene but had received home interventions prior to hospital visit. Home interventions used such as palm oil ingestion, induction of emesis and others may have caused complications leading to severe clinical manifestations and death of child. This shows the need for education of parents on appropriate things to do at home such as avoidance of administration of harmful home remedies when poisoning occurs in a child and the need to seek health care promptly. This mortality rate is lower than 9.1% reported by Ibekwe et al.[10] which also resulted from kerosene poisoning and 11.9%, 20% reported in Ile-Ife[15] and Calabar[23] but higher than 1.0%, 1.8%, 2.4%, 3.8% reported Ilorin, Benin, Azare and Jos respectively.[1,6,14,24] There was no recorded mortality in the study by Lee et al.[17] in Taiwan. These variations in mortality rate may be attributed to the accidental occurrence of poisoning in children, quantity of implicated substance ingested in addition to variation in time of presentation to hospital.

Mortality rate was associated with age and place of residence as the only death in this study occurred in a child below one year of age who was of low socioeconomic status and lived in a rural setting. Harmful inappropriate home intervention as well as poor resources to procure needed drugs for care may have contributed to the recorded mortality.

Conclusion

There appears to be a slight increase in prevalence rate of accidental childhood poisoning compared to earlier study. Kerosene still remained the major agent and male toddlers were most vulnerable. There is need to intensify enlightenments campaign and education of the public through workshops, media, schools, and during clinic visit semphasizing the hazard of storage of kerosene and other implicated substances at home. Close supervision of children and enhancement of community knowledge on important emergency response actions like early health seeking behaviour in the event of unintentional poisonings as well as regulatory policy on proper ways of storing harmful household chemicals and medications is also recommended.

This study was conducted in a tertiary hospital, considered a referral centre and hence may not be fully representative of the true status of acute childhood poisoning in our communities. Being are netrospective study, more than half of the medical records were not available to obtain full information due to poor record keeping and absence of electronic records. Thus, the information obtained so far may not optimally provide the clinical profile of paediatric accidental poisoningin Abakaliki. To address this limitation, we plan to carry out a prospective study in the nearest future in order to obtain more accurate data on accidental childhood poisoning in Abakaliki.

Conflicts of interest: None
Funding: None

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