

# PROFILE OF HOSPITAL ADMISSIONS OF CHILDHOOD POISONING AT A NORTH-CENTRAL NIGERIAN TERTIARY HEALTH CARE CENTRE

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## ABSTRACT

**Background:** Childhood poisoning is an important but preventable cause of morbidity and mortality in the paediatric subpopulation. There is the continuous need to describe the pattern of childhood poisoning and to create public awareness on the common agents of poison in this environment.

**Objectives:** To determine the pattern of childhood poisoning and to bridge the existing knowledge gap on childhood poisoning in North-Central Nigeria.

**Patients and methods:** A retrospective study of case records of children admitted and treated for childhood poisoning at the Emergency Paediatrics Unit of the Jos University Teaching Hospital, Jos over a five year period (February 2008-February 2013) was undertaken. The data extracted from the case records included bio-data, date of admission, type and route of poison exposure, level of education and occupation of parents of affected children, treatment received and outcomes.

**Results:** Twenty-six (0.94%) out of a total of 2,770 children were admitted and treated for poisoning. Their ages ranged from 5 months to 13 years. Children aged 0 to 2 years accounted for 12 (46.2%) cases with a mean age of 1.88 years. There were 10 (38.5%) male and 16 (61.5%) female with a male: female ratio of 0.62:1. Organophosphate and kerosene accounted for 9 (34.6%) and 6 (23.1%) of all cases respectively. Twenty-four (92.3%) of the poisoning were accidental while 2(7.7%) were intentional. Oral route was the commonest route of poison exposure in 20 (76.9%) and 24 (92.3%) of all cases which occurred in their home environment. gastrointestinal system symptoms were the most frequent clinical presentation 16 (61.5%). Thirteen (50.0%) of the affected victims presented to the hospital in 1-6 hours of poison exposure. Indications for hospital admissions in decreasing order of frequency were dehydration 7 (26.9%), seizures 6 (23.1%) and coma 6 (23.1%). Six (23.1%) of patients received palm oil/milk as home remedies prior to hospital presentation. There was a mortality rate of 3.8% from carbon monoxide poisoning. Mean duration of hospital stay was 1.87 days.

**Conclusions:** Organophosphate is the commonest cause of childhood poisoning in North-Central Nigeria and children aged 0-2 years are the most vulnerable age group for accidental poisoning while older children aged 13 years and above for intentional poisoning. Therefore, there are needs to increase and sustain public health awareness on childhood poisoning and the government to provide poisoning centres and improve standards of living.

**Key words:** Pattern, admissions, poisoning, children, North-Central Nigeria.

## INTRODUCTION

Childhood poisoning is an important cause of morbidity and mortality in children the world over.<sup>1-3</sup>

The determinants of paediatrics poisoning, the poison substance and the treatment outcome vary in

different parts of the world and is greatly influenced by the socio-economic status of the care-givers, the nature of the environment, the availability of the poison agents and the quality of the health-care services that are readily accessible in the

community in which the affected children live.<sup>3-6</sup> Whereas, accidental (unintentional) ingestion of household poison agent is commoner in the younger age group, non-accidental (intentional) poisoning is frequently seen in the older age subpopulation of children.<sup>8,9</sup>

Contrary to the previously held notions that, intentional poisonings were problems of the developed world, recent works seem to indicate its significance in the developing world.<sup>3</sup> A recent work in Bangladesh showed that 14% of all deaths amongst women aged 10-50 years old were due to poisoning, most of which followed suicidal ingestion of pesticides.<sup>10</sup>

The types of ingested poison agents include drugs (prescribed and non-prescribed), hydrocarbons (kerosene), pesticides / rodenticides (carbamates / organophosphates), fumes (carbon monoxide) and household products (bleach), plant (cyanide from cassava).<sup>3</sup>

The World Health Organization (WHO) Global Burden of Disease project estimated that, of a total of 345 814 deaths attributable to accidental poisoning in all ages in 2004 worldwide, 13% occurred among children and young people under the age of 20 years resulted to a death rate of 1.8/100 000 population.<sup>3</sup> According to the WHO European Regional report (2004), poisoning is the third leading cause of unintentional injury death. Each year 3,000 young children aged 0-14 die of acute poisoning. Children under the age of 5 years account for the majority of all poison exposures with children up to 2 years old particularly vulnerable.<sup>11</sup>

Whereas, the profile of childhood poisoning is well studied in the high income countries of the world and some parts of Nigeria, there is to the best of our knowledge a paucity of data on this subject in the North- Central part of Nigeria. The present retrospective study therefore, is aimed at bridging this knowledge gap.

## PATIENTS AND METHODS

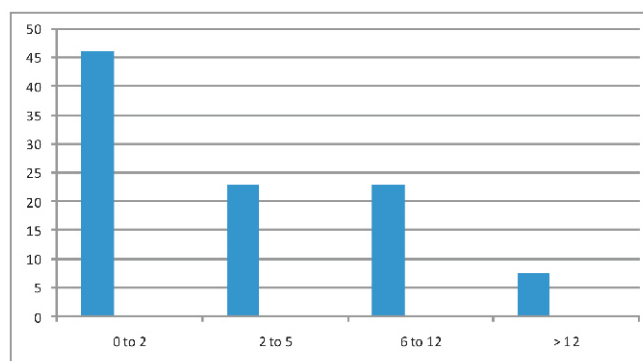
The Jos University Teaching Hospital (JUTH) is located in Jos, the Plateau State capital in the North Central Nigeria. It is the major tertiary health care facility and serves as a referral centre for other tertiary and secondary level health-care facilities

and to the neighbouring states of Bauchi, Benue, Nassarawa, Gombe, Taraba and the southern parts of Kano and Kaduna.

Case records of paediatric patients admitted into the Emergency Paediatrics Unit (EPU) JUTH over a five year period (February, 2008- February, 2013) were retrospectively studied. Data retrieved from the patients' case notes included patient's demographics, type of poison agent, place of poison exposure, symptomatology, time of presentation, educational level and occupation of parents/legal guardians of poisoned child, beneficial/harmful home remedies, reason for and the duration of hospital admission and the treatment outcomes. The data extracted were transferred into computer software SPSS versions 15.0 and subsequently analyzed. Descriptive statistics were generated and here represented in table and charts. Ethical approval was received from the Jos University Teaching Hospital Ethic Committee.

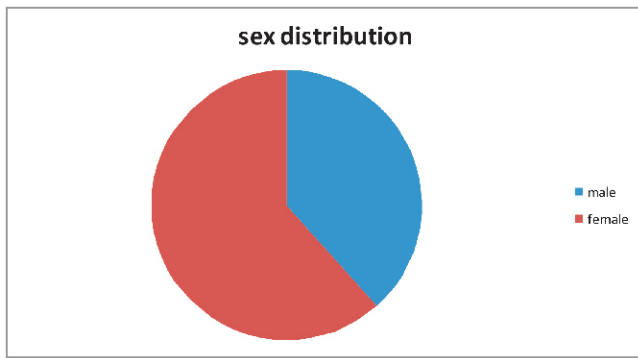
## RESULTS

During the five-year period under review, a total of 2,770 children were seen and admitted into the Emergency Paediatrics Unit (EPU). Out of these, 26 (0.94%) of children were admitted and managed for childhood poisoning which corresponded to an incidence of 9.4/1000 patients admitted. Of a total of 26 cases of childhood poisoning, 24 (92.3%) were accidental (unintentional) while 2 (7.7%) were non-accidental (intentional). The ages of the children ranged between 5 months and 13 years with a mean of 1.88 years. Children aged 0-2 years and greater than 12 years made up 12 (46.2%) and 2 (7.7%) respectively of the cases of poison seen. (Figure 1).



**Figure 1:** Age Distribution in 26 Cases of childhood poisoning studied

**Figure 1:** Age Distribution in 26 Cases of childhood poisoning studied



**Figure 2:** Sex distribution of patients studied.

Of the poison agents ingested organophosphates 9 (34.6%) while drugs and carbon monoxide poison were each 4 (15.4%) and 2 (7.7%) respectively. Records of 3 (11.6%) poison agents were missing.

**Table 1:** Types of poison agent

Agent of poison	No of patients	Percentage
<b>Household products</b>		
Organophosphates	9	34.6
Kerosene	6	23.1
Carbon monoxide	2	7.7
Mosquito coil	1	3.8
Unidentified	1	3.8
<i>Subtotal</i>	<i>19</i>	<i>73.0</i>
<b>Drugs</b>		
Antimalarial	1	3.8
Antiepileptics	2	7.7
Antiemetics	1	3.8
<i>Subtotal</i>	<i>4</i>	<i>15.4</i>
Missing records	3	11.6
<b>Total</b>	<b>26</b>	<b>100.0</b>

Routes of poison exposure were similarly reviewed. Twenty (76.9%) were oral, 2 (7.7%) were inhalational. Records of 3 (11.5%) were missing.

Overall, 24 (92.3%) of the poisoning events occurred at home while only 1(3.8%) took place outside the home environment (market). No cases of multiple poisoning found in the present review. Records were missing in one poison episode.

Of the 26 cases of childhood poisoning studied, 14 (53.8%) had 1-4 siblings and 8 (30.8%) had greater than 4 siblings in their households giving a mean of 1.36 siblings. Twelve (46.2%) and only 1(3.8%) lived in a 1-2 rooms and more than 2 rooms respectively giving an average number of rooms of 1.08.

Only 1(3.8%) of the subjects reviewed had sickle cell anaemia as a co-morbidity. Two household members of affected children were been treated for epilepsy.

Mothers of 6 (23.1%) of affected children had no formal education. Six (23.1%) of mothers had tertiary level of education. Eight (30.8%) of these mothers were not gainfully employed. Nine (34.6%) were subsisting traders while 1(3.8%) of mothers was a medical practitioner.

All the fathers of the affected children had formal education. Seven (26.9%) each had primary and secondary levels of education respectively, of whom, 10(38.8%) were traders, 1(3.8%) farmer and 4 (15.4%) were commercial motor cyclists (okada-riders) as a means of livelihood.

Most children presented to hospital in 6 hours (Table 3).

**Table 2:** Time at presentation following poison

Time of presentation (hrs)	Frequency	Percent
Less than 1	3	11.5
Less than 1-6	13	50.0
Less than 6-24	2	7.7
Greater than 24	6	23.1
Missing records	2	7.7
<b>Total</b>	<b>26</b>	<b>100.0</b>

The common home remedies given prior to hospital presentation were milk, palm oil 6 (23.1%) and magnesium trisylcate (Gestid) suspension 2 (7.7%) while 7 (26.9%) were not given any home remedies.

Common presenting systems symptomatology were digestive 16(61.5%), central nervous system 14 (53.8%), respiratory 7 (26.9%) and integument 1(3.8%).

Indications for hospital admission were as shown in Table 4 below: seven (26.9%) patients were admitted into the emergency ward for dehydration while 2 (7.7%) for seizures were admitted.

**Table 3:** Indications for hospital admissions in patients studied.

Indication for Admission	Frequency	Percent
Dehydration	7	26.9
Chemical pneumonitis	6	23.1
Coma	6	23.1
Observation	3	11.5
Seizures	2	7.7
Missing records	2	7.7
<b>Total</b>	<b>26</b>	<b>100.0</b>

Of a total of 26 patients admitted into the EPU for childhood poisoning, 24 (92.3%) were discharged intact while 1 (3.8%) mortality was recorded during period under review. The mortality was that of carbon monoxide poisoning.

Ten (38.5%) patients spent 24 hrs while 7 (26.9%) spent more than 3 days on admission giving a mean duration of hospital stay of 1.87 days.

### DISCUSSION

In the current retrospective study, 0.94% of all the hospital admissions were due to childhood poisoning. This figure compares favourably with 1%, 0.74% and 1.3% reported from Ilorin, North-Central part of Nigeria, Sudano - Sahelian NorthEastern Nigeria and in the Caribbean (Antigua) respectively.<sup>15,16,17</sup> The finding in this present study however, fell lower than 1.7%, 2.0% and 2.1% reported from Barbunda, India, Saudi-Arabia and Malaysia respectively.<sup>18,19,20</sup>

The proportions of intentional poisoning (suicidal) in the current review compares favourably with 9% (pesticide ingestion) reported from hospital-based surveys on intentional poisoning in China but fell lower than 13% (Sub-Saharan Africa), 11% (Middle Eastern Crescent), 59% (India) and 27% (Latin America).<sup>12</sup> Although, the hospital-based regional surveys cited above included children and adults, it underscores the fact that, deliberate self-harm (intentional poisoning) could be a neglected problem in the developing world.<sup>3</sup>

Many studies have clearly demonstrated that, not all victims who die following intentional poisoning actually wish to die<sup>13,14</sup> as in the case in the present study. They appeared to have acted to express their

rage and gain revenge by causing pain to their family members. Curiously, the two patients were females who had just celebrated their 13<sup>th</sup> birthdays.

Organophosphate, paraffin (kerosene) and drugs were the common agents in decreasing order of frequency in our study. Organophosphate was the agent of poisoning in onethirds of all poisoning in the study population. It was also the sole agent of intentional poisoning in the present study. This finding is consistent with 37.6%<sup>18</sup> reported from India but sharply contrasts with other reports from Ilorin, North-Central Nigeria (51.0%),<sup>15</sup> Maiduguri, North-Eastern Nigeria (78.8%),<sup>16</sup> and Calabar, South-South Nigeria (57.8%).<sup>22</sup> The reasons for this difference is not clear. However, it is well documented that, children living predominantly in agrarian communities are at risk for acute pesticide poisoning because the organophosphate is a common household substance which is used to reduce rodents' accessibility to stored foods. In socially disadvantaged family settings where there is thin line between work and the home environments, children may become exposed to pesticides/ rodenticides present in such work environments, clothes, in the air from spraying and household dust.<sup>20, 21</sup> Organophosphate pesticides have gained notoriety the world-over as the commonest poison agent particularly in Asia and Africa.<sup>10</sup>

Paraffin (kerosene) was the next common poison agent in one-fifths of the current study population. This finding was not surprising because kerosene is used in many low income households and countries as fuel for cooking, heating and lighting. Kerosene poisoning is reported to be a leading cause of unintentional childhood poisonings in many developing countries amongst children 1-3 years of age.<sup>4,22,25</sup>

Carbon monoxide (CO) constituted about a tenth of the effected children with unintentional poisoning in this study. CO, an odourless, colourless gas, produced from incomplete combustion process can kill its victim without their knowledge and can be fatal at high concentration as in the present study in which one of the two who presented in coma died despite appropriate care. Curiously, the season at which the poisoning occurred was in the month of January when average temperatures of the study area averages 22.7° C. During those periods households commonly use charcoal fires to heat their homes to mitigate effects of the lower temperatures.

Children between the ages 0 and 6 years were most commonly involved in the present study in whom; half of the proportions were those between ages and 2 years. Over ninety per cent of the poisoning events occurred at the home environment of the affected children. These findings agree with several national and international reports on accidental childhood poisoning.<sup>2,4, 15,16,18,19,23</sup> The curiosity of children to explore their environment by putting everything in their mouth and the fact that, they are easily attracted to and will eat or drink anything that smells good and colourfully packaged irrespective of the active ingredients places children at a significant risk for poisoning compared to the older children. In addition, following exposure, young children are particularly susceptible to suffer the toxic effects of poisoning because of their peculiar physiology and the ability to effectively metabolize and neutralize the toxic chemicals.

Close to two-thirds of the affected children were males in this present review. The finding of female preponderance over males contrasts sharply from several reports from Nigeria and around the globe.<sup>15,16,17,18,19</sup> The reason for this departure is not obvious. It may be explained by the facts that, some of the reports cited above were more than 5 year reviews and therefore larger sample size compared to the current study.

More than one-thirds of the children reviewed shared one or two rooms with at least four siblings in whom one-thirds of the mothers had no formal education and unemployed. Although the fathers of affected children had had formal education, majority of them were subsistent traders or commercial motor-cyclists. Socio-economic factors have long been linked with injury and deaths from poisoning and the risk is found to be three time higher among children from poor background than the risk for children in affluent settings.<sup>27, 28</sup> In developing countries like Nigeria, poverty drives and sustains childhood poisoning. Poor people tend to live in overcrowded, poorly ventilated single roomed apartment with inadequate sanitary facilities - for laundry, sewage waste disposal and limited storage space for toxic substances away from the reach of their wards. Slump dwellings are more likely to be close to waste dumps which attract rodents thus, the need for pesticides use and contamination of foods and domestic water sources.

Less than one-fifth of the patients reviewed presented to the EPU with gastrointestinal symptoms. This may partly explain the correspondingly high proportions of oral route of exposure to poison substance. Similarly, half of the patients studied presented within six hours of exposure to poison agents. The reasons for the delayed hospital presentation may be due to parental instincts to administer home remedies to their affected children. As is the case in some studies in developing countries,<sup>4,15,16</sup> many caregivers resorted to use of home remedies following poison exposure before accessing medical care. Palm oil and liquid milk were the frequently used home remedies in the patients studied. These frequently used home remedies may become harmful because of their potential to induce emesis with consequent chemical pneumonitis or eventual death of the poisoned victim. Late hospital presentation following accidental poisoning deprives poisoned victims of gastric lavage as a treatment modality for poison substances that possess the physical property for rapid gastrointestinal absorption, with attendant consequences of poor treatment outcome. Thus, it underscores the need for increased and sustained public health awareness campaigns to improve health seeking behaviour.

The common indications for hospital admission were dehydration, chemical pneumonitis and coma. Treatments given essentially included intravenous fluid, atropine, antibiotics (ampicillin-cloxacillin) and anticonvulsants medications.

We recorded a mortality rate of 3.8% in our patients. Our mortality rate was lower than 0%,<sup>16</sup> 20.0%,<sup>22</sup> and 11.9%<sup>29</sup> reported from Maiduguri, North-East Nigeria, Calabar, South-South, Nigeria and Northern-India respectively. The mortality was a case of carbon monoxide poison (CO) who presented in coma. The patient died within minutes into hospital admission. In the USA, mortality rates from CO poisoning is 0.62% / year among the under-fives.<sup>3</sup> CO does not injure the lungs directly, its toxic effects results from the displacement of haemoglobin from oxygen binding sites to form carboxy-haemoglobin thereby impairs the facilitated diffusion of oxygen to tissues. Carboxy-haemoglobin levels less than 10% in the blood may be asymptomatic. Symptoms include throbbing headaches, atypical dyspnoea, impaired concentration, confusion, lethargy, respiratory

failure, seizures. Coma and death ensue when carboxy-haemoglobin levels in the blood exceed 70%. Survivors of CO poisoning suffer from chronic respiratory disease from long-term exposure.<sup>30</sup>

One-quarter of patients in the present study were discharged within 24 hours while another one-quarter of patients with severe symptoms of their poisoning stayed in excess of 3 days in the hospital with a mean duration of hospital admission of 1.87 days. No patient spent more seven days on admission.

Multi-prong approach may be required to reduce morbidity and mortality attributable to childhood poisoning in the study area: the establishment of poison information and control centres, legislation and enforcement of child-resistant, blister packaging of necessary poisonous substances and improvement of living conditions of the people by the government, removing poison agents within reach of children by care-givers, prompt and effective management of acute poisonings and to promote research on childhood poisoning.

The major limitation of the current study is the retrospective nature which may partly explain the loss of data in some sections of the study.

In conclusion, organophosphate poisoning was the commonest agent of childhood poisoning in North-Central Nigeria. Children aged 0-2 years are particularly vulnerable to accidental/unintentional poisoning whereas, older children 13 years and above are vulnerable to intentional/suicidal poisoning who were all female children. Childhood poisoning is an important but preventable cause of morbidity and mortality in our environment. There is therefore, the need to enable, increased and sustained public health awareness campaigns by all and the government to create regional poison control centres and improve the living standards as parts of service delivery.

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