



## **Precautionary Measures taken by Caregivers against Accidental Childhood Poisoning in Edo and Delta States, Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author BIA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors IO and UI managed the analyses of the study. Authors BIA and IO managed the literature searches. Authors BIA, IO and UI jointly developed the structure and arguments for the paper, made critical revisions and approved the final manuscript. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background:** Accidental childhood poisoning constitutes one of the most vital challenges of child health in contemporary times. It is a major public health issue worldwide. Many childhood poisoning episodes are avoidable but measures to prevent poisoning are usually overlooked by caregivers. Many deaths and disabling complications in children following poisoning could be prevented if more attention were given to implementing preventive measures at home. The strategies undertaken by caregivers (if any) to prevent accidental childhood poisoning in their young children is thus worth evaluating.

**Aim:** To assess the precautionary measures taken by caregivers and determine factors that

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influence the precautionary measures against accidental childhood poisoning among caregivers in Edo and Delta States of Nigeria.

**Subjects and Methods:** The study subjects included 632 caregivers who brought their under-five children to Well Baby/Immunization Clinics of the University of Benin Teaching Hospital (UBTH) and the Central Hospital, Benin City in Edo State and the Federal Medical Centre (FMC), Asaba and Central Hospital, Warri in Delta State, Nigeria. A structured questionnaire was used to assess their biodata, types of potential poisons present in the home, the container for storage, where kept and precautionary strategies adopted by caregivers in order to prevent accidental childhood poisoning.

**Results:** The common precautionary measures adopted by caregivers to prevent childhood poisoning include keeping household cleaning agents [bleaches (56.6%), detergent (54.1%)] and medicines (65.7%) out of the sight of their children as well as ensuring that these poisons [bleaches (57.6%), detergent (55.1%) and medicines (64.1%)] are above shoulder height. It is important to note, however, that caregivers indulge in risky practices like leaving the poisonous bait meant for rodents to remain on the floor for days when not eaten by the rats (44.8%) as well as leaving children below five years in the care of older children who are below 15 years (38.8%). Some caregivers (42.6%) keep potential poisons in familiar containers like soft drink bottles which is capable of attracting the children to the poisons while others (55.4%) hardly use chemicals stored in child-resistant containers which ought to help in the prevention of accidental poisoning in children. There was no significant relationship between level of education, marital status, occupation and type of apartment of caregivers on one hand and level of precautionary measures taken on the other hand.

**Conclusion/Recommendation:** Health education of the populace on aspects in which caregivers are deficient is necessary so as to prevent episodes of childhood poisoning. The mass media may be employed to reach a large audience in this regard.

*Keywords: Unintentional poisoning; precautionary measures; Caregivers; Nigeria.*

## 1. INTRODUCTION

Accidental childhood poisoning is a fundamental public health issue globally. Accidents happen in both the developing and developed nations and are main reasons for morbidity and death in children. In developing nations, however, poisoning is of major importance though cause of morbidity and mortality is dominated by infectious diseases and undernourishment. Whether they are evaluated using morbidity or death, accidents constitute one of the most vital challenges of child health in contemporary times. Studies have depicted that many childhood home accidents are avoidable but usually underestimated by caregivers [1]. Some children are hospitalized in emergency units because they have unintentionally taken some form of household poisons like kerosene, pesticide or medicine. A great number of these 'accidental' poisonings are largely preventable.

Traditionally, caregivers and injury researchers usually take 'accidents' to be the plausible result of carelessness, nonchalant attitude and stupidity. [2] 'Accidents' were frequently thought by people to be non-preventable and the consequence of fate. Since research information

supported that 'accidental' injury is preventable, the word 'accidental' injury was reframed by injury researchers to be 'unintentional' injury (in other words, injury not emanating from violence or maltreatment). Notwithstanding the fore-going, many caregivers and the general populace still refer to unintentional injury as accidents.

Two injury prevention perspectives have been highlighted in the literature namely passive and active strategies [3]. Passive strategies denote environmental/structural interventions, which normally need negligible parental/caregiver effort such as secured cabinets containing poisonous items. Active strategies usually necessitate steady, or recurrent activities by caregivers such as supervision at playtime, during bathing or kitchen actions. Maximum injury control is envisaged through the efficient deployment of active and passive strategies, [4,5] however caregiver application of such actions have been generally unsuccessful [6]. Such unsatisfactory outcomes have been ascribed to the inadequate application of psychological values to injury prevention, which is geared towards the modification of behaviour and amplified learning. [7,8] Hence, current efforts have tried to best

comprehend the cognitive and behavioural causes of injury preventive actions.

In the formative stages of life, the home remains the place where little children live and explore their world. As expected therefore, the home is also where they encounter their first accidents. Some of the factors ascribed for causing accidents include poor maternal supervision, the steady collapse of the extended family system in divergent communities, rural-urban drift resulting in shantytowns and overcrowding, poor implementation of policies coupled with insufficient measures to decrease the rate of poverty in the society [9]. Other risk factors which contribute to the occurrence of childhood poisonings are knowledge and behaviours of the caregivers of these children, access to poison control education, hindrances to the utilization of the accessed education among others. These factors singularly and collectively affect the findings of a poisoning scenario. With increasing urbanization and economic crisis, mothers who are the primary caregivers of young children need to work to support the family. This results in the absence of many mothers and subsequent dependence on nannies who may do a poor work of supervision. Similarly, in the face of poor socio-economic factors, especially poor housing and attendant overcrowding in Nigeria, childhood accidents are likely to become predominant public health challenges except preventive mechanisms are effected early [10,11].

Based on a WHO report, [12] accidental poisonings contributed to 300,000 deaths in year 2000. In Nigeria, the few researches on accidental poisoning are hospital-based and thus may not be a true reflection of the current incidence of poisoning in the Nigerian community.

Proxies of unintentional injury have evolved to appraise childhood injury as serious injuries happen at low frequencies and are unlikely to happen under direct caregiver supervision [13]. The evaluation of injury risk-taking patterns, which have the capacity to result to an injury, enables researchers to study other concepts related to injury without actually requiring an injury to happen. Rather, behaviours bordering on injury events are evaluated. For example, to better comprehend the causes of unintentional injury and injury risk (the major concern being childhood poisoning), caregiver practices, precautionary measures or intervention strategies with regards to the prevention of

childhood poisonings are vital to consider. The need to reduce the occurrence of accidental poisoning in children less than five years old necessitated the conduct of this study.

## 2. SUBJECTS AND METHODS

The subjects consisted of 632 caregivers who brought their children to the Well Baby Clinics of some major hospitals in Edo and Delta States of Nigeria (both located in South-south Nigeria). The four health facilities were selected purposively, two per state. The selected health facilities were the University of Benin Teaching Hospital (UBTH) and the Central Hospital both in Benin City, Edo State as well as the Federal Medical Centre (FMC), Asaba and Central Hospital in Warri, Delta State. They were selected because they are the major referral centres and they have well-baby clinics.

The caregivers were selected using a stratified sampling technique (two steps). The four hospitals formed the strata. To achieve this, a listing of all mother and child pair that accessed the well-baby clinics the previous month was obtained from the four hospitals as 2189, 1980, 1211 and 941 for UBTH, Central Benin, FMC Asaba and Central Warri respectively. They served as the sampling frame.

Step 1: The number of caregivers to be selected from each hospital was determined by 10% equal proportion allocation, that is, 219, 198, 121 and 94 caregivers from UBTH, Central Hospital Benin, FMC Asaba and Central Hospital Warri respectively to give a total sample of 632 respondents.

Step 2: The assigned number of caregivers to be selected from each hospital were then recruited using simple random sampling.

The study was conducted between 16<sup>th</sup> February and 27<sup>th</sup> April 2016.

This descriptive, cross-sectional study involved the use of structured questionnaire which were researcher-administered with the aim of recording information on the subjects' biodata, types of potential poisons present in the home, where kept, the container and location of storage and precautionary measures adopted by caregivers in order to prevent accidental poisoning episodes in their children. Caregiver's occupation was classified according to International Standard Classification of

Occupations by International Labour Organisation (ILO) [14]. It was also of essence to determine what constituted safe storage of potential poisons. Storage was measured by asking whether the respondents stored the various products, “On the floor” or “In a drawer/cupboard without a lock, lower than 1.5 metre”, “In a drawer/cupboard without a lock, higher than 1.5 metre”, or “In a drawer/cupboard with a lock or safety catches”. The first two answers were considered as unsafe storage, and the latter two as storing the products in a child-safe manner [15]. Ten questions were used for the scoring of precautionary measures. A positive response was given a score of two while a negative response a score of zero (minimum total score of zero and maximum total score of 20). The total score of each caregiver was classified as: poor (0-6), fair (7-13) and good precautionary measures (14-20). Ethical approval was obtained from the Ethics and Research Committee of all the hospitals involved and informed consent was obtained from each participant.

Data collected were entered into the IBM Statistical Products and Servicing Systems (SPSS) version 20.0 spreadsheet and analyzed. The results obtained were presented as frequency tables and bar charts. Means, standard deviations and ranges were used as

appropriate to describe continuous variables. Chi-square was used to test the strength of association where appropriate. Significance of the test was presumed for  $P$  value  $< 0.05$ .

### 3. RESULTS

A total of 632 respondents were studied. Their mean age was  $31.6 \pm 6.5$  years (range; 16 and 60 years). Over half (52.4%) of them had tertiary education while 36.9% had secondary education. Only 10.8% of the caregivers had primary or no formal education. Majority of the caregivers 592 (93.7%) were married.

Most of the respondents 415 (65.7%) kept their medicines out of sight of their children. Over half of them, 358 (56.6%) and 342 (54.1%) respectively, kept their bleaches and detergents out of sight of their children as well (Fig. 1). A higher proportion 405 (64.1%) of the respondents kept their medicines above shoulder height, 364 (57.6%) kept their bleach above shoulder height, and 348 (55.1%) kept their detergent above shoulder heights (Fig. 2).

Of the 500 caregivers, who use rat poisons to handle rodents at home, the baits with rat poison were not removed promptly but left in position for days by 224 (44.8%) caregivers (Table 1). Most of the caregivers [387 (61.2%) of total

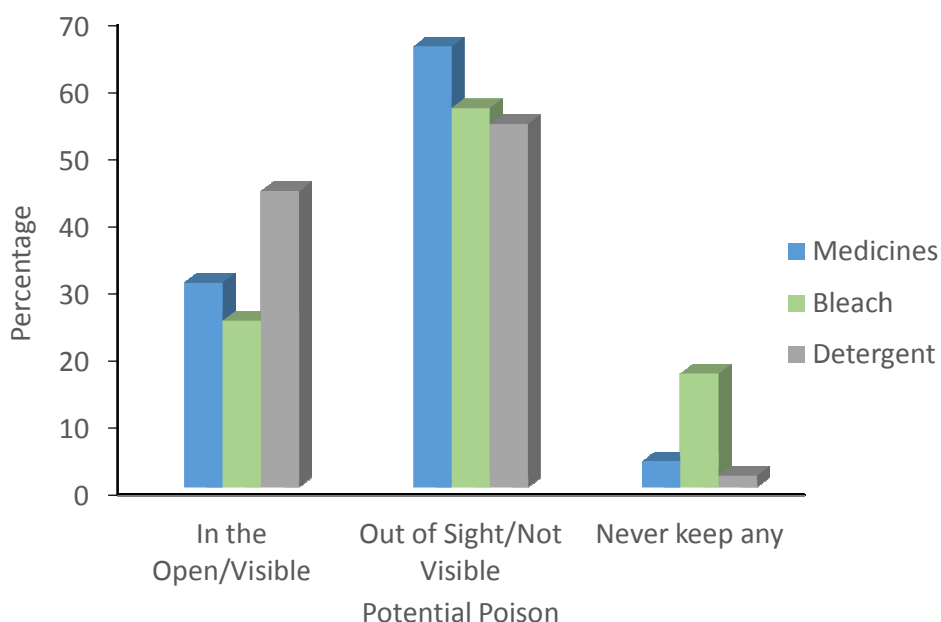
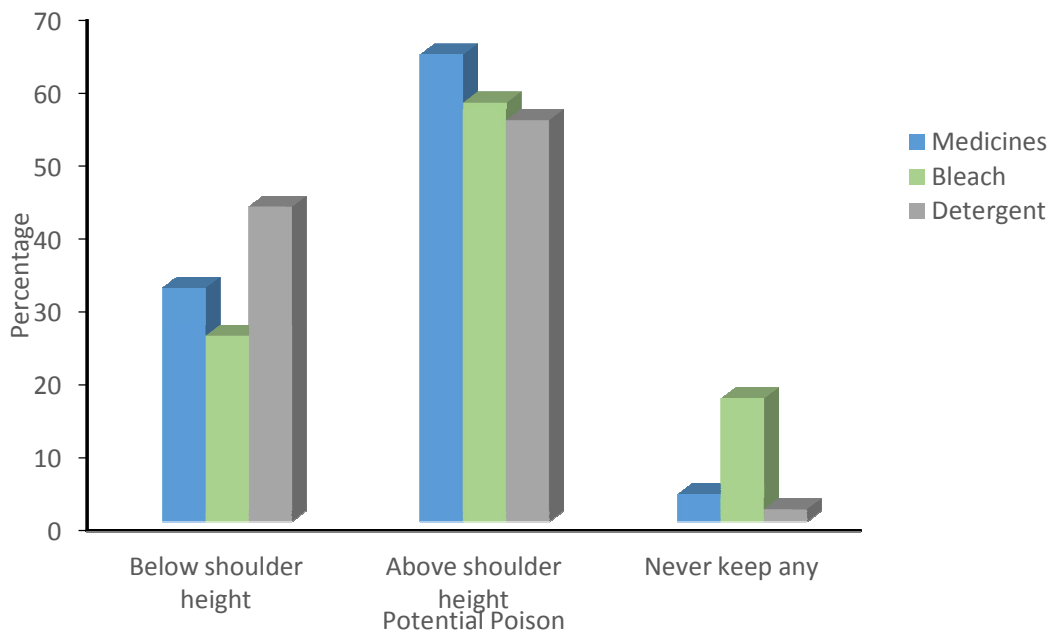
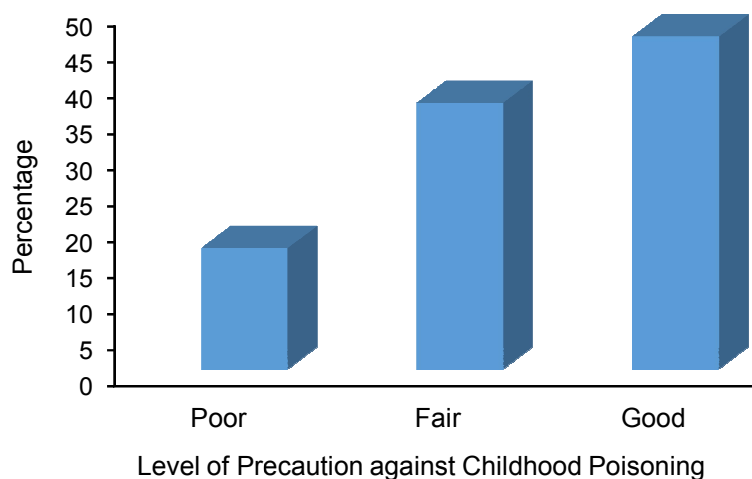


Fig. 1. The place where potential poisons are kept by caregivers



**Fig. 2. The height where potential poisons are kept by caregivers**



**Fig. 3. Caregivers' level of precaution against childhood poisoning**

participants] ensured that they did not leave children below five years in the care of older children below 15 years; 363 (57.4%) of them do not keep potential poisons in containers like soft drink bottles while 282 (44.6%) use mainly chemicals stored in Child-Resistant containers so as to prevent the occurrence of unintentional poisoning of their children (Table 1).

The overall caregivers' level of intervention to prevent childhood poisoning was mainly fair

(37.0%) and good (46.2%); and in combination constitute 83.2% of the responses. Those who had poor level of intervention were 106 (16.8%) [Fig. 3].

No significant relationship exists between level of education, marital status, occupation and type of apartment of caregivers on one hand and level of precautionary measures taken by them on the other hand [Table 2].

**Table 1. Other caregivers' precautionary actions**

Caregivers' precautionary actions	Yes (%)	No (%)
Rat poison used as bait are left for days (n=500)	224 (44.8)	276 (55.2)*
Children below 5 years left in the care of older children below 15 years	245 (38.8)	387 (61.2)*
Keep potential poisons in containers like soft drink bottles	269 (42.6)	363 (57.4)*
Use mainly chemicals stored in Child-Resistant containers.	282 (44.6)*	350 (55.4)

In table 1, the asterisks "\*" represent the favourable response.

**Table 2. Relationship between level of education (LOE), marital status, occupation, type of apartment of caregivers and level of precautionary measures taken**

Parameter	Poor (%)	Fair (%)	Good (%)	$\chi^2$	P-value
<b>Caregivers' LOE</b>					
None	6 (22.2)	10 (37.0)	11 (40.7)	2.486	0.870
Primary	6 (14.6)	18 (43.9)	17 (41.5)		
Secondary	43 (18.5)	83 (35.6)	107 (45.9)		
Tertiary	51 (15.4)	123 (37.2)	157 (47.4)		
<b>Marital status</b>					
Not married	8 (20.0)	18 (45.0)	14 (35.0)	2.159	0.340
Married	98 (16.6)	216 (36.5)	278 (47.0)		
<b>Occupation</b>					
Skill Level 1	34 (18.5)	71 (38.6)	79 (42.9)	1.584	0.818
Skill Level 2	48 (16.7)	102 (35.5)	137 (47.7)		
Skill Level 3 & 4	24 (14.9)	61 (37.9)	76 (47.2)		
<b>Type of apartment</b>					
Single Room	6 (13.3)	21 (46.7)	18 (40.0)	3.905	0.690
Room and Parlor	23 (20.5)	40 (35.7)	49 (43.8)		
Self-contained	18 (16.8)	43 (40.2)	46 (43.0)		
Flat and others	55 (15.8)	126 (36.2)	167 (48.0)		

Others include Duplexes and Traditional courtyard dwellings

#### 4. DISCUSSION

Prevention of childhood poisoning is a concern for all – the child, the caregiver, the health professionals, the health educators and the community at large. The prevention of poisonings positively improves the quality of health, and thus the quality of life, of both the individual and the community as a whole. Prevention of accidental poisoning in childhood requires that caregivers be vigilant and practice measures intended to mitigate or eliminate, if possible, episodes of poisoning. The findings of the current study revealed that the common precautionary measures adopted by caregivers against childhood poisoning included keeping household cleaning agents like bleaches and detergent as well as medicines out of the sight of their children. Also, they ensured that these agents were kept above shoulder height. The preventive measures embarked upon by caregivers may be influenced by their knowledge and perception among others. Based on findings, caregivers store useful but potentially poisonous products at

various places and heights in the home. For instance, 30.5%, 24.8% and 44.1% of the caregivers stored medicines, bleach and detergents respectively in the open (not out-of-sight). Also, 32.1%, 25.5% and 43.2% stored these same agents in a position below shoulder level. These places and heights in the home are unsafe for the storage of poisonous agents. They are sites that can easily be reached by young children. This was similar to the findings of an American study that considered a taxonomy of behavioural and environmental variables leading to the unintentional poisoning of three to seven year olds in Tennessee in which the authors recorded that the most frequently reported antecedent condition resulting in childhood poisoning was improper storage of the substance by the parent [16-18].

Furthermore, among caregivers who use rat poisons as bait, a sizeable proportion leave the bait to remain for days when not eaten up by rodents. This act is very risky as infants and toddlers who crawl or move around the house

run the risk of picking up the baits and eating them up. The poisons are harmful not only to rats but can also affect humans adversely. For instance, in a study [19] surveying parents/guardians of children under five years who had ingested a rodenticide, it was found that in most cases, children accessed the poison at the site where it had been laid and that in 69% of cases this site was not a normal place for the child to be playing. Parents incorrectly believed that the site was inaccessible and therefore safe. As a result, the authors suggested that information on rodenticide packaging should recommend the placement of baits in specific, inaccessible locations such as under refrigerators or in specially designed bait stations [19].

Another risky practice of caregivers identified in the present study include the fact that caregivers leave their young children in the care of older children (age less than 15 years) in 38.8% of cases. It is important to note that caregivers who are children are likely to act immaturely and so may not be responsible enough to care for other children irrespective of their ages [20]. Morrongiello et al. [20] had shown in a past research that supervision by older siblings increased the risk of young children's unintentional injury in the home. Poorer supervision by the older sibling as well as noncompliance by the supervisee (younger sibling) contribute to this increased risk [20]. A supervising sibling can easily be distracted (for instance by television shows and video games) and may not remember that he or she has been asked to care for another very young child. The resultant poor supervision increases the risk of accidental poisoning [20].

The storage of potentially poisonous agents in containers (e.g. soft drink bottles) other than the original containers is another documented risky practice of caregivers. In the present study, 42.6% of the caregivers attested to the fact that they are involved in this. This finding is in consonance with the documentation of Osaghae and Sule [21] as well as Ugwu et al. [22]. The practice makes the poisonous substance attractive to the young child who had probably drunk a sweet drink from a similar container in the past. However, some of the caregivers claim that they use mainly chemicals stored in child-resistant containers (CRCs). The aim is to prevent young children from accessing poisonous household agents. These child-resistant containers are difficult for children to

open. If by chance they come across poisonous agents that are stored in such containers, they spend so much time trying to open it and are unable to open such container within a short period of time. In the process, the caregiver can meet the child still struggling to open the container. Thus, the use of such containers delays the child until he/she is hopefully found by an adult. It is important to note that although the use of CRCs help to prevent accidental childhood poisoning, the prevention is not a hundred percent. If the child remains with the container long enough, he/she may be able to eventually open it. So, that a poisonous substance is stored in a CRC is no reason for it to be kept anywhere in the home that is unsafe. It must still be properly kept away from the sight and reach of children. Therefore, the process of storing poisons out of sight and reach of children as well as in CRCs is a "delay strategy". Child resistant closures should, therefore, never take the place of good supervision [23].

There was no significant relationship between caregivers' level of education and level of precautionary measures taken against accidental childhood poisoning. Other factors which did not influence the level of precautionary measures taken by caregivers include marital status, occupation and type of apartment. Having formal education does not necessarily mean that an individual would have the knowledge of a particular health matter. Even when the knowledge is available, and is influenced positively by the level of education, it does not exactly translate to practice or behaviour. Whereas caregivers who have higher poison prevention knowledge are expected to have better behaviours related to poison safety, [24] it is essential to note that behaviours are not necessarily dependent upon knowledge; though they tend to be correlated [25]. It has been documented that caregivers' cognitions are not at all times consistent with their practices or behaviour. This inconsistency has been recognized as the "attitude-practice gap" in the unintentional injury literature [1,26,27]. It is important to note that whereas adequate knowledge is important in that it provides correct information which may modify health behaviour, it is known that knowledge (awareness) does not automatically translate to practice or behavioural change. It, therefore, implies that factors other than knowledge or awareness (of preventive practices) may determine caregivers' behaviour or practices in terms of prevention of accidental childhood poisoning. For instance, Morrongiello

et al. [28] in 2004 noted that health beliefs, beliefs about potential injury severity and extent of effort required to implement precautionary measures were the key determinants of mother's engaging in precautionary measures against poisoning. These factors may thus be considered and addressed by the health professional or the health educator.

## 5. CONCLUSION

Caregivers should be health educated on aspects of childhood poisoning in which they are deficient. This is necessary so as to reduce or prevent episodes of childhood poisoning. In this regard, the mass media may be employed to reach a large audience.

## CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

## ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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