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Environment Factors and the Health of Under-Five Children in Urban Slums in Enugu State: Implications for Malaria and Diarrhea Diseases

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ABSTRACT

Introduction: Environmental conditions in households and behaviors serve to increase the risk of Malaria and diarrhea diseases which are among the top killers of children under the age of five in developing countries. **Materials and Methods:** A cross sectional descriptive study amongst caregivers of under-five children in Enugu urban slums. Selected by multistage sampling. Data were collected using interviewer administered questionnaire and observation checklist. Analyzed using SPSS. **Result:** Mean age was 1.24 ± 0.47. Most caregivers were child's mother aged 20 to 29 years. 107 (47.0%) sourced their drinking water from protected well; only 71 (31.0%) purified it before giving it to the child. Soap was available in 98% of the households but was used for other purposes than hand washing. 55% disposed of refuse by open dumping. Perceived causes of diarrhea were bad water 69%, spoilt food 54%, germs 55%. Cause of malaria was from the sun 4%, oily food 13%. Only 35% took a sick child to a health centre, 44% gave drugs at home, 41% gave Oral Rehydration Solution, 26% gave zinc tablets, 17% went to the Patent medicine dealer/laboratory and 0.9% went to prayer houses. Only 46% of the children slept under ITNs. **Conclusion:** Most of the observed environmental health behaviors are risky to the health of children. If reduction of morbidity and mortality from malaria and diarrhea is to be achieved, there's need to improve the environmental sanitation of the households in urban slums.

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INTRODUCTION

In the global effort to reduce morbidity resulting from preventable causes, sub-Saharan African has, unfortunately, fallen far behind the rest of the world with USA and Europe recording the best progress. This lack of progress in Africa is of grave consequence to world health when one considers that the population of Africa is estimated at 1.16billion, 17% of estimated world population of 6.9 billion.[1]

The disparity in the progress to reduce preventable morbidity between Africa and the rest of the world has the most negative effect on children who are more vulnerable to the environmental factors which cause preventable illnesses. Again, among children, the most vulnerable group is the under-five who account for 15.4% (178million)[1] of the population of Africa. Children under age five breathe more air, drink more water, and eat more food per unit of body weight than adults do, so they may experience higher rates of exposure to pathogens and pollutants. Typical childhood behaviors, such as crawling and putting objects in the mouth, can also lead to increased risks.[2]

To highlight this vulnerability, it has been estimated that every minute, eight under-five children die in sub-Saharan Africa. More worrying is the fact that two-thirds of the under-five deaths in the African region are due to preventable causes. The chief causes of death are neonatal conditions and acute respiratory infections mainly pneumonia, malaria, diarrhoeal diseases, measles and HIV/AIDS. According to WHO, an estimated 10.6 million under-five children die each year, 4.6 million of whom die in the African region.

The conditions which encourage and exacerbate the occurrence of preventable morbidity are more prevalent in urban areas and the rapid and unplanned growth of cities has worsened the situation since it has also given rise to informal or illegal settlements, commonly known as slums. These poor urban areas grow at up to two times the rate of the surrounding city. Today, nearly one-third of the world's population lives in slums and over 90% of slum dwellers live in low-income and middle-income countries, including hundreds of millions of children.[3] The growing slum population in the developing world is an increasing challenge. With sparse income, most of the city residents opt to stay in the slums, which therefore have been expanding rapidly. Reports show that 60% of the population of big cities live in urban slums.[4,5] Urban slums pose special health problems due to poverty, overcrowding, lack of potable water and waste disposable facilities. Evidence from demographic and health survey

indicates that the urban poor in sub-Saharan Africa exhibit higher mortality rates than residents from other subgroups including rural residents.[6]

The leading causes of under-five morbidity and mortality in our environment are diarrheal diseases, pneumonia, malaria, malnutrition and measles.[7] These illnesses are related to ignorance, poverty and poor environmental conditions such as overcrowding, poor quality drinking water, poor sanitation with stagnant pools of water and no waste disposal system.[8]

House Hold Environmental Health (HHEH) encompasses actions and conditions that can provide hazard free environments within the homes, with preventive potential over killer infectious diseases, which include malaria and diarrheal disease.

Even though presently, there has been great improvement in child survival, mortality rates in children under-five still constitute a major global problem. Access to improved water and sanitation among children under five years old is a serious public health problem in many developing countries, including Nigeria.[9] Globally, nearly a billion people still lack access to improved sources of drinking water, and about 2.5 billion lack improved sanitation.[9] Unimproved water and sanitation are major causes of diarrhea, which globally accounts for approximately 1.4 million child deaths each year. The majority of these deaths occur in sub-Saharan Africa where nearly half the population lacks access to improved water and sanitation.[10] Children are more vulnerable to the health hazards associated with unimproved water supply and sanitation; their immune, respiratory, and digestive systems are still developing,[11] and children play in areas contaminants may accumulate.[12]

The impact of unimproved water and sanitation as a leading cause of childhood diarrhea has long been recognized and documented in the public health literature. A report on global progress on sanitation and drinking water showed that approximately 109 million and 66 million people in Nigeria still lack access to basic sanitation facilities and improved drinking water, respectively.[9]

According to recent global estimates, malaria and diarrhea together account for 2.6 million (25%) of under-five deaths in developing countries.[13] These two diseases have in common the fact that environmental conditions surrounding the child, particularly at household level, can play an important role in promoting or interrupting transmission.

Young children in Africa spend most of their time in the home or its vicinities. Therefore, they are likely to be constantly exposed to environmental health hazards at household level, which means that they are also likely to benefit highly from actions towards prevention of such hazards. In many parts of Africa, these are activities that rest almost entirely within the hands of women, as a reflection of a clearly defined sexual division of labor.[15] Households tend to be the primary loci of activity for women in such settings. Opportunities to carry out household level preventive behaviors beneficial to young children are likely to coincide with such activities, which include bathing, feeding, and supervising children, putting children to bed, food preparation, dishwashing, laundering, cleaning the house, sweeping the yard, water collection, storing, and handling, and livestock management. In some settings, e. g. Nigeria, women are recognized as the family health provider.[14] Therefore emphasis on the female caretaker is crucial in the study of household environmental health practices, and hence the primary participants in studies understanding behavior related to child and family health in general and household environmental health in particular. In health terms, the focus of this study is malaria and diarrheal disease in children under five.

Urban slum population is growing every day, with reports showing that 60% of the population of the big cities live in urban slums.[4] Urban slums pose special health problems due to poverty, overcrowding, lack of potable water and waste disposable facilities. Evidence from demographic and health surveys indicates that the urban poor in sub-Saharan African exhibit higher mortality rates than residents from other subgroups including rural residents.[6]

It has been estimated that every minute eight under-five children die in sub-Saharan Africa. Two thirds of the under-five deaths in the African region are due to preventable causes. The chief causes of death are neonatal conditions and acute respiratory infections mainly pneumonia, malaria, diarrhoeal diseases, measles and HIV/AIDS. According to WHO, an estimated 10.6 million under-five children die each year, 4.6 million of whom die in the African region.

Diarrheal disease is a leading cause of child mortality and morbidity in the world and mostly results from contaminated food and water sources.[5] Diarrhea due to infection is widespread throughout developing countries.[13] The diarrhea prevalence rate in Nigeria is 18.8% and it's one of the worst in sub-Saharan Africa.[3] It is the 2nd leading cause of death amongst Nigerian children (after malaria). In slums, infants who live without piped water may have up to 4.8 times the risk of death from diarrhoea.[15, 16] Worldwide, 780 million individuals lack access to

improved drinking water and 2.5 billion lack improved sanitation. In Nigeria, approximately 109 million and 66 million people lack access to sanitation facilities and water.[4] Unimproved water and sanitation are major causes of diarrhea, which globally accounts for approximately 1.4 million child deaths each year.[10]

Malaria is endemic throughout Nigeria, where it is one of the leading causes of morbidity and mortality.[17] It currently accounts for nearly 110million clinically diagnosed cases per year, 60% of outpatient visits, and 30% hospitalizations in the country.[17] An estimated 300,000 children die of malaria each year. It is also believed to contribute up to 25% infant mortality and 30% under-five mortality. In addition to the direct health impact of malaria, there are also severe social and economic burdens on communities and on the country as a whole, with about 132 billion Naira lost to malaria annually in the form of treatment costs, prevention, loss of work time, etc.[8] Nigeria has the largest population at risk of malaria in Africa. Official estimate suggests as much as four bouts of malaria per person per year on the average.[18] One major problem facing prevention and control of malaria in Nigeria is delay in health seeking due to wrong perception of the cause of the disease among others.[19]

This study assessed factors in the environment that may adversely affect the health of under-five's. It focuses on practices and conditions relating to man's interaction with the environment, which in turn affect children's exposure to particular hazards (e. g., mosquito bites and contact with fecal material) and hence their health in terms of risks to diarrhoeal disease or malaria. By documenting such practices or conditions, the study will contribute towards the recognition of important risks expressed in the form of behavior, which may be brought about by social, economic and cultural factors.

MATERIALS AND METHODS

This study was carried out in Enugu metropolis the capital of Enugu State in the South Eastern Geopolitical Zone of Nigeria. Enugu metropolis covers an area of 200 km^2. The projected population of the city in 2014 is 915,500 with density of 6400/km^2 hectares. About 22% of the population of Enugu State lives in Enugu city. There are three local government areas (L.G.As.) within Enugu Metropolis namely: Enugu South, Enugu North and Enugu East with a mixture of residential, industrial and commercial areas in the three local government areas. There are eight slums in Enugu Metropolis namely Ugbo Odogwu, Iva valley, Ngonevu, Ugwu Paul, Artisan quarters slum 1 & 2, Nikenevu and Adazindube.

Study Design

This was a community-based cross sectional (household) study involving the residents of Enugu.

A semi-structured, interviewer administered questionnaire was used to collect data on the: socio-demographic variables, basic amenities like source of water, type of latrine, hand washing and sanitation as well as mosquito preventive measures. The questionnaire was validated by pretesting it in a pilot study carried out in another slum not used in the main study (Iva valley).

A checklist was used to cross check whether they had relevant materials needed for personal hygiene, sanitation and mosquito control measures.

Study Population

The participants were the under-five children's in Ugbo Odogwu and Ngonevu urban slums in Enugu.

Sample Size

The sample size was calculated using the formula for one sample size determination: [43]

$$\mathbf{N = \frac{Z\alpha^2 pq}{d^2}}$$

n = Minimum sample size

Zα = Confidence level at 95%;

p = Number of the under five children in a typical Nigerian slum = 15%[69]

q = (1-P), (1-0.15) = 0.85

d = level of precision = 0.05

$$n = \frac{1.96^2 \times 0.15 \times 0.85}{(0.05)^2}$$

= 195.9 = **196**

10% due to non-response was added.

= 10% of 196= 0.10 x 196= 19.6 = 20

n = 196 + 20 = **216**

A sample size of **216** was arrived at after adjusting for 10% non- response but 228 were used for the study.

Sampling Technique

Multistage sampling method was used to select the study participants.

First stage: Enugu has eight slums from which two were selected by simple random sampling, using the ballot method. They were Ugbo Odogwu and Ngonevu.

Second stage: the households were selected through systematic sampling method using the National Immunization Plus Days (NIPDs) micro planning as sampling frame. The sampling interval was determined by dividing the number of houses by the expected number of respondents in each community (114 per community). Where 216 houses were mapped for Ugbo Odogwu, while 246 houses were mapped for Ngonevu. It was divided by 114 and we used every other house. Only one household was used from each mapped house and this was selected by random sampling through balloting.

Third stage: In each household, respondents were selected based on who is most qualified using the inclusion criteria (mother, nanny or maid). That is the one who spent most time of the day with the child.

Inclusion and Exclusion Criteria

Persons responsible for bathing, feeding, putting to sleep and supervising the child living in Ugbo Odogwu and Ngonevu urban slums, who gave their consent to be part of the study. They include mothers, nannies, housemaids, and relatives while caregivers not accessible on days of study like people who refused to open their doors nor gave consent were excluded.

Ethical Considerations

Ethical clearance was obtained from the University of Nigeria Teaching Hospital's (UNTH) Ethics committee before commencement of the study. Verbal informed consent was obtained from all participants before administration of the questionnaire.

Limitations of the Study

Getting cooperation of the respondents as most of them were not well educated, were subsistence farmers or petty traders which prevented consent and presence as the study was being carried out.

Data Analysis

Data were analyzed using Statistical Packages for Social Sciences (SPSS) version 20. Frequency and contingency tables were drawn to show the distribution of data. Quantitative data were summarized using mean and standard deviation. Chi-square statistical test of significance was used to determine the association between purification of child's drinking water, method of stool disposal as well as malaria prevention practices of caregivers of children under five years and the socio-demographic characteristics of the head of household and the caregiver. The level of statistical significance was at 0.05.

RESULTS

228 caregivers participated in the study. The age distribution of child interest in the family showed that over two third were in age bracket 1 to 2 years and only 2.0% were aged 5 years. The mean age was 1.24 ± 0.47years. Over 60.0% of the children were male. Most of them 157 (69.0%) had started schooling.

In the socio-demographic characteristics of the head of household. About 80.0% were males and all except one of the males was the child's father. Over 60.0% of them had senior secondary education as their highest qualification while only 7.0% had no form of formal education. Most of the heads of household were self-employed (46.0%), followed by civil servants (31.0%) and the least being farmers (4.0%). Up to 60.0% of the households had 4-6 people living in the household. About 65.0% had a regular source of income.

Almost half of the caregivers were in age bracket 20 to 29 years and less than 6.0% aged 40 and above. The mean age was 26.51±8.24. All the respondents were females, mostly the child's mother. Most of them attained at least primary education with 68.0% having secondary education and above. About 55.0% were unemployed and 68.0% of respondents were married and lived with their husbands. About 65.0% of the caregivers had a regular source of income.

Table 1: Patterns of water usage identified as being associated with the risk or prevention of diarrhea and malaria in under five children

Water usage practices	**Frequency**	**Percent**
	n=228	
Source of water		
Protected well	107	47.0
Unprotected well	36	16.0
River	33	14.5
Tanker	24	10.5
Rain	18	7.7
Pump	10	4.3
Commonest method for Storage of child's drinking water		
Gallon with cover	92	40.0
Separate bucket with cover	86	38.0
General bucket without cover	50	22.0
Water was purified		
Yes	71	31.0
No	157	69.0
Purification agent used	(n=71)	
Boiling	47	66.0
Water guard	13	18.0
Chlorine	11	16.0

Table 1 shows the water usage practices identified as being associated with the risk or prevention of diarrhea and malaria in under five children. Many of the households 107 (47.0%) had their source of water is from protected well, while the least source was from pipe born water 10 (4.3%) which is pump. The most popular way of storage of child's drinking water was with the use gallon with cover 92 (40.0%), while the least way was with general bucket without cover 50 (22.0%). Only 71(31.0%) purified the water for the child's usage and most of them did so by boiling 47 (66.0%).

Table 2: Patterns of hygiene practices identified as being associated with the risk or prevention of diarrhea and malaria in under five children

Hygiene Practices	Frequency n=228	percent
Soap present in the house	223	98
Use of Soap (Multiple responses apply)		
Bathing	220	96.5
Laundry	199	87.3
Dishwashing	169	74.1
Hand washing	166	72.8
Times you wash hands (Multiple responses apply)		
Wash fruits and edibles	224	98.0
After using the toilet	203	89.0
After cleansing baby's buttocks	173	75.9
Before preparing baby's food	149	65.4
Before feeding the baby	85	37.3
Prepared food preservation (Multiple responses apply)		
Reheat before use	119	52.0
Cover on the table	116	51.0
Refrigerate	56	24.6
Dispose of it	39	17.0
Refuse collection method		
Dustbins with lids	98	43.0
Refuse bags	67	29.0
Open containers	57	25.0
Heap on the floor	6	3.0
Refuse disposal method		
Dumping in sulo bins	95	42.0
Open dumping	68	30.0
Dumping in streams	54	23.0
Burning	7	3.0
Dumping in gutters	4	2.0

Table 2 shows the hygienic practices identified as being associated with the risk or prevention of diarrhea and malaria in under five children. Soap was available in 98.0% of the households and was used mostly for bathing. Most of the respondents 203 (89.0%) washed their hands

after using the toilet but only 173 (75.9%) washed their hands after cleaning the baby's buttocks. Majority of the respondents either covered the food on table 116 (51.0%) or they reheated the food before use 119 (52.0%). Collection of refuse is mostly in dustbins with lids 98 (43.0%) and disposal is mostly in sulo-bins as by 95 (42.0%).

Table 3: Perceptions of caregivers about causes and prevention of diarrhea in under five children

Knowledge of diarrhea	**Frequency**	**Percent**
	n=228	
Passage of watery stool		
3 times daily	101	44.0
Twice	38	17.0
Once	8	4.0
No idea	7	3.0
Perceived causes of diarrhea in children (Multiple responses apply)		
Bad water	158	69.3
Germ	127	55.7
Spoilt food/fruits	124	54.4
Transmission from infected case	100	44.0
Teething	52	22.8
Flies on food	23	10.1
Evil spirit	2	0.9
Action taken on a sick child (Multiple responses apply)		
Give drugs at home	102	44.7
Give ORS/SSS	95	41.7
Take to health center	81	35.5
Give Zinc tablet	61	26.8
Go to Patent medicine dealer/Laboratory	52	17.6
Give fluids	12	5.3
Stop breastfeeding	6	2.6
Treat traditionally	4	1.8
Go to prayer house	2	0.9
Diarrhea preventive practices (Multiple responses apply)		
Clean environment	187	82.0
Using clean water	173	75.9
Covering food	32	14.0
Using boiled water	30	13.2

Table 3 shows the perception of caregivers about causes and prevention of diarrhea in under five children. Most of the caregivers knew diarrhea to be the passage of watery stool, three times daily 102 (44.7%), while the commonest perceived cause of diarrhea was bad water 158 (69.3%) with only about 10.1% knowing that flies perching on food can lead to diarrhea. Giving drugs at home was the commonest action taken on a sick child but only 61(26.8%) knew about giving zinc tablets while giving fluids was one of the least actions undertaken by the caregivers. Using clean water and having clean environments were the commonest diarrhea preventive practices known to the respondents.

Table 4: Perceptions of caregivers about causes of malaria and its control measures in under five children

Knowledge of malaria and control measures	**Frequency n=228**	**Percent**
Perceived causes of malaria in children (Multiple responses apply)		
Mosquito bite	219	96.1
Dirty environment	160	70.2
Bad water	62	27.2
Oily food	30	13.2
Teething	11	4.8
Sun	10	4.4
Bad weather	6	2.6
Transmission from infected case	4	1.8
Symptoms of malaria (Multiple responses apply)		
Fever	207	90.8
Headache	100	43.9
Vomiting	56	24.6
Convulsion	5	2.2
Knowledge of malaria control measures (Multiple responses apply)		
Use of ITN	200	87.7
Clean environment	179	78.5
Netting doors/windows	124	54.4
Using mosquito repellant cream	47	20.6
Staying indoors at night	45	19.7
Wearing protective clothes	4	1.8

Table 4 shows the perceptions of caregivers about causes of malaria and its control measures in under five children. Respondents who perceived mosquito bite to be the cause of malaria were in majority 219 (96.1%), with about 30 (13.2%) respondents perceiving it to be from

oily food and the least being transmission from infected case. The commonest symptom known was fever 207 (90.8%) and the commonest malaria control measure is known as the use of ITN.

Table 5: Observed practices that affect the health of under five children

Variable	Frequency n=228	Percent
Houses physical characteristics (Multiple responses apply)		
Zinc roof	223	99.6
Cemented floor of main building.	220	96.5
Plastered wall of main building	180	79.0
Domestic hygiene (Multiple responses apply)		
Stored water for drinking well covered.	166	72.0
Signs of swept compound	128	56.0
Child defecating in the open	125	55.0
Toilet/latrine available	110	48.0
Slab present with lid over the latrine (n=110)	105	95.4
Childs buttocks cleansed afterwards (n=125)	102	81.6
Faeces on the yard floor	98	43.0
Both hands properly washed after the cleansing (n=102)	76	74.5
Childs sleeping room seen with mosquito preventive measure in place.	48	21.0

Table 5 shows the observed practices that affect the health of under five children. It was observed that almost all the houses 220 (96.5%) had their floors cemented but only 180 (79%) had the main building plastered. The commonest hygienic practice observed was well covered stored drinking water. Faeces were seen on the floor of 98 (43%) respondents, though 128 (56.0%) of their houses showed signs of being swept. About 48.0% of them had a toilet/latrine but only 105 had a lid over it. There were 125 (55.0%) children seen defecating in the open, only 102 of them cleaned the child's buttocks after defecating, while only 76 (74.5%) of them washed both hands properly afterward.

DISCUSSION

This study is about certain practices that were observed or reported to affect the health of children between the ages of 0 to 5 years, their age distribution showed that over two third of the children were in age bracket 1 to 2 years and only 2.0% aged 5years. The mean age was

1.24 ± 0.47 years. A similar study on survey of household practices for the prevention of malaria in Benin City, Nigeria had the mean age of children as 1.46 years with a standard deviation of 0.22.[14] In another study on prevention of diarrhea in young children in developing countries, the majority of the children were aged 1-2 years.[20] This contrasts with findings from urbanization and child health in resource poor settings with special reference to under-five mortality in Africa, where most of the children were between 0-6months old.[22] This could be due to the methodology used as the inclusion criteria of the later study showed preference to for children less than one year.

Majority of the children (66.0%) were male. This is similar to the study on survey of household practices for the prevention of malaria in Benin City where most of them were males too.[20] This contrasts with the study that estimated the burden of diseases from water, sanitation, and hygiene at a global level which had mostly female children.[23] This could be due to the location of the study. Most of them 69.0% had started schooling. Studies done in other places had both similar and different findings. In the already cited study done in Benin city, there were more children who had not started schooling (62.0%) than those who had,[20] while the study on environmental determinants of diarrhea morbidity in under-five children in Southwest Ethiopia had most (63.0%) of the children of same age group already schooling.[24] This could be because most people from the eastern part of Nigeria traditionally start their children in school early.

The head of household deserved attention because the level of wealth of a household is suggested to be dictated by his social, economic, educational and occupational status. About 80% of the head of households were males and all except one of the males was the child's father. This is in accordance with the study done in Makurdi, where 90.0% of the HoHs were males.[25] Studies have shown that it is better than having females as HoH since households with male HoH had better financial resources and were less prone to having children in poor health than the female HoH homes.[4] Majority (60.0%) of the households had 4-6 people living in the household. This shows that these households have the tendency to depart from the large extended families (8-10 people living in a household) reported to be the case in Africa.[7]

A large percentage of the study participants were educated, (93.0% of HoH and 92.0% of caregivers). Majority (61.0%) of the caregivers had senior secondary education, while 8.0% of the caregivers had no formal education at all. This may be because of the free education

system practiced in this part of the country and it reflects the high level of literacy in Eastern Nigeria. This is very important because education provides the knowledge of the rules of hygiene, feeding and weaning practices, and the interpretation of symptoms which enhances timely action on childhood illness.[27]The above, however, contrasts with other studies as follows: in one study more caregivers had primary level of education (46.5%), followed by secondary level (33.0%).[28] In another study done in Port Harcourt, most of the caregivers had primary school education (40.0%), while others have secondary level education (37.5%).[29] In another study on household malaria preventive practices carried out in the North, 43.2% of the HoH had no formal education at all.[25] This could be attributed to the higher school enrolments in the Eastern part of Nigeria as against the Northern part.

Most of the head of households were self-employed (46.0%), followed by civil servants (31.0%) and the least being farmers (4.0%). There were 21 (9.0%) unemployed head of households. About 65.0% had a regular source of income. This is relevant because the economic status of these head of households will play a role in patterning the departure from or inclination to conforming to social norms that constrict or facilitate the pursuit of protective household environmental health practices. eg, their ability to afford soap for hand washing and ability to afford clean drinking water. Most of the caregivers 55.0% were unemployed, 14.0% had informal employment, 7.0% were traders and 1.0% were farmers. This is in line with the findings in Calabar where most of the caregivers (60.0%) were unemployed.[7] This could be due to the culture of our people, where women are seen to be purely homemakers and it also goes to show their level of dependence on their husbands and hence their inability to make decisions that had monetary involvement.

The caregiver's age ranged from 10 to 52 years with a mean age of 26.51 years. This is important because different age groups may relate to different values and experiences related to management of the household environment. It was also found from other studies that showed that older caretakers would be more likely to perform safer hand hygiene and stool disposal practices compared to their younger, childless counterparts.[29] The caregiver's age is also an important variable potentially associated with decision-making power. The caregivers were mostly female 191 (92.0%) who are usually considered socially disadvantaged. For example, in Nigeria, a woman’s identity is built by mechanisms of socialization that excludes her from functions of control.[19] For example, the decision to seek care for a sick child and to purchase some households items that are of environmental importance, whereas the direct

responsibility for children's welfare generally falls on their mothers. This is similar to a study in Pakistan where social isolation of a mother would become obvious if her child experienced a diarrhea episode when the father was physically absent.[15] It was found that 65.0% of the caregivers were their mothers, followed by their siblings (15.0%), other relations (11.0%), grandmothers (5.0%) and nanny (4.0%). Most (68.0%) of the caregivers were married and lived with their partners. This is expected since most of them were the child's mother and are living with their husbands whereas the other 32.0% were single.

In patterns of practices identified as being associated with the risk of diarrhea and malaria in under five children, literature review revealed that isolation of fecal material from the environment, hand washing with soap after contact with feces and preservation of the safety of water at the point of use are important protective factors for diarrheal disease.[12] This study found that 47.0% of the respondents got their water from protected well, followed by 16.0% from unprotected well, 14.5% got theirs from the river, 10.5 % from tankers, 7.7% from rain and only 4.3% got theirs from pump. This is risky especially because only 31.0% of respondents purified their water before giving it to the child and it was mostly purified by boiling, followed by addition of chlorine or water guard. Studies have shown that higher rates of diarrhea were associated with unprotected sources of water.[9, 12. 30] This is similar to a study done in Akure Nigeria, where the primary source of water to majority of household was deep well which may not be too clean for consumption,[31] and the children were seen to have various types of infections, top of which was diarrhea disease. This is also similar to a study that assessed environmental determinants of childhood diarrhea and revealed that children coming from households that obtained water from protected sources were less likely to have diarrhea as compared to those who got their water supply from unprotected sources.[32] This was also supported by a study in Northern Nigeria that showed the use of unprotected water sources being significantly associated with diarrheal morbidity.[33] The result also showed that 40.0% of the respondents stored the child's drinking water in a gallon with cover, while 38.0% stored theirs in a separate bucket with cover and the least being those that stored in a general bucket (22.0%). Therefore, less than half of the studied population stored their child's drinking water inappropriately and this may be due to ignorance on the caregivers' side as a lot of pathogens can still come in contact with the water from a good source through bad storage practices. The children may thereby be exposed to the risk of acquiring diarrheal disease with its consequent complications.

Almost all (98.0%) the respondents had soap in the house, but this soap was used for various purposes other than hand washing. Majority (96.5%) of the respondents used it for bathing while only 72.0% used it for hand washing. This is similar to study done in Akure that observed hygiene practices of the household and showed that 48.5% did not have an in-house wash hand basin and therefore did not practice hand washing.[31] This contrasts with the studies done in the United States of America where 94.0% of the respondents washed their hands regularly.[34] The difference in both countries may be due to caregivers education, head of households' socioeconomic status to afford the needed facilities and caregivers exposure to information. When asked the reasons for hand washing in a day, 89.0% said it was after using the toilet, 75.9% said after cleansing the child's buttocks and the least (37.3%) was before feeding the baby. It is known that hand washing with soap after fecal contact interrupts the route of fecal contamination through food and direct person-to-person contact as shown in a study on effect of hand hygiene on infectious disease, where improvements in hand hygiene resulted in reductions in gastrointestinal illnesses of 31.0%.[35] The lack of hand washing in this study may be attributed to inadequate facilities in the households in urban-slums and their poor hygiene practices which predisposes the children to diarrheal diseases.

Inappropriate preservation of food and refuse collection and disposal methods are risky behaviors through which malaria and diarrheal diseases are contracted. About 24.6% of the respondents refrigerated their preserved prepared food and only 17.0% disposed of it, while majority covered it on the table overnight and few reheated it before usage. This contrasts with the study done in Akure which showed that 10.0% of the household neither keep their food in cupboard nor preserved in the refrigerator but left the food in an open place.[31] The difference in result could be due to the location of the study and the socio-economic status of the households studied. Microbial pathogens from flies can infect the food and cause diarrhea, these flies could be from latrines or refuse bins because majority (43.0%) of the respondents collected their refuse in an open method while 55.0% disposed of it in gutters, streams and by open dumping. This is similar to the findings from a study on solid waste disposal in urban areas and health, where 72.0% of the respondents disposed of their refuse by open dumping for landfill and it adversely affected the health of the neighboring population.[36] These hygiene behaviors create room for mosquitoes to breed and thus promotes malaria disease.

In ascertaining the perceptions of caregivers about causes, transmission, treatment and control of diarrhoea and malaria in children under five years in urban slums of Enugu, it was found that the respondents had a fair knowledge of the definition of diarrhea as 32.0% got it correctly but the others knew it was passage of watery stool of varying durations. This is similar to studies done in Ibadan amongst market women which showed that 52.0% got the definition whereas almost all knew what it was.[37] This shows that mass media education is really effective though they may not know the tiny details. This study showed that their perceived causes of diarrhea were mostly bad water (69.3%), spoilt food (54.4%), germs (55.7%) and a minority attributed it to evil spirit (0.9%). These perceptions contrasts with those of respondents from a study on home management of diarrhea disease done in Sokoto Nigeria which showed that witchcraft (56,0%), spoilt breast milk (68.0%) and teething (43.0%) were the main causes of diarrhea.[38] This could be due to the difference in educational level as portrayed earlier and it needs to be corrected so that appropriate precautions can be taken against this disease.

The findings were not much different for perceptions of causes of malaria because, though majority of the respondents (96.1%) knew the cause to be from mosquito bite, some still had their misconceptions such as getting it from the sun (4.4%), oily food (13.2%), bad weather (2.6%), bad water (27.2%), while 1.8% respondents attributed it to be transmission of infection from a case of malaria. This is similar to misconceptions shown from studies done in Ibadan and Ebonyi, where oily food and impure water were the commonest misconceptions.[19, 39] These misconceptions could be due to traditional beliefs held by our forefathers in the days of ignorance which some people still hold strongly unto and they have implications for negative behavior by caregivers in the community and also leads to inappropriate health seeking behavior though majority were aware of fever as the commonest symptom (90.8%).

The respondents took various actions when they suspected that a child was showing signs of diarrheal disease. Only 35.5% took the child to a health center, majority gave drugs at home (44.7%),41.7% gave ORS, 26.8% gave zinc tablets, 17.8 % went to the chemist/lab, while the least action taken was taking the child to a prayer house by 0.9% of the respondents. This is similar to the findings of the study done in Ibadan where only 32% gave ORS at home and 19% went to the chemist.[37] The actions were almost the same for a child suspected of having malaria. These actions could be due to poverty or ignorance amongst the caregivers studied.

The diarrhea preventive practices showed that clean environment was practiced most by the respondents (82.0%) and the use of boiled water was the least diarrhea preventive practice observed by only 13.2% of the participants. This contrasts with the study on knowledge and management of diarrhea among underserved minority parents and caregivers, where use of purified water was the commonest preventive practice carried out (98%), followed by hand washing (86%). This could be due to the location of the study and cultural diversity because the study was carried out in the USA while this study was done in an urban slum.

In malaria preventive practices of caregivers, it was found that only 46.0% of the children slept under ITNs the previous night. About 30.0% slept under untreated bed nets, 31.0% used local insecticide, 21.0% used insecticidal spray and 13.0% burnt mosquito coil. This is better than the findings of the study done in Ile-Ife and Shagamu, where 21.0% and 22.8% respectively used ITNs. Whereas it contrasts with the findings of usage of ITN in India (79.0%)[40] and Sierre Leone (67.0%).[41] This means that though the participants knew about ITNs, usage is very low in most parts of Nigeria and this was attributed to cost by 44.0% and to search for a more effective way as shown by 45.0% of the respondents in this study. This result negates the objectives of the roll back malaria initiative which is having at least 60.0% of those at risk of malaria infection (the under-fives inclusive) have access to an effective means of malaria prevention like ITNs. It undermines the efforts of the government who had put in so much in free distribution of these nets and in social marketing. Since little is known about the effectiveness of the other methods such as mosquito coils and local insecticides, more effort is therefore needed to enforce the utilization of ITNs especially in the urban slums where poor housing and overcrowding perpetuates malaria disease. This was seen, as only 79.0% of the respondents had their houses plastered, though 96.5% had their floors cemented. Literature review showed that house design was highlighted as an important factor contributing to variations in the incidence of malaria as living in houses with eaves spaces was associated with high risk of malaria disease, while adding ceilings reduced the mosquito densities.[42]

It is, therefore, necessary to educate the caregivers more on the need for a healthy and friendly environment for the children.

CONCLUSIONS

The findings have added to the existing knowledge, an insight into the challenges of household environmental health practices that affect the health of under-five children in urban slums. Some of the practices identified as risky to the health of the under-fives were: getting the child's drinking water from protected well without purification, not washing of hands with soap after carrying out certain critical functions, open collection and disposal of refuse, amongst others. Even though most of the caregivers had good knowledge of the causes of diarrhea and malaria, some misconceptions persisted and they had poor health seeking practices but fair prevention practices.

It is therefore recommended that

1. Culturally sensitive and appropriate educational intervention programs should be designed for caregivers and implemented to improve access to health-related information.

2. Urgent promotion of hand washing in the homes by making soap and water readily available at appropriate spots in the home.

3. Promotion of use of insecticide treated bed nets by making it available through free distribution or highly subsidized prices for the households.

4. Urgent need to improve the environmental sanitation of the households in urban slums.

5. Introduction of cheap plastic containers for defecation for children under five years should be considered as an intervention to reduce fecal prevalence in the compounds.

6. Behavioral change interventions should be targeted for safe stool disposal at households of low socioeconomic status people.

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