The Pattern of Utilization of Insecticide Treated Nets among Children Emergency Room Attendees in a Tertiary Hospital in Sagamu, Nigeria

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ABSTRACT

Background: Malaria is an important cause of morbidity and mortality among children in sub-Saharan Africa including Nigeria. The use of preventive measures such as the insecticide-treated nets plays a significant role in malaria control.

Objective: To determine the pattern of utilization of insecticide-treated nets among attendees of the Children Emergency Room in a tertiary hospital

Methods: It was a cross-sectional, descriptive, hospital-based study conducted at the Children Emergency Room (CHER) of the Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria.

Results: A total of 75 mother-child pairs were surveyed. The highest educational level of the caregivers was secondary school education for the fathers and mothers respectively. About two-in-five of the children (41.3%) slept under ITN. More of the children in the age category >5 – 10years (61.5%) used ITN. More female children (52.2%) compared with their male counterparts used ITN (p = 0.205). A higher proportion of children whose fathers had no formal education (75.0%) used ITN compared to those whose fathers had formal education (p = 0.019). A higher number of children from the urban area (47.3%) used ITN compared to those from rural area (25.0%) (p = 0.083).

Conclusion: The study observed that the utilization of ITNs was relatively high among the study participants, but its utilization was suboptimal compared to the Roll-Back-Malaria target.

Keywords: Caregivers, Children, Insecticide-treated nets, Malaria, Utilization

INTRODUCTION

Malaria is an entirely preventable and treatable mosquito-borne illness, caused by a protozoan parasite, the Plasmodium species (World Health Organization 2015). The vectors responsible for the transmission of the malaria parasites are female Anopheles mosquitoes (Bello & Hassan, 2016). The larvae of female Anopheles mosquitoes are seen in a variety of habitat but most species prefer clean, unpolluted water including fresh or salt water, marsh, mangrove swamps, rice fields, stream edges and rivers (Bello & Hassan, 2016). It is a life-threatening disease that mostly occurs in the tropical countries.

About 50% of the world's populations are affected by malaria, majority of these affected individuals live in sub-Saharan Africa, with pregnant mothers and children under-five being most vulnerable (World Health Organization 2000; Akaba, 2013). Nigeria alone accounted for about 31.3% of all these global deaths from malaria in 2021 (World Health Organization).

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The following factors compounded malaria burden in Nigeria: the ecological conditions, poor socio-economic factors and lack of access to effective preventive and curative health care delivery

services (USAID, 2019). The disease is transmitted throughout the country, with 76% of the population living in high transmission areas (USAID, 2019).

The correct and timely use of preventive measures such as insecticide treated nets (ITNs) causes a reduction in the risk of malaria infection and transmission and plays a significant role in malaria control (World Health Organization 2006) because there will be neither access by the mosquito vector to acquire the parasite from an infected person nor access to transmit it to another person and consequently the mosquito vector dies with the parasite. ITNs were developed in the 1980s is from treating mosquito nets with pyrethroid insecticides which did not only reduces human–vector contact but further increased the barrier efficacy of the mosquito nets by killing the malaria vectors that came into contact with it (Insecticide treated mosquito nets, 2007).

The use of ITN is an important malaria preventive strategy in children to reduce malaria morbidity and mortality. About 5.5 lives can be saves every year for every 1000 children protected with an ITN (Lengeler, 2004). The use of ITN will reduce the incidence of uncomplicated malaria episodes by 50% and 39% in a stable malaria transmission and unstable malaria transmission areas respectively (Lengeler, 2004). The use of ITN also reduced the incidence of severe malaria, hyper- parasitaemia, and splenomegaly by 45%, 29%, and 30% respectively (Lengeler, 2004). All these therefore translate to less hospitalization secondary to malaria infections in children following proper use of ITNs. This reinforces the need to sustain the malaria control programme.

Households are said to be covered by vector control if the households own at least one ITN (UNICEF, 2007).

According to the Nigeria Malaria Indicator Survey (NMIS) for 2021, the number of households with at least one ITN had increased from 42% in 2000 to 56% in 2021, however, the rate is still far below the target of 80% which should have been reached by 2010 (National Malaria Elimination Programme (NMEP) of the Federal Ministry of Health. Malaria Indicator Survey 2021). Interestingly, the rate is higher for households in the rural areas compared with those in the urban areas (National Malaria Elimination Programme (NMEP) of the Federal Ministry of Health. Malaria Indicator Survey, 2021).

In a quest to meet the Sustainable Development Goals (SDGs) targets, it will be indispensable to determine the actual levels of utilization of ITNs so as to take timely corrective actions. Therefore, this study was carried out to determine the use of ITNs among Children Emergency Room attendees in a tertiary hospital.

SUBJECTS AND METHODS

Study Area- The study was conducted at the Children Emergency Room (CHER) of the Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu, Nigeria. The hospital is a referral centre majorly for-health facilities within Ogun State but also for health facilities in the contiguous parts of the neighbouring Lagos, Ondo and Edo States. The CHER renders 24-hour emergency paediatric healthcare services to children as the first port of call for emergency cases.

Study Subjects: All children who presented to the Children Emergency Room whose parents/caregivers consented to the study were recruited and served as the respondents

Study Design- A cross-sectional descriptive study was conducted. Data were collected with the aid of a pre-tested questionnaire administered by the researcher. Three respondents were used for the pre-test of the study questionnaire and these respondents were subsequently excluded from the actual study. All the collected data remained confidential throughout the study. The information obtained from each subject included: socio-demographic characteristics, history of present illness and assessment of the household ownership of ITNs and the use of ITNs by the ill child.

Study Period: 1st August 2019 to 30th October, 2019.

Subject recruitment technique: About five to ten children and their parents/caregivers respectively attended the Children Emergency Room daily. All the eligible caregiver-child pairs were conveniently recruited, except those who did not give consent.

Inclusion and Exclusion Criteria: All children who presented to the Children Emergency Room and whose parents/caregivers consented to the study

Sample size: The Fischer's formula (Charan, 2013) was used to determine the sample size: $n = (z^2pq)/d^2$ where, n = Minimum sample size, z = Standard normal deviate set at 1.96, which corresponds to the 95% confidence interval. p = 16.0% (0.16) proportion of ownership of at least one ITN in urban area from a national survey conducted by National Population Commission (National Population Commission 2010), q = 1 - p (1 - 0.16) = 0.84, d = degree of accuracy desired = 0.1. Substituting these figures into the formula the calculated sample size was 52, an additional 25% of the calculated sample size adjusting for non-response (13 subjects) added to bring the calculated minimum study sample size to 65.

Ethical Considerations: Approval for the study was

granted by the Department of Paediatrics and the Research and Ethics Committee of the Olabisi Onabanjo University Teaching Hospital. Written informed consent was obtained from each parent/caregiver prior to their selection for the study. A rural area is defined as an open swath of land that has few homes or other buildings, and population density is very low (Rural Area).

Data analysis: The collected data were entered in Microsoft Excel and Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 17.0. Mean, median, standard deviation and proportion were used for data summarization. The Chi-Square test was used to test relationship between categorical variables while logistic regression model was used to determine the predictors associated with use and non-use of ITNs. P values < 0.05 were considered significant.

RESULTS

A total of 75 subjects were surveyed. Two-thirds (66.7%) of the children were aged five years and below with male preponderance (69.3%). The highest educational level was secondary school education for the fathers and mothers respectively. Almost three-quarters of the respondents reside in urban area (73.3%) (Table 1).

The duration of illness before presentation at OOUTH range from one to 30 days with a mean of 5.37 (±5.74) days. Two-third of the study subjects had fever associated with their present illness during the study period. Only about one-sixth (14.0%) of the respondents with fever reported the usage of antimalarial drug before presentation at OOUTH. Almost one-third of the sick children have malaria parasitaemia (Table 2).

Table 3 shows the distribution of utilization of ITNs according to socio-demographic and other characteristics of the participant. About two-in-five of the study participants (41.3%) sleep under ITN. A higher proportion of the children who belonged to the age category >5 – 10years (61.5%) use ITN, and this was not significantly higher compared to older age groups (p = 0.170). More females (52.2%) compared with their male counterpart (47.8%) use ITN. More children whose fathers have no formal education (75.0%) use ITN compared to those whose fathers had formal education. Similarly, more children whose mothers had no formal education (50.0%) used ITN compared to those whose mothers had lower academic attainment. A higher number of children from the urban area (47.3%) used ITN compared to those from rural area (25.0%). These observations were not statistically significant for all the parameters tested (p > 0.05), except for father's educational status, which reached a significant level (p = 0.019)

Table 1: Socio-demographic and other characteristics of the participants

Characteristics	Variable	N	%
Age Group of Child (years)			
	0 – 5	50	66.7
	>5 – 10	13	17.3
	>10	12	16.0
Gender of Child			
	Male	52	69.3
	Female	23	30.7
Caregiver's Relationship to Child			
	Parent	67	89.3
	Aunt	2	2.7
	Grandparent	6	8.0
Father's Educational Status			
	None	4	5.3
	Primary	2	2.7
	Secondary	40	53.3
	Tertiary	29	38.7
Mother's Educational Status			
	None	4	5.3
	Primary	13	17.3
	Secondary	32	42.7
	Tertiary	26	34.7
Place of Residence			
	Urban	55	73.3
	Rural	20	26.7

Table 2: Information on index illness for the sick children

Characteristics	Variable	N	%
Duration of illness before presentation at OOUTH (days) (n = 64)			
	≤1	12	18.8
	2-4	30	46.9
	5-9	18	28.1
	≥10	4	6.2
Fever associated with present illness (n = 75)			
	Yes	50	66.7
	No	25	33.3
Use of antimalarial drug before presentation at OOUTH by febrile patients (n = 50)			
	Yes	7	14.0
	No	43	86.0
Malaria blood film result (n = 50)			
	Positive	15	30.0
	Negative	35	70.0

Table 3: Distribution of utilization of ITNs according to socio-demographic and other characteristics of the participants

Characteristics	Variable	Used ITN (n = 31)	Did not use ITN (n = 44)	P-value
Age Group of Child (years)				0.170
	0 - 5	20 (40.0)	30 (60.0)	
	>5 - 10	8 (61.5)	5 (38.5)	
	>10	3 (25.0)	9 (75.0)	
Gender of Child				0.205
	Male	19 (36.5)	33 (63.5)	
	Female	12 (52.2)	11 (47.8)	
Caregiver's Relationship to Child				0.893
	Parent	28 (41.8)	39 (58.2)	
	Aunt	1 (50.0)	1 (50.0)	
	Grandparent	2 (33.3)	4 (66.7)	
Father's Educational Status				0.019
	None	3 (75.0)	1 (25.0)	
	Primary	1 (50.0)	1 (50.0)	
	Secondary	10 (25.0)	30 (75.0)	
	Tertiary	17 (58.6)	12 (41.4)	
Mother's Educational Status				0.494
	None	2 (50.0)	2 (50.0)	
	Primary	6 (46.2)	7 (53.8)	
	Secondary	10 (31.3)	22 (68.7)	
	Tertiary	13 (50.0)	13 (50.0)	
Place of Residence				0.083
	Urban	26 (47.3)	29 (52.7)	
	Rural	5 (25.0)	15 (75.0)	
Fever associated with present illness (n = 75)				0.407
	Yes	19 (38.0)	31 (62.0)	
	No	12 (48.0)	13 (52.0)	
Use of antimalarial drug before presentation at OOUTH (n = 75)				0.931
	Yes	3 (42.9)	4 (57.1)	
	No	28 (41.2)	40 (58.8)	
Malaria parasitaemia (n = 50)				0.260
	Positive	4 (26.7)	11 (73.3)	
	Negative	17 (48.6)	18 (51.4)	

As shown in Table 4, children aged between >5 - 10 years were 1.566 times more likely to use an ITN as compared to those who were older than 10 years that are five times less likely to use ITN. Female participants were 2.254 times more likely to use an ITN as compared to their male counterpart. Children whose fathers had no formal education and those whose fathers' highest education were primary and secondary were 10, 12.5 and 33 times less likely to use an ITN respectively and there was

a strong association with secondary education achievement. On the contrary, children whose had no formal education and those whose mothers' highest education were primary and secondary were 11.182, 21.375 and 7.894 times more likely to use an ITN respectively and there was a strong association with secondary education achievement. Study participants who resided in the rural area were 10 times less likely to use an ITN as compared to those who reside in urban area.

Table 4: Factors associated with utilization of ITNs among study subjects

Characteristics	Variable	Odds Ratio	95% Confidence Interval	p-value
Age Group of Child (years)				
	0 - 5			
	>5 - 10	1.566	0.373 – 6.568	0.540
	>10	0.231	0.037 – 1.455	0.119
Gender of Child				
	Male			
	Female	2.254	0.675 – 7.529	0.187
Father's Educational Status				
	None	0.133	0.002 – 8.668	0.344
	Primary	0.080	0.001 – 4.355	0.215
	Secondary	0.031	0.002 – 0.486	0.013
	Tertiary			
Mother's Educational Status				
	None	11.182	0.204 – 614.205	0.238
	Primary	21.375	0.911 – 501.301	0.057
	Secondary	7.894	0.538 – 115.888	0.132
	Tertiary			
Place of Residence				
	Urban			
	Rural	0.259	0.055 – 1.225	0,088
Caregiver's Relationship to Child				
	Parent			
	Aunt	0.993	0.013 – 74.880	0.998
	Grandparent	0.451	0.057 – 3.544	0.449

DISCUSSION

Malaria accounts for 41% of morbidities and 30% of mortalities among under-five children in Nigeria (United Nations System in Nigeria 2001). The rate of malaria parasitaemia of 30% recorded in this study is higher than 23.3% and 22.6% recorded from tertiary hospitals in southeast and northeast Nigeria by Nwaneli (2022) and Balogun et al (Balogun, 2019) respectively. The difference between studies may be due to geographical variation of malaria prevalence as a result of varying environmental and seasonal conditions which influence the breeding habit and abundance of mosquito vectors with highest prevalence in the southwestern region which is the geographical region where the index study was conducted due to high annual rainfall and moderate temperature (Simon-Oke, 2023].

The pre-hospital use of medicines is a common practice among parents of febrile children (Balogun, 2019; Orimadegun, 2008). This practice has generated some controversy among healthcare workers. Some authority believed that early treatment with effective antimalarial drugs decreases the morbidity and mortality of malaria in endemic countries (Orimadegun, 2008). On the contrary, some workers believed that excessive use and self-administration of antimalarial drugs lead to a risk of resistance and progression to severe forms of the disease (Zieli´nski, 2023; Tumukunde, 2017). A fewer number of the study participants (9.3%) in the present study used antimalarial drugs before presentations at the hospital. The proportion of subjects who used antimalarial drugs before visiting the hospital is lower than 74.1% reported by Balogun et al (2019) among children in Maiduguri, northeast Nigeria. The low proportion of the subjects who used antimalarial drugs before visiting the hospital is likely an indication of rational drug use among our study population. The present study has shown that pre-hospital antimalarial treatment of febrile children is not a popular practice among febrile patients in our setting.

The regular and proper use of ITNs has been acclaimed as one of the most cost-effective ways to prevent mosquito bites and contracting malaria (Dun-Dery, 2022). The current study demonstrated that two-in-five of the study participants (41.3%) sleep under ITN. The ITN utilization rate reported

in the present study is higher compared with 2.1% reported by Senbanjo et al (2006) among attendees of Children Emergency Room of Obafemi Awolowo University Teaching Hospital, Ile-Ife, Osun State and 36.0 % obtained from a national survey conducted by National Malaria Elimination Programme (NMEP) of the Federal Ministry of Health (National Malaria Elimination Programme (NMEP) of the Federal Ministry of Health. Malaria Indicator Survey, 2021). This suggests a good culture of ITN utilization among participants in the present study.

The effectiveness of ITN in protecting against malaria is not debatable. However, its utilization among vulnerable populations at risk such as under-five children is still sub-optimal. It has been suggested that if the targets for malaria control are to be met, focus for ITN use should go beyond vulnerable groups (Okafor, 2012). In the present study children aged >5 – 10years predominantly used ITN the most. One may therefore, infer that this finding might perhaps be responsible for the observed higher rate of utilization even higher than the reported rate from the national survey as aforementioned above.

Some socio-demographic factors have been identified as important predictors of ITN use. (Haileselassie, 2016; Tchinda, 2012; Pettifor, 2008; Ndjinga, 2010; Graves, 2010). These socio-demographic factors include: gender, wealth, access to health care, education, and ethnicity (Haileselassie, 2016; Tchinda, 2012; Pettifor, 2008; Ndjinga, 2010; Graves, 2010). The current study found no association between ITNs usage and these factors. The explanation for the observed different finding across studies is not clear. However, due consideration should be given to the fact–that in the past malaria control strategies which previous studies evaluated paid more attention to vulnerable groups like children below five years of age and pregnant woman. Another plausible explanation could be that public health awareness campaigns have educated people on the benefits of using ITNs as a tool of malaria prevention. Furthermore, the government of Ogun State, under the National Malaria Control Programme and with the Roll Back Malaria (RBM) partners, embarked on free mass distribution of ITNs in the state around the study period utilizing a strategy of two nets per household with the aim of ensuring wide-scale and equitable distribution of ITNs among other malaria control tools in the state (Ladi-Akinyemi, 2019).

CONCLUSION

This study has shown that the utilization of ITN among study participants was quite encouraging with a higher rate than a recent national rate, but this utilization rate remains suboptimal compared to the Roll Back Malaria target for 2010 of 80.0%. Health education and free distribution of ITNs should be further strengthened across all strata of the population.

CONFLICT OF INTEREST

None declared

SOURCE OF FUNDING

Self

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