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Determinants of Household Long Lasting Insecticidal Nets Use among Children Under 5 Years in Nigeria

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Abstract

Background: *LLIN is one of the proven interventions adopted by the national malaria program to reduce malaria burden in Nigeria. Despite the marginal high ownership of LLIN across the geo-political zones of Nigeria, utilization among the under-five children is low. The study aimed to identify determinants of household use of long-lasting insecticidal net among under-five children in Nigeria.*

Methods: *A review of 2015 Malaria Indicator Survey was done. Independent variables include household's and women socio-demographic and economic characteristics. Outcome variables of interest was LLIN use by persons in household. Univariate, bivariate and multivariate analysis done to identify predictors of HH LLIN use in under-five children. Level of significance was set at <0.05.*

Results: *Twenty-five thousand six hundred and thirty-nine (66.7%) of under-five children slept under LLIN the night before the conduct of the survey. There was statistically significant association ($p<0.05$) between age, type of residence, wealth index, fever in the last two weeks before the conduct of the survey, number of mosquito bed nets and number of sleeping rooms.*

Conclusion: *LLIN ownership among household members most especially the under-five children were still not optimal bearing in mind the need for universal coverage of LLIN. Predictors of LLIN use among under-five children include age, type of residence, wealth index, fever in the last two weeks before the conduct of the survey, number of mosquito bed nets and number of sleeping rooms.*

Keywords*: LLIN ownership, LLIN utilization, Under-five children, Malaria, Household, Nigeria.*

Introduction

Malaria is a major cause of morbidity and mortality worldwide and it mostly affects pregnant women and children under five years of age (U5s) (*WHO. World malaria report 2016. World Health Organization*, 2017). It poses an enormous burden on the world's population, with 219 million cases and 435, 000 deaths attributable to this mosquito-transmitted parasite in 2017 alone(*World Health Organization. (2018). World malaria report 2018*). Sub-Saharan Africa is mostly affected with almost 86 percent of deaths occurring in children less than five years of age (*World Health Organization*, 2013). The burden of malaria is largely borne by Africa where 61% of deaths occurred, with pregnant women and children under five years of age most at risk of infection and adverse outcomes(*World Health Organization. (2018). World malaria report 2018. World Health Organization*).

The World Health Organization (WHO) together with other malaria implementing partners has been at the forefront of sponsoring the distribution of insecticide treated nets in malaria endemic areas as one of ways of combating malaria and achieving Sustainable Development Goals. During the past 10 years, coverage with vector control interventions increased substantially in Africa. In 2013, almost half of the population at risk in Africa (49%) had access to an insecticide-treated mosquito net, compared to 3% in 2004. In 2014, an estimated 214 million long-lasting insecticidal nets (LLINs) were delivered to malaria-endemic countries in Africa, bringing the total number of LLINs delivered to that region since 2012 to 427 million(Graves *et al.*, 2011).

The National malaria programme acclaimed that the use of Long Lasting Insecticidal Net (LLIN) being the most cost-effective interventions against malaria (*National Malaria Elimination Programme (NMEP), National Population Commission (NPopC), National Bureau of Statistics (NBS), and ICF International. 2016. Nigeria Malaria Indicator Survey 2015. Abuja, Nigeria, and Rockville, Maryland, USA: NMEP, NPopC*). Long Lasting Insecticidal Net ownership and use is one of the proven

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interventions adopted by RBM partners to reduce malaria burden in Nigeria.(Aderibigbe *et al.*, 2014). Malaria preventive services for children under 5 years include the use of LLIN which are being accessed through the immunization clinic after the completion of the national programme on immunization.

Studies have shown that consistent and correct utilization of LLIN leads to a 90% decrease in malaria transmission rate.(Baume and Marin, 2008; Bejon *et al.*, 2009). Since 2009, over 95million LLINs have been distributed in Nigeria through mass campaigns. In the north-western region of the country, there has been an increase in ownership (50% to 69%), access (36% to 55%) and utilisation (13% to 37%).(*National Population Commission (NPC) [Nigeria] and ICF International. 2014. Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International*; *National Malaria Elimination Programme (NMEP), National Population Commission (NPopC), National Bureau of Statistics (NBS), and ICF International. 2016. Nigeria Malaria Indicator Survey 2015. Abuja, Nigeria, and Rockville, Maryland, USA: NMEP, NPopC*)

Correct use of LLINs has been proven to reduce malaria cases by about 50%, and effectively reducing all causes of child mortality by 20% (Lengeler, 2004). Studies have revealed that LLIN use among those who own them is commonly interrupted by forgetfulness, unavailability of net due to washing or dirtiness, extreme fatigue, labour pains and illness(Pulford *et al.*, 2011), heat and not being bothered about mosquito bites(Toé *et al.*, 2009).

Despite the high ownership of LLIN across the geopolitical zones in the country(*National Malaria Elimination Programme (NMEP), National Population Commission (NPopC), National Bureau of Statistics (NBS), and ICF International. 2016. Nigeria Malaria Indicator Survey 2015. Abuja, Nigeria, and Rockville, Maryland, USA: NMEP, NPopC*, no date), utilization among the under-five population is still low.(*National Malaria Elimination Programme (NMEP), National Population Commission (NPopC), National Bureau of Statistics (NBS), and ICF International. 2016. Nigeria Malaria Indicator Survey 2015. Abuja, Nigeria, and Rockville, Maryland, USA: NMEP, NPopC*, no date) This study is therefore necessary to improve understanding of the factors influencing the use and barriers of LLIN in this target population.

Many studies (Otsemobor *et al.*, 2013; Aderibigbe *et al.*, 2014; Obembe, Anyaele and Oduola, 2014) have been done on utilization of LLIN but only a few have focused on the factors influencing the use and barriers of LLIN among under five children. Understanding various sources of information with regards to ownership and use of LLIN among children under 5 years will be of great value. It is also pertinent to understand drivers of the use and non-use of LLIN among the most vulnerable groups (children under 5 years) in the general population. The information from this study will assist program managers and policy makers to explore ways of improving utilization of LLIN among children less than five years of age. The study assessed determinants of household (HH) LLIN use among U5s using the 2015 Malaria Indicator Survey (MIS) data set.

Methods

Study area

The study was conducted across the six geopolitical zones of Nigeria.

Study design

A review of 2015 Malaria Indicator Survey was done to assess the determinants of LLIN use among mother's/caregivers of under-five children in Nigeria.

Study population

The study population included Mothers /care givers of under-five children in Nigeria at the time of study.

Sample size determination

The sample size estimation was done using the methodology for 2015 Malaria Indicator Survey.

Sampling technique

The sampling technique was done using the methodology for 2015 Malaria Indicator Survey.

Data source

2015 Malaria Indicator Survey data was obtained from the Demographic Health Survey Programme ICF International Rockville, Maryland, USA following a concept note shared on determinants of LLIN utilization among children under five in Nigeria.

Data abstraction / variables of interest

Variables of interest for analysis was abstracted from the datasets from 2015 Malaria Indicator Survey. Independent variables considered include household's and women characteristics, wealth index, birth history, literacy status of women in households, household possession and use of LLIN. Outcome variables of interest was LLIN use by persons in household.

Statistical analyses

Data analysis was conducted using SPSS version 20.0. Chi-square and t-test was used to ascertain associations between categorical and continuous variables respectively. Multivariate analysis will be conducted to identify predictors of HH LLIN use in U5s. Level of significance was set at <0.05.

Ethical considerations

Approval for the entire study was obtained from the Demographic Health Survey Programme ICF International Rockville, Maryland, USA. Datasets was shared only be used for analysis of study objectives. Confidentiality of the datasets was maintained and not shared with a third party.

Results

1. A total of 38,442 respondents were interviewed during the 2015 Malaria Indicator Survey. Majority of the household heads were more than 50 years of age 15488 (40.3%) and were mostly males 34473 (89.7%). Children between ages 1-4 constituted 67.1% of children 5 years and under with majority from the North-West region of the country 9338 (24.3%) and in the rural settlements 23755 (61.8%) (Table 1).
2. Nine thousand three hundred and ninety (24.4%) had mosquito bed net with the source of net most gotten from campaigns 10392 (86.0%) and were mostly gotten free 12426 (89.1%) and rectangular in shape 13190 (94.5%) (Table 2).
3. Twenty-five thousand six hundred and thirty-nine (66.7%) of children 5 and under slept under the mosquito bed net the night before the conduct of the survey. History of fever in the last two weeks among children 5 years and under before the conduct of the survey accounted for 12524 (32.6%) (Table 3).
4. There was statistically significant association between respondents' socio-demographic characteristics and children under five years who slept in bed net ($p<0.05$) (Table 4).
5. There was statistically significant association between age, type of residence, wealth index, fever in the last two weeks before the conduct of the survey, number of mosquito bed nets and number of sleeping rooms (Table 5).

Discussion

Long Lasting Insecticidal Nets is an important means of controlling malaria and other vector-borne diseases (Tokponnon *et al.*, 2014). Several studies in malaria endemic countries have shown the usefulness of LLINs in reducing man-vector contact,(Eisele *et al.*, 2006; Thwing *et al.*, 2008) thereby reducing the incidence of malaria infection (Ouattara *et al.*, 2011; CDC, 2014).

The commonest type of insecticide-treated nets used in Nigeria in long lasting insecticidal nets (LLINs). Children under five years of age have been identified as a vulnerable group to malaria and its consequences in endemic countries (Nwaorgu, 2011). This study revealed the determinants of household LLIN use among children under five years in Nigeria using the 2015 Malaria Indicator Survey.

Household ownership of LLIN among respondents across the six geo-political zones showed that two-third of respondents had between 1-4 mosquito bed nets. This is similar to the findings in studies done in Imo state (76%) and Burkina Faso (90%) where majority of the households owned bed nets

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(Diabaté *et al.*, 2014; Ozims and Eberendu, 2014). This is in contrast to the finding in a study done in Ogun state where only 23.6% of respondents owned LLINs (Adeneye *et al.*, 2014). Most of those that had LLINs acquired the net free. This finding was as a result of the frequent net distribution campaign that had taken place in the country.

Six out of ten children under five years slept under net the night before the conduct of the 2015 Malaria Indicator Survey. This is similar to the findings in previous studies done in malaria endemic countries such as Burkina Faso (70%) and Kenya (52.2%) (Malusha *et al.*, 2009; Diabaté *et al.*, 2014), however, study findings was in contrast to a study among under five children in Ghana (43%) (Zuradam, 2012), also was reported by Kabir et al, where utilization was found to be 31%. Statistic also showed utilization of 1% in Nigeria in 2003, 16% in Vietnam in the year 2000 and 7% in Zambia in the year 2002.

The study of NetMark in Nigeria, 2004, found utilization of 3% and 4% among children under-five and pregnant women respectively. Of all the under- five children sampled majority slept under the net every night. This was encouraging as regular use of the net is necessary to reduce the incidence of malaria among under five children.

History of fever two weeks before the conduct of the survey showed that 3 out of 10 under five children had fever with children 1-4 years mostly affect. This in turn underscores the fact that some under five children were still not being protected against malaria possibly due to LLIN utilization still not universal.

Association between socio-demographic factors of respondents and utilization of LLIN a night before the conduct of the 2015 Malaria Indicator Survey showed that there was a statistically significant difference between respondents' age, geo-political region, residence type and wealth index with their LLIN utilization.

There was also statistically significant difference between occurrence of fever two weeks before the conduct of the survey, number of children under five years, number of LLINs in the household and number of sleeping rooms. Predictors of household long lasting insecticidal nets use among children under five years who slept in bed net. There was statistically significant association between age, type of residence, wealth index, fever in the last two weeks before the conduct of the survey, number of mosquito bed nets and number of sleeping rooms.

Conclusion

The findings from this study showed that LLIN ownership among household members most especially the children under five was still not optimal bearing in mind the need for universal coverage of LLIN. The major sources of LLIN were from mass campaigns with a few from the health facility through the antenatal clinics and immunization clinics.

The level of utilization of LLIN among children under five was found to be slightly above average, however history of fever two weeks before the conduct of the survey mostly amongst children1-4 years of age underscores the fact that some under five children were still not being protected against malaria possibly due to LLIN utilization still not universal. The durability status of the nets was also found to be on the average which reaffirms the possible need for net replacement campaigns in the nearest possible time.

Factors identified to influence LLIN utilization were age of children under five, region, type of residence, wealth index, fever in the last two weeks before the conduct of the survey, number of children under five in the household, number of mosquito bed nets and number of sleeping rooms.

Predictors of household long lasting insecticidal nets use among children under five years who slept in bed net. There was statistically significant association between age, type of residence, wealth index, fever in the last two weeks before the conduct of the survey, number of mosquito bed nets and number of sleeping rooms. There is need for net replacement campaigns across the six geopolitical zones in the country with media intensification of educative programmes on the use of LLIN in other to improve usage. Also, parents/caregivers should promote the use of LLIN most especially for children under five.

Table 1. Socio-demographic characteristics of respondents in Nigeria

Characteristics	Frequency (N=38442)	Percentage (%)
Age of head of household		
< 20	148	0.4
20-29	3270	8.5
30-39	8778	22.8
40-49	9868	25.7
≥ 50	15488	40.3
Don't know	890	2.3
Mean age	22.30±19.93	
Sex of head of household		
Male	34473	89.7
Female	3969	10.3
Household members		
<5	9973	25.9
5-9	20843	54.2
≥ 10	7626	19.8
Children 5 and under		
0	11016	28.7
1-4	25785	67.1
≥ 5	1641	4.3
Region		
North central	7109	18.5
North east	7261	18.9
North west	9338	24.3
South east	4284	11.1
South south	5233	13.6
South west	5217	13.6
Type of residence		
Urban	14687	38.2
Rural	23755	61.8
Wealth index		
Poorest	6642	17.3
Poorer	7357	19.1
Middle	8176	21.3
Richer	8536	22.2
Richest	7731	20.1

Table 2. Respondents' mosquito bed net ownership in Nigeria

Characteristics	Frequency (N=38442)	Percentage (%)
Rooms for sleeping		
<5	32975	85.8
5-9	5007	13.0
≥ 10	460	1.2
Mosquito bed net ownership		
Yes	9390	24.4
No	29052	75.6
Number of mosquito bed net		
0	9390	24.4
1-4	24868	64.7

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≥ 5	4184	10.9
Sources of mosquito bed net (n=12086)		
Campaign	10392	86.0
ANC	576	4.8
Immunization clinic	1118	9.2
Status of bed net (n=13952)		
Bought	1498	10.7
Free	12426	89.1
Don't know	28	0.2
Shape of bed net (n=13952)		
Conical	739	5.3
Rectangle	13190	94.5
Others	23	0.2

Table 3. Respondents utilization of mosquito bed nets in Nigeria

Characteristics	Frequency (N)	Percentage (%)
Children 5 and under slept under mosquito nets (n=38442)		
0	25639	66.7
1-4	12513	32.6
≥ 5	290	0.8
Household respondents slept under a mosquito net (n=29052)		
Yes	19355	66.6
No	9697	33.4
Encourage use of mosquito net*		
Could easily hang net	86	0.2
If net were not hot	57	0.1
If net did not smell	517	1.3
If net had a different colour	114	0.3
If net were not itchy/irritating	881	2.3
If net were bigger	382	1.0
If there were mosquitos present	1117	2.9
Others	1228	3.2
Fever in last two weeks before the survey for children 5 and under		
Yes	12524	32.6
No	25656	66.7
Don't know	262	0.7

***Multiple responses**

Table 4. Relationship between children under five years who slept in bed net and their socio-demographic characteristics

Characteristics	Slept under mosquito bed net a night before survey			$\chi 2$	df	p value
	No n (%)	All children n (%)	Some children			
Age (in years)						
0	93 (1.2)	73 (0.8)	0 (0.0)	905.308	4	<0.001*
1-4	7326 (93.0)	9277 (95.3)	2482 (80.8)			
5	458 (5.8)	381 (3.9)	590 (19.2)			
Region						
North central	1251 (15.9)	1678 (17.2)	595 (19.4)	1528.024	10	<0.001*
North east	1437 (18.2)	2183 (22.4)	905 (29.5)			
North west	1675 (21.3)	3690 (37.9)	1051 (34.2)			

South east	1159 (14.7)	580 (6.0)	173 (5.6)			
South south	1148 (14.6)	887 (9.1)	225 (7.3)			
South west	1207 (15.3)	713 (7.3)	123 (4.0)			
Type of residence						
Urban	3308 (42.0)	2918 (30.0)	790 (25.7)	388.562	2	<0.001*
Rural	4569 (58.0)	6813 (70.0)	2282 (74.3)			
Wealth index						
Poorest	1075 (13.6)	2455 (25.2)	873 (28.4)	1490.753	8	<0.001*
Poorer	1195 (15.2)	2423 (24.9)	803 (26.1)			
Middle	1609 (20.4)	2151 (22.1)	685 (22.3)			
Richer	2043 (25.9)	1587 (16.3)	491 (16.0)			
Richest	1955 (24.8)	1115 (11.5)	220 (7.2)			

*Statistically significant

Table 5. Predictors of household long lasting insecticidal nets use among children under five years

Characteristics	AOR	95% CI
Age (in years)		
< 5	1.52	1.32-1.74
≥ 5 (ref.)		
Type of residence		
Rural (ref.)	0.59	0.56-0.63
Urban		
Wealth index		
Not rich (ref.)	0.37	0.35-0.40
Rich		
Fever in the last two weeks		
Yes (ref.)	1.16	1.09-1.24
No		
Number of mosquito bed nets		
≥ 5 (ref.)	0.42	0.38-0.46
1-4		
Number of sleeping rooms		
≥ 5 (ref.)	1.11	1.02-1.21
< 5		

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