Geographical/Ecological Differentials in Insecticide-Treated Net Use among Under-Five Children in Somolu Local Government Area, Lagos State

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Abstract

Malaria control efforts currently lay emphasis on reducing transmission by limiting human–vector contact. More studies have been carried out on mosquito avoidance practices in the rural areas, leaving the urban areas understudied. This study was conducted to identify knowledge of malaria transmission and to investigate geographical/ecological differentials in the use of insecticide-treated nets (ITNs) among caregivers of under-fives in Somolu Local Government Area, Lagos State. A household survey was conducted by interviewing 394 female caregivers of under-fives selected using the WHO Lot Quality Technique from communities stratified based on level of planning and drainage. The mean age of the respondents was 33.6 ± 7.7 years. Malaria transmission was attributed mostly to mosquito bites in all strata: S1 (58.3%), S2 (56.1%) and S3 (61.4%). Mosquito net was mentioned as a preventive measure by: 59.3% (S1), 80.7% (S2) and 64.3% (S3). Ownership of long-lasting insecticidal nets was: 76.0% (S1), 75.4% (S2) and 68.6% (S3), and of these, 73.1% (S1), 70.7% (S2) and 72.4% (S3) reported that their child slept under the net the night before the survey. There is a need to reinforce education on transmission and ownership of ITNs especially among caregivers in unplanned, poorly drained communities.

Introduction

While child mortality rates (0–5 years) have declined from 12.0 million in 1990 to 7.6 million in 2010 globally, it is unequally distributed, with India and Nigeria together accounting for a third of such deaths worldwide (WHO 2011). Malaria is a disease known to be associated with poverty and underdevelopment, and is a major scourge in the vast majority of tropical and subtropical regions of the world. Malaria control requires an integrated approach, comprising prevention (including vector control) and treatment with effective antimalarial agents (WHO 2008).

The use of insecticide-treated nets (ITNs) is currently considered one of the most cost-effective methods of malaria prevention in highly endemic areas, and it is the main method of malaria prevention used in Nigeria. Free distribution of long-lasting insecticidal nets (LLINs) is conducted through mass campaigns, routine distribution in public health facilities, faith-based organizations and non-governmental organizations, with the goal of achieving universal access for the at-risk population of children less than five years and pregnant women (FMOH 2008).

Poor perception and knowledge of malaria control are among the factors likely to influence use of ITNs. Currently, the Nigerian malaria control program emphasizes the behavioural change communication strategies as an integral part of the mass ITN distribution campaigns. Behaviour change communication refers to mobilizing the communities, local, regional and national, as well as political and religious leaders to play an active role in malaria control and ensuring proper understanding of the core interventions by the population and promoting positive change of behaviour (FMOH 2008). Understanding the local perceptions and practices could be of immense relevance to such interventions that seek to enhance the community's potential to adopt and sustain the use of ITNs.ITNs have been shown to reduce all-cause mortality among children <5 years by approximately 20% (Baume et al. 2005; Carol et al. 2007). This translates to the

prevention of almost 0.5 million deaths each year in Africa south of the Sahara. ITNs also protect against the development of anaemia in both pregnant and young children, the groups at highest risk from malaria and malarial anaemia. This recent development from ITNs that need to be retreated to long-lasting, wash-resistant nets that will remain effective for up to 4 years has proven to be more effective (WHO 2010). Mosquitoes transmit the malaria parasite and hence, protecting humans (especially the vulnerable ones like pregnant women and children under the age of five) from mosquito bites would go a long way in reducing the malaria burden. Yet, despite the well-known benefits of ITNs and the efforts of the Nigerian Government to promote this intervention, many families and individuals at risk in the country do not own or use them (WHO 2008). Several national surveys have shown persistently low levels of ownership and use of ITNs. The proportion of Nigerian households that owned at least one ITN during the same period was 2.2% in 2003 and 8% in 2008, while the proportion of under-five children who used ITN during the same periods was 1.2% and 5.5%, respectively. In this study, we sought to obtain more information about the perceptions and knowledge of malaria and its control among caregivers of under-five children. The objectives of this study were to: (1) investigate perceived cause of malaria; (2) find out knowledge of the various preventive measures against malaria; (3) find out general knowledge on mosquito nets, its ownership and usage among caregivers of under-five children; and (4) determine ecological/geographical differentials in ITN use among under-five children in Somolu Local Government Area (LGA). The findings of the study can help to inform planning of an acceptable intervention and community-based program to improve malaria transmission prevention practices among under-five children.

Methods

Study Area

The study was carried out in Somolu LGA, which is one of the 20 LGAs in Lagos State and lies on the North of Lagos City. The LGA is densely populated (as at the last census, i.e., 2006, the population was 602,673) and it has an area of 12 km^2. Social infrastructures like roads, water, health facilities and educational institutions abound in the LGA. It is close to the lagoon, and it is predominantly an Ijebu settlement with some Ilajes and Ijaws along the shoreline of the lagoon. There are also other tribes due to the influx of people into the State.

Study Design

A descriptive, cross-sectional study was carried out to investigate geographical/ecological differentials in the knowledge of malaria transmission and use of ITNs among caregivers of under-five children.

Sampling Technique

The study site was stratified into three strata based on the level of planning and drainage observed across the study site using the geographic information system (GIS). This helped to control for the environmental and topographical variation that is assumed to influence mosquito ecology. The three strata were: Stratum 1: Planned, well-drained. In this stratum, the streets were planned with a very good road network with no potholes and no open drainages system. Stratum 2: Planned, poorly drained. In this stratum, the streets had a good road network system with the streets linking each other; however, there were open drainage systems, revealing the litter-filled drains. Stratum 3: Unplanned, poorly drained. Here, the road network was bad with potholes as well as blocked and waterlogged drainage systems serving as mosquito breeding sites.

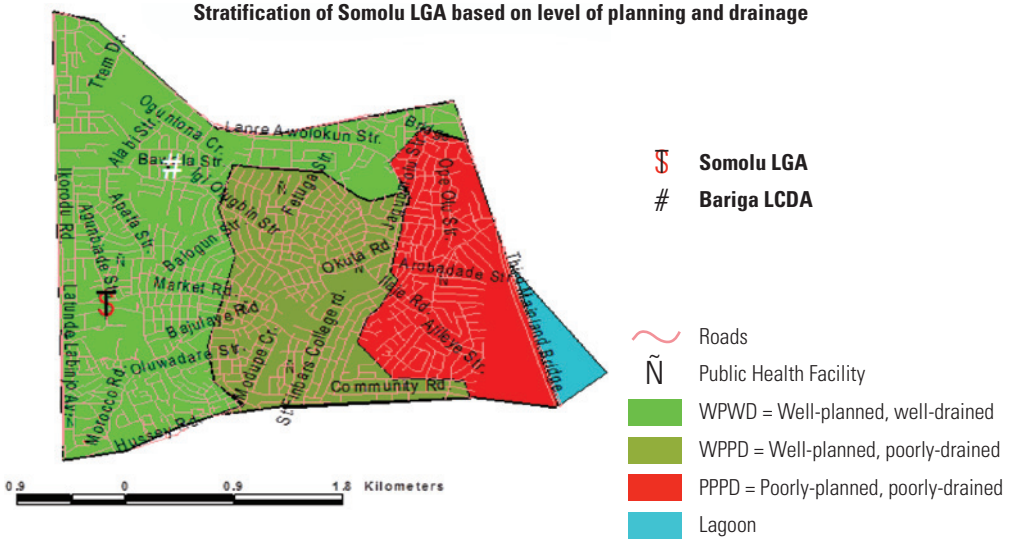
Sample Size and Sampling

The minimum sample size was estimated at 394 using the formula for a single population proportion (Leslie 1965), considering the use of the cluster sampling method and the 95% confidence interval assumption, 5% margin of error, 20% non-response rate and prevalence of use of ITNs among under-five children in South-western Nigeria as 28.8% (MIS 2010). The WHO Lot Quality Technique sampling method (WHO 2006) was used to select 394 caregivers of under-five children from the study communities.

The WHO Lot Quality Technique was selected so as to make judgements about individual stratum and hence formulate policies to direct resources to the stratum that needs them the most.

Firstly, the study LGA was stratified based on the level of planning and drainage observed across the LGA using the GIS. This resulted in: Stratum 1 (S1): planned, well-drained; Stratum 2 (S2): planned, poorly drained; and Stratum 3 (S3): unplanned, poorly drained. Figure 1 shows the LGA according to the level of planning and drainage system.

Figure 1. Map showing stratified, sampling scheme for Somolu Local Government Area (LGA)



The number of grids to sample in each stratum was selected proportionately, and the sample size was shared proportionately among the three strata. The sample size determined for each stratum was divided by the number of grid cells selected for each stratum to determine the number of caregivers to be studied per grid. A tossed coin with head up signals that data collection should start from the right of each grid and tail up signals that all houses on the left with care-givers of under-five children is sampled till the number of households in each grid was achieved. In households with more than one eligible caregiver, the random sampling method was used to select the caregiver to be interviewed.

Data Collection Methods

A pre-tested, interviewer-administered, semi-structured questionnaire was administered to caregivers with at least one child under the age of five by trained research assistants who had sufficient information about the research and the area and who were closely supervised by the principal investigator. Each research assistant had a minimum of Secondary School Leaving Certificate, was a resident in the area and was thoroughly trained on the research, and all were fluent in both English language and Yoruba language. The research assistants duly informed the caregivers (as they went from house to house) about the purpose of the study and the benefits they

stand to gain when the results of the study translate to policies that impact positively on their health and that of their under-five children. No incentive was given to the caregivers to encourage them to participate in this study.

The questionnaire was adapted from the study of Macintyre et al. (2002) in Kenya. The contents of the first section of the questionnaire were on the sociodemographic characteristics of the respondents, such as age, monthly income, marital status and occupation. Questions in the second section probed respondents' knowledge on the mode of malaria transmission, knowledge of signs and symptoms of malaria, its prevention and the various mosquito avoidance practices of the respondents. The third section contained questions that elicited information on respondent's knowledge of mosquito, ITNs ownership and usage and the suspected malaria episodes in the U-5C in the past 12 months (U-5C stands for children under the age of five years).

Data Analysis

The data was analyzed using SPSS 15.0 statistical software (SPSS Inc. USA). The outcome variable measured is usage of ITNs by under-five children the night before the survey. Independent variables include sociodemographic characteristics of the caregivers as well as their knowledge of signs and symptoms of malaria and its preventive measures. Descriptive statistics such as frequencies and means were used to summarize the data. Principal component analysis was used to calculate the household wealth index of households by means of a list of household assets ownership. Categorical data were compared using the chi-square test, and a p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Nigerian Institute of Medical Research Institutional Review Board. Prior to data collection, permission was sought from the Somolu Local Government. Informed consent was obtained from all respondents before the interview commenced.

Results

Sociodemographic Characteristics of Respondents

All respondents were female. The mean age of the respondents was 34 ± 7.7 years. Their ages were grouped into five, with the modal age group for all the strata being 30–39. In all the strata, more of the respondents reported that their monthly earning was difficult to say, with 134 (42.9%), 39 (68.4%) and 46 (65.7%) in S1, S2 and S3, respectively. Overall, 22.4% were in the richest quintile comprising S1 – 79.5%, S2 – 9.1% and S3 – 11.4%. A majority of the respondents came from households with density of between three and five, with S1: 198 (63.5%), S2: 43 (75.4%) and S3: 48 (68.6%). More caregivers had just one under-five child: S1: 187 (59.9%), S2: 35 (61.4%) and S3: 48 (68.6%). Table 1 shows a summary of the sociodemographic characteristics of the respondents.

Table 1. Sociodemographic characteristics of the caregivers (N = 394)

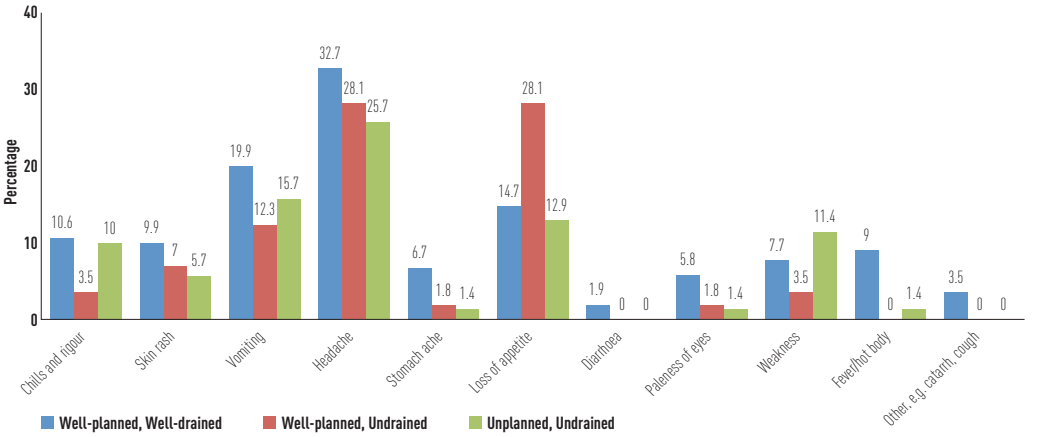
Characteristic	S1 n (%) N = 207	S2 n (%) N = 89	S3 n (%) N = 98	Total n (%) N = 394
Age group				
<20	8 (3.8)	0 (0)	0 (0)	8 (2.0)
20–29	56 (27.2)	12 (14.0)	22 (22.9)	90 (22.8)
30–39	107 (51.9)	56 (63.2)	15 (15.4)	178 (45.1)
40–49	27 (13.1)	17 (19.3)	20 (20.0)	64 (16.2)
<49	8 (3.8)	3 (3.5)	6 (5.7)	17 (4.3)
$\chi2 = 12.721$, df = 8, $p = 0.122$				
Marital status				
Currently married	182 (87.8)	86 (96.5)	95 (96.5)	363 (92.1)
Others	25 (12.2)	3 (3.5)	3 (3.5)	31 (7.9)
$\chi2 = 4.186$, df = 2, $p = 0.123$				
Occupation				
Unemployed	45 (21.5)	16 (17.5)	13 (12.9)	74 (18.8)
Student	25 (11.9)	8 (8.8)	10 (10.0)	43 (10.9)
Artisan	21 (10.3)	6 (7.0)	10 (10.0)	37 (9.4)
Trader	102 (49.4)	58 (64.9)	62 (62.9)	222 (56.3)
Civil servant	14 (7.1)	2 (1.8)	4 (4.3)	20 (5.1)
$\chi2 = 9.530$, df = 8, $p = 0.300$				
Educational status				
No formal education	15 (7.4)	6 (7.0)	4 (4.3)	25 (6.3)
Primary	19 (9.3)	6 (7.0)	13 (12.9)	38 (9.6)
Secondary	111 (53.8)	58 (64.9)	62 (62.9)	231 (58.6)
Tertiary	61 (29.5)	19 (21.1)	20 (20.0)	100 (25.4)
$\chi2 = 6.339$, df = 6, $p = 0.386$				
Wealth quintile				
Lowest	43 (20.8)	12 (14.0)	20 (20.0)	75 (19.0)
Second	36 (17.3)	27 (29.8)	24 (24.3)	87 (22.1)
Middle	38 (18.3)	27 (29.8)	20 (20.0)	85 (21.6)
Fourth	44 (21.2)	11 (12.3)	21 (21.4)	76 (19.3)
Highest	46 (22.4)	12 (14.0)	14 (14.3)	72 (18.3)
$\chi2 = 13.897$, df = 8, $p = 0.084$				

Respondents' Perceived Causes and Signs/Symptoms of Malaria

The proportion of the respondents who reported the cause of malaria is a mosquito bite was 234 (75%), 50 (87.7%) and 59 (84.3%) in S1, S2 and S3, respectively. Apart from mosquito bites, other causes mentioned include standing under the sun (S1: 12.8%, S2: 10.5%, S3: 5.7%), eating bad food (S1: 4.6%, S2: 3.8%, S3: 1.8%), stress (S1: 6.4%, S2: 6.7%, S3: 7%) and dirty surroundings (S1: 10.5%, S2: 10.6%, S3: 7%). However, there was no significant difference in these other causes as reported across the three strata. Also, there was no significant association between the age of the caregiver

($\chi^2 = 7.918$, $p = 0.095$), education ($\chi^2 = 2.06$, $p = 0.560$) and the wealth quintile ($\chi^2 = 2.843$, $p = 0.584$) of the respondents and those who reported mosquito bites to be the cause of malaria in S1, S2 and S3, respectively. Signs and symptoms of malaria that respondents mentioned are displayed in Figure 2.

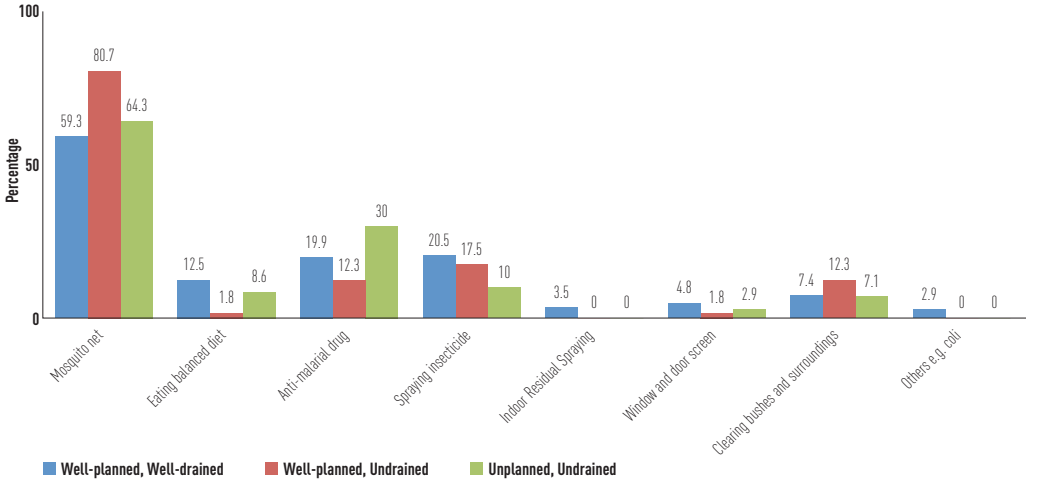
Figure 2. Signs and symptoms (according to location) as reported by the respondents



Respondents' Knowledge of Malaria Prevention Measures

A summary of respondents' knowledge of malaria prevention measures is given in Figure 3. Age had no significant association with those who reported the mosquito net as a preventive measure against malaria ($\chi^2 = 10.153$, $p = 0.06$); also, age had no significant association with knowledge of antimalarial drugs as a malaria preventive measure ($\chi^2 = 0.792$, $p = 0.673$). However, a significant association was found between occupation ($\chi^2 = 16.421$, $p = 0.03$), wealth quintile ($\chi^2 = 9.964$, $p = 0.04$) and knowledge of antimalarial drugs as a malaria preventive measure. Figure 3 presents the malaria preventive measures mentioned by the respondents.

Figure 3. Respondents' knowledge of malaria prevention measures



Mosquito Net Ownership and Their Source

Table 2 shows the mosquito ownership status of the respondents as well as how they got the net. Mosquito nets refer to both retreatable nets and LLINs. Most of the households of the respondents had more than one mosquito net: S1, 171 (77.4%); S2, 29 (70.7%); and S3, 33 (68.8%).

Acquisition of mosquito nets was mainly at the health facility in the three strata, with 146 (62.1%) of the respondents in S1 having their nets from the health facility and 27 (62.8%) and 32 (66.7%) of the respondents in Strata 2 and 3, respectively, reporting likewise. This was followed by distribution by local government officials (civil servants) in S1 (26%), S2 (35%) and S3 (27.1%), respectively.

Table 2. Mosquito net ownership and their source

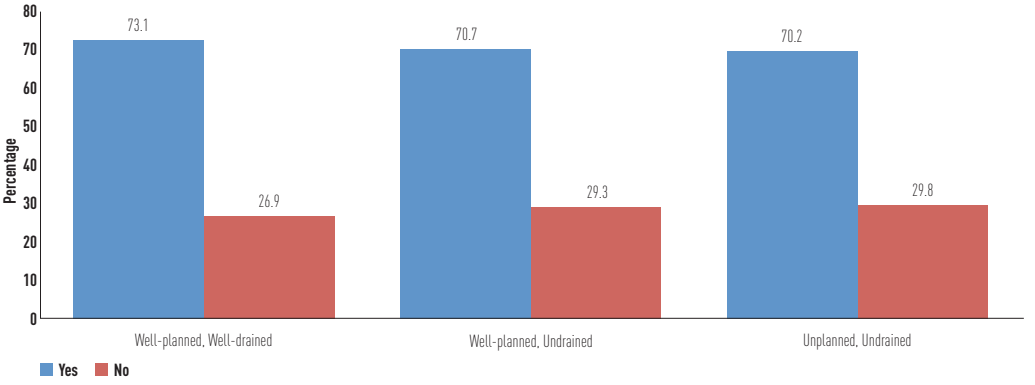
	Variable strata			
	Well-planned, well-drained n (%) N = 206	Well-planned, not well-drained n (%) N = 89	Not planned, not well-drained n (%) N = 98	Total
Do you have a mosquito net?				
Yes	157 (76.0)	67 (75.4)	67 (68.6)	291
No	49 (24)	22 (24.6)	31 (31.4)	102
***Which type do you have?**				
Untreated net	14 (8.9)	5 (7.0)	6 (8.3)	25
Retreatable net	55 (35.0)	14 (20.9)	10 (14.6)	79
Long-lasting insecticide-treated net	85 (54.4)	45 (67.1)	53 (79.2)	183
***How did you acquire it?**				
At health facility	98 (62.1)	42 (62.8)	45 (66.7)	185
Distribution by local government officials	41 (26.0)	23 (35.0)	8 (12.5)	72
Bought it	27 (17.0)	14 (35.0)	18 (27.1)	59

*Multiple responses.

Mosquito Net Usage

More than 70% of the respondents in each stratum had their under-five child sleep under the net the night before the survey (Figure 4).

Figure 4. Proportion of under-five children who slept under a bed net the night before the survey



A significant association existed between occupation ($\chi^2 = 19.606, p = 0.001$), monthly earning ($\chi^2 = 18.106, p = 0.001$), the type of house in which respondents live ($\chi^2 = 11.726, p = 0.03$), number of under-five children in the household ($\chi^2 = 35.709, p = 0.00$), the number of times the child had febrile illness in the past one year ($\chi^2 = 6.209, p = 0.045$) and the child slept under the net a night before the survey.

Relationship between Caregivers' Characteristics and Bed Net Usage among Under-Five Children

The relationship between caregivers' characteristics and bed net use among under-five children (the night before the survey) is given in Table 3.

Table 3. Relationship between caregivers' characteristics and bed net usage among under-five children

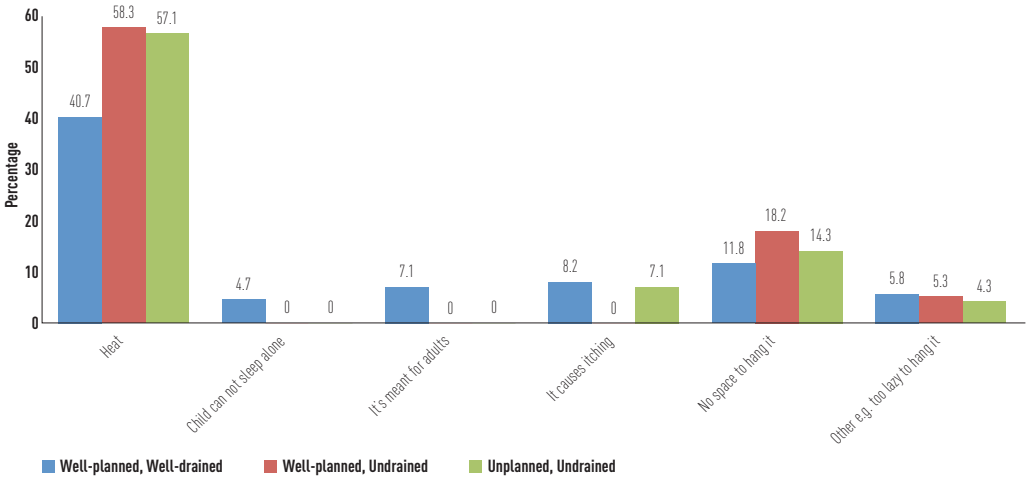
	Yes n (%)	No n (%)	Total N (%)	$\chi 2$	df	*p*
Occupation						
Unemployed	49 (88.3)	6 (11.7)	55 (100)	19.606	4	0.001*
Student	23 (89.3)	3 (10.7)	26 (100)			
Trader	113 (68.3)	52 (31.7)	165 (100)			
Artisan	21 (64.7)	11 (35.3)	32 (100)			
Civil servant	7 (50.0)	7 (50.0)	14 (100)			
Type of house				11.726	2	0.003*
One room	81 (68.9)	37 (31.1)	118 (100)			
Room and parlour	91 (82.6)	19 (17.4)	110 (100)			
Self-contained apartment	37 (60.9)	24 (39.1)	61 (100)			
Number of under-five children in the household				6.98	1	0.008*
1	116 (67.0)	57 (33.0)	173 (100.0)			
≥2	93 (80.5)	23 (19.5)	116 (100)			

*Significant at 95% level of significance.
N = 283 (number of respondents with bed net).

Reasons Why Under-Five Child Did Not Sleep under the Net the Night before the Survey

For the children who did not sleep under the net a night before the survey, the reasons given in the three strata include: the net generates heat, the child cannot sleep alone, the net is meant only for adults, the child reacts to the net or it causes itching in the child and lack of space to hang it in the room. However, the majority in each stratum mentioned the issue of heat generated by the net: 41%, 58% and 57% in S1, S2 and S3, respectively (Figure 5).

Figure 5. Reported reasons for under-five child not having slept under a bed net the night before the survey



Reasons for Not Owning a Net

For the respondents who reported not owning mosquito nets, in S1 and S2, a higher proportion (32.9% and 43.8%, respectively) of the respondents reported that they owned a net but it was torn (Table 4). The unavailability of the net in the market was the main reason given in S3.

Table 4. Reasons given by under-five caregivers for not owning a net

Variable	Strata			
	S1 n (%)	S2 n (%)	S3 n (%)	Total
Reasons				
I can't afford it	6 (12.7)	0 (0)	6 (18.8)	12 (11.8)
I don't think it's effective	10 (20.3)	7 (31.3)	4 (12.5)	21 (20.6)
It's not available in the market	11 (21.5)	6 (25.0)	8 (25.0)	25 (24.5)
I had but it's torn	16 (32.9)	10 (43.8)	8 (25.0)	34 (33.3)
Others, e.g., I can't find it	6 (12.7)	0 (0)	5 (18.7)	11 (10.8)
Total	49 (100)	22 (100)	31 (100)	102 (100)

Factors Associated with Bed Net Use as a Mosquito Avoidance Practice

As shown in Table 5, there was no significant association between location ($\chi^2 = 0.46$, $p = 0.795$), monthly earning ($\chi^2 = 6.124$, $p = 0.190$), wealth quintile ($\chi^2 = 12.336$, $p = 0.15$) and the use of a mosquito net. However, there was a significant association between its effectiveness ($\chi^2 = 7.081$, $p = 0.008$), its ease of use ($\chi^2 = 12.458$, $p = 0.000$) and its affordability ($\chi^2 = 9.209$, $p = 0.002$).

Table 5. Factors associated with bed net use as a mosquito avoidance practice

Characteristic	Bed net					
Location	**Yes N = 256 n (%)**	**No N = 138 n (%)**	**Total N = 394 n (%)**	**χ^2**	**df**	**P**
Stratum 1	133 (64.4)	74 (35.6)	207 (100)	0.795	2	0.460
Stratum 2	61 (68.4)	28 (31.6)	89 (100)			
Stratum 3	62 (62.9)	36 (37.1)	98 (100)			
Monthly earning	**Yes N = 256 n (%)**	**No N = 139 n (%)**	**Total N = 394 n (%)**	**χ^2**	**df**	**P**
Difficult to say	135 (23.0)	62 (77.0)	197 (100)	6.124	4	0.190
≤₦20,000	72 (63.2)	42 (36.8)	114 (100)			
₦21,000-₦40,000	30 (63.0)	18 (37.0)	48 (100)			
₦41,000-₦60,000	7 (42.1)	9 (57.9)	16 (100)			
≥₦61,000	12 (59.1)	8 (40.9)	20 (100)			
It is effective	**Yes N = 254 n (%)**	**No N = 140 n (%)**	**Total N = 394 n (%)**	**χ^2**	**df**	**p**
Yes	29 (50.0)	30 (50.0)	59 (100)	7.081	1	0.008*
No	225 (67.2)	110 (32.8)	335 (100)			
It is easy to use	**Yes N = 253 n (%)**	**No N = 143 n (%)**	**Total N = 394 n (%)**	**χ^2**	**df**	**p**
Yes	1 (16.7)	11 (83.3)	12 (100)	12.458	1	0.000*
No	252 (66.0)	130 (34.0)	382 (100)			

* Significant at 95% level of significance.

Discussion

In this study, more than 70% of the respondents had their child sleep under the net a night before the survey. This is quite encouraging but does not meet the target for malaria control during 2009–2013, which is to expand and sustain net usage to at least 80% of children under age 5 and to pregnant women by 2010 and to sustain the coverage until 2013 (MIS 2010).

The proportion of LLINs use among under-five children in this study is higher than in other studies conducted in Nigeria and Africa (MIS 2010; WHO 2010). For those children who did not sleep under the net, the major reason given in this study is similar to that reported in a study carried out in Ethiopia where factors like heat, absence of mosquitoes, LLINs preventing free air movement and difficulty hanging the nets were some of the reasons given for non-use of net in the study (Yared et al. 2008).Occupation of caregiver, type of house inhabited and the number of children under five in the household were significantly associated with the use of bed nets among the children under 5. Arogundade et al.

(2011) in their study in Nigeria reported other factors significantly associated with the use of bed nets and they are: education, geopolitical zone and misconception about causes and prevention of malaria. Worthy of note in this study is the association between accommodation type and use of bed net by the under-five children. Children who live in a one-room apartment may be unfortunate in that there may be just one bed (on which the parents sleep), while the children sleep on the floor. Alaii et al. (2003) in her study in Kenya reported that the use of bed nets was seasonal and was only meant for adults, not children. The respondents' geographical location had no direct association with ITN use among the under-five children. This could be as a result of free distribution by local government officials and when the respondents go for antenatal care visits.

Conclusion

This study sought to identify the perceived cause of malaria, knowledge of the various preventive measures against malaria, information on the general knowledge of mosquito nets and mosquito net ownership and usage among caregivers of under-five children, and to investigate ecological/geographical differentials in use of ITNs among caregivers of under-five children in Somolu LGA, Lagos State. Respondents' knowledge of the signs/symptoms of malaria in their under-five children and their perception of the cause of malaria and the various preventive measures against malaria is encouraging. However, it is disturbing that some still had misconceptions about the causes of malaria, like standing under the sun and eating bad food. This suggests an urgent need to strengthen educational programs on malaria that emphasize the causes and signs/symptoms of malaria. This improved knowledge will translate to uptake of malaria preventive services. As shown in Table 5, the stratification of Somolu LGA had no direct association with the use of bed nets by the under-five children a night before the survey. This could be as a result of the free distribution done at antenatal care clinics and by local government officials. We can therefore conclude that with enactment and implementation of policies that encourage universal access to bed nets, the divide between the rich and the poor in terms of access to bed nets can be bridged, hence increasing the health status of the entire population. Over 70% of the respondents had their child sleep under a bed net a night before the survey, and this is encouraging as compared with the use of ITNs among under-five children in South-western Nigeria, which was only 28.8% (MIS 2010). This increase could be related to the increasing subsidy of healthcare services or free healthcare services and products by the government.From the findings in this study, it is obvious that but for free distribution of LLINs by the government, most of the households would have had no LLIN. More health education should be done on the importance of under-five children sleeping under bed nets to encourage its use. Even though the bed nets were given free of charge, some of the respondents still reported its unavailability in the market, and this could be due to their not being at home during distribution. The free distribution of the bed nets might be the reason why there was no statistical significance between monthly earnings, community measure of wealth and the use of bed nets.However, most of those whose children did not sleep under an ITN said it was as a result of the heat generated by the net, especially as there is usually sporadic power supply, which if it were stable, might have led to the use of electric fans. Therefore, LLIN material that does not absorb heat or is not heat-producing is highly recommended. It is important for malaria program managers to understand people's perceptions and knowledge about ITNs. It could be helpful if program managers encourage community participation so as to bridge the gap between planning and utilization.One limitation of

this study is the self-report of bed net use. All other previous studies were also based on self-reports. Given that bed net usage is not a very sensitive subject, there is not much to suggest that there would be a high level of false reporting on this subject. Nevertheless, it would strengthen future studies if objective observations of bed net use could be used along with self-reports to corroborate study findings. A larger study representing the geo-political zones of the country is needed to provide more generalizable findings for all of Nigeria as well as a study in a community where there has not been free distribution of bed nets to determine the influence of community-level measure of wealth on bed net usage.

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