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Determinants of ownership and utilisation of insecticide treated bednets in children with sickle cell anaemia in Benin City

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Abstract

Introduction: *malaria in children with Sickle Cell Anaemia (SCA) results in severe morbidity and mortality, thus like in pregnant women and young children, malaria prevention in them should involve a multipronged approach. In addition to the use of chemoprophylaxis, sleeping under Insecticide-Treated Net/Long-Lasting Insecticide-Treated Net (ITN/LLIN) has been found to be efficacious and effective in reducing malaria by vector control and preventing bites by mosquitoes. The aim of this study is to determine the ownership and utilization of ITN/LLIN and socioeconomic factors influencing the ownership/utilisation of ITN/LLIN in children with SCA.* ***Methods:*** *this was a cross-sectional study involving children with SCA aged 6 months to 17 years; conducted using semi-structured interviewer-administered questionnaire.* ***Results:*** *a total of 806 questionnaires on the ownership and utilization of ITN/LLIN were filled and retrieved from children with SCA and their caregivers. The mean age of study population was 80.1±48.5 months. A total of 421 (52.2%) respondents owned at least one ITN/LLIN in their homes, while 291 (36.1%) slept under an ITN the previous night. The use of malaria chemoprophylaxis was a significant predictor of both ownership and utilisation of ITN/LLIN (p=0.000; OR: Odds ratio = 2.3 and p=0.001; OR=2.0). Clinic attendance at University of Benin Teaching Hospital (UBTH) was the only significant predictor of ownership of ITN/LLIN (p=0.002, OR =2.1).* ***Conclusion:*** *the ownership and utilization of ITN/LLIN amongst respondents was low. Chemoprophylaxis use and attending clinic at the UBTH were significant predictors for the ownership of ITN/LLIN.*

Introduction

Nigeria currently has the highest burden of malaria in the world, with 27% of global malaria deaths occurring in Nigeria [1]. Children aged under 5 years are the most vulnerable group affected by malaria [1]. Nigeria has the highest burden of Sickle Cell Anaemia (SCA) globally, with more than 150,000 Nigerian children born each year with the disorder [2]. Malaria is a significant cause of morbidity and mortality in children with SCA [3-8]. McAuley *et al.*in 2010, reported that the mortality in children with SCA who had malaria was about 10 times higher than in children without SCA [5]. This is due to the fact that following parasitaemia, accelerated sickling of red blood cells (RBCs) occurs, triggering vaso-occlusive, haemolytic and/or a sequestration crisis (leading to severe anaemia) [6,7]. Thus, malaria induces morbidity and mortality in SCA by triggering vaso-occlusive crisis and severe anaemia, leading to hospital admissions and sometimes deaths [8].

Long-term malaria chemoprophylaxis has been shown to lower the incidence of malaria-induced severe anaemia, the number of hospital admissions and crises as well as mortality in SCA [9-13]. However, prevention of malaria is a multi-pronged approach; sleeping under insecticide-treated net/long lasting insecticide treated net is also an effective method for malaria control and prevention [14]. Insecticide-treated net/long-lasting insecticide-treated net reduces the burden of malaria by reducing human contact with mosquitoes [15]. Insecticide-treated net/long-lasting insecticide-treated has been shown to reduce severe disease due to malaria in endemic regions by up to 50% and reduce all-cause mortality by 17% in children living in high endemic areas, including Nigeria [16-22].

Distribution of long lasting insecticide-treated nets (LLINs) has been ongoing for over two decades. Over the years, the distribution of ITN/LLIN in sub-Sahara Africa has increased [1,14]. However, there has been a non-commensurate rate of rise in the ownership and utilisation of LLINs. The uptake and utilisation of ITN/LLIN vary across population at risk and across countries in sub-Sahara Africa, including Nigeria (with utilisation lagging behind ownership) [1,14,23].

In sub-Sahara Africa, between 2015 and 2020, the rate of rise of ownership and utilisation of

ITN/LLINs was almost static; household ownership was between 63% and 68%, while use of Insecticid-treated net (ITN) was between 46% and 52% for populations at risk (pregnant women and children aged under five years) [1,14,23]. In Nigeria, in 2020, the household ownership of ITN/LLINs was 60.6%, while by population at-risk ownership of LLINs was 47.5%, with a lower usage rate of 43.2% [1,24]. These rates in sub-Sahara Africa and Nigeria are far from reaching the WHO targets for universal coverage (at least 80% for ownership and usage of ITN/LLINs in population at risk) [25,26]. The situation in Nigeria has raised significant concern; despite the high burden of malaria in Nigeria and widespread distribution of ITN/LLIN across the country, Nigeria has the lowest ownership and usage of ITN/LLINs across Africa; with a usage rate of between 43.2% and 50%, compared to 70% in other African countries (DRC, Ghana and Uganda) with lower malaria cases [23]. In persons with SCA, little is known about the ownership and utilisation of ITN/LLINs; a study done in South Western Nigeria in 2007 showed that only 10% of adult patients with SCA used ITNs [27]. No study in children with SCA was identified.

Various socioeconomic and environmental (heat and absence of mosquitoes) factors, affect the uptake and utilization of ITN/LLIN amongst population at risk [22,28,29]. However, little or no information on the factors influencing the ownership and utilisation has been documented in children with SCA. Therefore, this study assessed the ownership, utilisation, and associated factors influencing the ownership and utilisation of ITN in children with SCA. The data obtained from this study will be beneficial in addressing challenges in malaria prevention using LLINs and for policy making on malaria prevention in children with SCA.

Methods

Study design: this was a descriptive cross-sectional study conducted to determine the determinants of ownership and utilization of ITN/LLINs in children with SCA.

Study location and population: the study was carried out in Benin City, Edo State, Nigeria at two sickle cell clinics: the Sickle Cell Centre (SCC) and sickle cell clinic, University of Benin Teaching Hospital (UBTH). Edo State is located in South-South geopolitical zone of Nigeria where malaria transmission is holoendemic and stable. It is a cosmopolitan City, situated in the rainforest belt. It is located at 122 meters above sea level and has estimated population of 1,085,676 (year 2006 census). The clinic in UBTH, is situated in The Department of Child Health, UBTH; the clinic has two paediatric haematologists who run clinic once weekly along with other resident doctors in training. The Sickle Cell Centre, (SCC), is attached to the Central Hospital and Edo Specialist Hospital, both in Benin City. There are two senior medical officers who attend to patients in the SCC. Sickle cell centre provides secondary health care services to population within and outside Benin City. The SCC manages only Sickle Cell Disease (SCD) patients (children and adults); clinics are run daily from Monday to Friday.

Study population (participants): children aged 6 months to 17 years with known homozygous sickle cell haemoglobin (HbSS); as confirmed from their guardians and case notes, already attending clinics at The Sickle Cell Centre in Benin or The Sickle cell clinic at The University of Benin Teaching Hospital (UBTH), Benin City. Written informed consent was obtained from the parents and guardians while assent was obtained from children older than 8 years.

Data collection: an interviewer-administered semi structured questionnaire (pilot tested among 45 patients with SCA who were not part of the study) was used to obtain information of study participants on demographics, socioeconomic status, use of chemoprophylaxis, ownership and utilisation of ITN/LLIN from parents/guardians of children with SCA. Older children also provided information. Interviewers were trained to understand and appropriately administer all aspects of the questionnaire and interview process.

Minimum sample size: the estimated minimum sample size was 691. This number was calculated assuming that the expected proportion of persons with SCA using ITN/LLIN was 10%, as found in the study by Kotila *et al.* in 2007 [27]. Assuming an attrition rate of 20% (for incomplete information, and missing questionnaires), a total of 829 questionnaires were administered.

Sampling method: children aged 6 months to 17 years were recruited from the SCC and the sickle cell clinic in UBTH. Study participants were recruited consecutively until the sample size was met. Fewer patients were recruited from UBTH due to an industrial action that took place at the time of study implementation. The industrial action lasted 3 months; during this period routine clinic visitation was prohibited.

Measurement/definition of terms: the questionnaire included information on the child's bio-data: age, sex, parent's socio-demographic data (mother's level of education, mother's occupation, and father's occupation), age at diagnosis of SCA, ownership and utilisation of Insecticide-treated nets/long lasting insecticide treated nets (ITN/LLIN), and type and frequency of administration of malaria chemoprophylactic drug being used for malaria prevention.

ITN/LLIN: an insecticide-treated net (ITN) was defined as a bed net that has been treated with safe, residual insecticide for the purpose of killing and repelling mosquitoes [22]; while a long-lasting insecticide-treated net (LLIN) is an ITN designed to remain effective for multiple years without retreatment [28].

Ownership of ITN/LLIN was measured by: dividing the number of children who owned at least one ITN/LLIN by the total number of children in the study [29]. This was expressed in percentages.

Utilisation of ITN/LLIN was measured by: dividing the Number of children who slept under ITN/LLIN last night by the total Number of children in the study. This was expressed in percentages.

Available ITN/LLIN use was measured by: dividing the Number of children who slept under ITN/LLIN last night by the Number of children who own at least one ITN/LLIN. This was expressed in percentages.

Statistical analysis: all data generated were collated, checked and analysed using statistical package for social sciences (SPSS) version 21 (SPSS for Window Inc; Chicago, LL, USA). Descriptive statistics (frequency distribution) was used to analyse and present socio-demographic parameters (age, sex, mother´s level of education, socioeconomic status, age at diagnosis, and clinic attended). Bivariate analysis using Pearson Chi-square test was used to analyse the association between the dependent variables (ownership and utilisation of ITN/LLIN) and the independent variables (age group, age at first diagnosis of SCA, educational status of mother, socioeconomic status, clinic attended: SCC or UBTH, and the use of malaria chemoprophylaxis). Multiple logistic regression model was developed to determine the extent of the relationship between ownership/utilisation of ITN/LLIN and independent variables and significant predictors of ownership/utilisation of LLIN. Statistical significance was set at $p<0.05$.

Ethical clearance: ethical clearance was obtained from the Ethical Committee of the University of Benin Teaching Hospital, with ethical protocol number of ADM/E22/A/VOL.VII/839.

Results

Socio-demographic characteristics of children with sickle cell anaemia: a total of 806 questionnaires were completely filled and retrieved (717 from SCC and 89 from UBTH). Patients were aged between 6 months and 17 years. The mean age of patients was 80.1±48.5

months, and the modal age was 36 months. Majority 424 (52.5%) of the patients were between the ages of 6 months and 59 months, with 64.1% of them aged between 36-59 months Table 1. Also, 449 (55.7%) of respondents were males, while 357 (44.3%) were females Table 1. Majority 388 (48.1%) of respondents belonged to middle socioeconomic class while only 93 (11.5%) belonged to high socioeconomic class Table 1. Also, 440 (54.6%), 185 (23.0%) and 181 (22.4%) had mothers with secondary, primary and tertiary level of education respectively Table 1. Majority 329 (40.8%) of respondents were first diagnosed with SCA at the age of between 12 and 35 months; and 555 (68.9%) of respondents used malaria chemoprophylaxis.

Ownership of insecticide treated net/long lasting insecticide treated net and characteristics of children with sickle cell anaemia: a total of 421 (52.2%) children owned at least one ITN/LLIN in their homes. Of the children attending clinic at UBTH, 63 (70.8%) owned ITNs, and this was statistically significantly higher than 358 (49.9%) in patients attending the clinic at the SCC (p=0.000) Table 2. Majority 388 (48.1%) belonged to the middle class and majority of their mothers had secondary level of education 440 (54.6%); ownership of LLIN was not statistically significantly associated with socioeconomic class (p=0.571) and level of education (p=0.829). Most of those who used malaria chemoprophylaxis 327 (58.9%), owned an ITN/LLIN, while only 94 (37.5%) of those who did not use malaria chemoprophylaxis owned an ITN/LLIN. This difference was statistically significant (p=0.000) Table 2. Children on malaria chemoprophylaxis, and those who attended the sickle cell clinic at UBTH, were 2.3 and 2.1 times more likely to own an ITN/LLIN, compared to children not on chemoprophylaxis and those attending the SCC respectively Table 3.

Utilisation of insecticide-treated net/long lasting insecticide treated net and characteristics of children with sickle cell anaemia: the overall ITN/LLIN use in the study population was 291 (36.1%), which is a measure of the universal coverage of ITN/LLIN. The available ITN/LLIN use among those who owned at least one ITN/LLIN was 69.1%. Of those who slept under ITN the previous night, 147 (37.9%) belonged to the middle class, while 32 (34.4%) and 112 (34.5%) belonged to the low class and high class respectively Table 4. This difference was not statistically significant (p=0.597). Of the 185, 440 and 181 children whose mothers had none/primary, secondary and tertiary level of education, only 65 (35.1%), 160 (36.4%), and 66 (36.5%) respectively used ITN/LLIN. This difference was not statistically significant (p=0.952). Amongst those who attended SCC, 249 (34.7%) used ITN/LLIN, while 42 (47.2%) of those who attended UBTH sickle cell clinic used ITN/LLIN. This difference was statistically significant (p=0.021) Table 4. Of the 555 children who used chemoprophylaxis, 227 (40.9%) used ITN/LLIN. This was statistically significantly higher than the 64 (25.5%) of 251 children who used ITN/LLIN but do not use malaria chemoprophylaxis. The proportion of children older than 5 years, who utilised ITNs 151 (39.1%), was similar to that 140 (33.3%) in those younger than 5 years Table 4. Following multiple logistic regressions, on determinants of utilisation of ITN/LLIN, the use of malaria chemoprophylaxis was the only significant predictor of ITN/LLIN use; children on malaria chemoprophylaxis were 2.0 times more likely to own an ITN/LLIN, compared to children not on malaria chemoprophylaxis (Table 5).

Discussion

Insecticide-treated net/long lasting insecticide treated net was owned by only half (52.2%) of the children/caregivers. This value is similar to that found in the world malaria report 2019 and the 2018 household survey done in Nigeria [14,21], but much lower than that found in Ghana, Kenya, and Uganda, where ownership of ITN/LLIN among caregivers with children under five years was found to be 80.6%, 73.8% and 84% respectively [30-32]. This may be due to the fact that most of these studies were carried out following recent free distribution of LLIN. Utilisation of ITN was very low, only 36.1% of the study population used ITN/LLIN the previous night; lagging behind ownership. This is not unexpected as the current trend in the West African sub region shows the disparity between ownership and utilization [1]. In Nigeria, this pattern of utilisation lagging behind ownership was corroborated by Afolabi *et al.* in 2009, where a high possession of ITN/LLIN and low utilisation in Nigeria was reported [33].

Furthermore, the low utilisation of ITN found in this study, was lower than that reported in the world malaria report 2021, where the use of ITN among at risk population was 43%; with 49% found in children younger than five years and in pregnant women [1]. Also, other studies in West and East Africa (Ghana 41.7% and Ethiopia 73.3%) recorded higher rates of ITN utilisation compared to our study [32-34]. However, the use of ITN found in this study was much higher than 10% found among adult patients with SCA reported by Kotila *et al.* in 2007 [27]. The higher use of LLINs recorded in our study compared to Kotila *et al.* in 2007 may be due to the fact that children (especially those aged under 5 years) are more likely to sleep under an ITN/LLIN, compared to adults. Ownership and utilisation of ITN/LLIN was significantly higher among those who attended UBTH clinic than those who attended the SCC. Attendance at UBTH clinic was a significant predictor of ownership of ITN; children who attended UBTH clinic were 2 times more likely to own an ITN. This may be due to the fact that children attending UBTH may be receiving more health education on the use, and benefits of ITNs compared to those attending SCC. This is not surprising as paediatric haemato-oncologist attend to patients along with their resident doctors in the UBTH clinic, while the SCC is supervised by two Medical Officers. Thus, care and counseling is more likely to be more comprehensive in UBTH, where the doctors have more expertise and the work force is more compared to that at the SCC.

The use of malaria chemoprophylaxis was a significant predictor of ownership and utilisation of ITN/LLIN; children who use malaria chemoprophylaxis were 2 times more likely to own and use an ITN. This implies that one method of malaria prevention can promote the other. Although the 2009-2013 and 2014-2020 national malaria control strategic plan targeted that the distribution of 63 million LLIN by the end of 2010 with at least 80% utilisation in Nigeria; the only recommended preventive tool for malaria in the National guideline for the control and Management of sickle cell disease (2014), is the use of continuous malaria chemoprophylaxis (proguanil) in persons with SCD [35-37]. This could explain the poor ownership and utilisation of ITN/LLIN amongst children with SCA, as health care workers may not promote its use. Also, since there is a significant correlation between malaria chemoprophylaxis and ITN/LLIN use, promoting the use of ITN/LLIN in children with SCA will be highly effective and impactful in ensuring malaria prevention in them.

Socioeconomic class status and level of education were not significant predictors of ITN ownership and utilisation in this study. The non-significant impact of mothers´ level of education and socioeconomic class status on the ownership and utilisation of ITN/LLIN found in this study is similar to that found in Ghana and Ethiopia [38,39]. This can be probably due to equitable distribution of free ITN/LLIN across socioeconomic class and level of education. In Ethiopia, age and level of education were not significant predictors of utilisation; but the hanging of at least one mosquito net by a household showed the strongest positive statistical association with net utilization [39]. This may mean that in some cases personal reasons (heat, perception of feeling caged or no mosquitoes) and not necessarily socio-demographics may influence utilisation of ITN/LLIN [40].

In addition, health education on the use and benefit of ITN may have a higher impact on ownership and utilisation of ITN/LLIN compared to formal education/level of education. In this study, patients attending the UBTH clinic may have received adequate health education on ITN and malaria prevention compared to those in the SCC, thus ownership and utilisation of ITN was higher in them compared to those attending SCC. Similarly, a study done in Ethiopia reported that households who received or were told about ITN in the last 6 months were three times more likely to have used it than those who were not (OR 3.25; 95% CI 1.5-7.10) [41].

Although not statistically significant, more children in the age group 5-17 years owned and used ITN/LLIN compared to those younger than five years. This was unexpected as the ownership and use of ITN reduces with increasing age of the study population, especially in children aged 5-19 years [40,41]. A possible reason for this could be the peculiar characteristic (children with SCA) of our study population, those older than 5 years may have experienced several episodes of malaria and over time their caregivers or parents may have learnt to own and use ITN to prevent malaria and SCA crises.

Limitation of study: assessment of the utilization of ITN/LLINs among study participants was subjective, thus the utilization of ITN/LLIN reported may have been over represented in this study.

Conclusion

The ownership and utilisation of ITN/LLIN was poor amongst children/care givers of children with SCA. This poor rate seems not to have changed over the years. Malaria chemoprophylaxis was a significant predictor for both ownership and utilisation of ITN/LLIN, while attendance at UBTH clinic was a significant determinant for only ownership (but not utilisation) of ITN/LLIN.

What is known about this topic

- *Malaria is a significant cause of morbidity and mortality in children with SCA. ITN/LLIN has been shown to reduce severe disease due to malaria in endemic regions by half and reduce all-cause mortality in children living in high endemic areas, including Nigeria;*
- *Ownership and utilisation of ITN/LLINs amongst children in the general population and in Nigeria is low;*
- *Some socioeconomic factors (age, maternal LOE, socioeconomic class etc), influence the uptake and usage of ITN/LLINs despite adequate distribution.*

What this study adds

- *The ownership (52.2%) and utilisation (36.1%) of ITN/LLINs in children with SCA is low, with utilisation lagging behind ownership;*
- *The use of malaria chemoprophylaxis is a significant predictor for the use of ITN/LLINs.*

Competing interests

The authors declare no competing interests.

Authors' contributions

Conceptualization, formal analysis, data curation, methodology, visualization, writing of the original draft, writing review and editing: Izehiuwa Gertrude Enato, Ayebo Evawere Sadoh. Both authors have read and agreed to the final manuscript.

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Tables

Table 1: socio-demographic characteristics of children with sickle cell anaemia

Table 2: association between characteristics of children with sickle cell anaemia and ownership of insecticide-treated net/long-lasting insecticide-treated net

Table 3: multiple logistic regression model for the determinants of ownership of insecticide-treated net/long-lasting insecticide-treated net

Table 4: association between characteristics of children with sickle cell anaemia and utilization of insecticide-treated net/long-lasting insecticide-treated net

Table 5: multiple logistic regressions model for the determinants of utilisation of insecticide-treated net/long-lasting insecticide-treated net

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Table 1: socio-demographic characteristics of children with sickle cell anaemia

General characteristics	**Frequency (n)**	**Percentage (%)**
Age group		
6 - 59 months	424	52.5
5 - 17 years	382	47.5
Total	806	100
Gender distribution		
Male	449	55.7
Female	357	44.3
Total	806	100
Socioeconomic status		
High	93	11.5
Medium	388	48.1
Low	325	40.3
Total	806	100
Mother's level of education		
Primary/none	185	23.0
Secondary	440	54.6
Tertiary	181	22.4
Total	806	
Clinic attended		
Benin Teaching Hospital (UBTH)	89	11.2
Sickle cell centre	717	88.8
Total	806	
Age at diagnosis		
0 - 11 months	143	17.7
12 - 35 months	329	40.8
36 - 59 months	141	17.5
5 - 17 years	193	23.9
Total	806	

Table 2: association between characteristics of children with sickle cell anaemia and ownership of insecticide-treated net/long-lasting insecticide-treated net						
Characteristics	**Ownership of ITN/LLIN**		**N**	**df**	**χ^2**	**p**
	Yes n(%)	**No n(%)**				
Age group						
6 - 59 months	209(49.4)	214(50.6)	423	1	2.846	0.092
5 - 17 years	212(55.4)	171(44.6)	383			
Clinic attended						
SCC	358(49.9)	359(50.1)	717	1	13.803	0.000
UBTH	63(70.8)	26(29.2)	89			
Socioeconomic status						
Low	165(50.8)	160(49.2)	325	2	1.121	0.571
Middle	210(54.1)	178(45.9)	388			
High	46(49.5)	47(50.5)	93			
Mother's level of education						
None/Primary	93(50.3)	92(49.7)	185	2	0.376	0.829
Secondary	232(54.1)	208(47.3)	440			
Tertiary	96(53.0)	85(47.0)	181			
Chemoprophylaxis use						
Yes	327(58.9)	228(41.1)	555	1	31.928	0.000
No	94(37.5)	157(62.5)	251			

SCA: Sickle cell anaemia; ITN/LLIN: insecticide treated nets/long lasting insecticide treated nets; SCC: Sickle cell centre; UBTH: University of Benin Teaching Hospital; N: total number of each categorical variable df: degrees of freedom; χ2: Chi square test; p: p value; n: frequency

Table 3: multiple logistic regression model for the determinants of ownership of insecticide-treated net/long-lasting insecticide-treated net					
Determinants	**Category**	**B**	**OR**	**P-value**	**95% CI**
Clinic attended	SCC				
	UBTH	0.765	2.1	0.002	1.32 - 3.50
Chemoprophylaxis use	No				
	Yes	0.824	2.3	0.00	1.67 - 3.10

ITN/LLIN: Insecticide treated nets/long lasting insecticide treated nets; SCC: sickle cell centre; UBTH: University of Benin Teaching Hospital; B: coefficients; OR: odds ratio; CI: confidence interval

Table 4: association between characteristics of children with sickle cell anaemia and utilization of insecticide-treated net/long-lasting insecticide-treated net						
Factors	Utilisation of ITN/LLIN		N	df	χ^2	p
	Yes n (%)	No n (%)				
Age						
6 - 59 months	140(33.3)	280(66.7)	420	1	2.919	0.088
5 - 17 years	151(39.1)	235(60.9)	386			
Mother' s level of education						
None/primary	65(35.1)	120(64.9)	185	2	0.098	0.952
Secondary	160(36.4)	280(63.6)	440			
Tertiary	66(36.5)	115(63.5)	181			
Socioeconomic status						
High	112(34.5)	213(65.5)	325	2	1.030	0.597
Middle	147(37.9)	241(62.1)	388			
Low	32(34.4)	61(65.6)	93			
Clinic attended						
SCC	249(34.7)	468(65.3)	717	1	5.331	0.021
UBTH	42(47.2)	47(52.8)	89			
Chemoprophylaxis use						
Yes	227(40.9)	328(59.1)	555	1	11.061	0.001
No	64(25.5)	187(74.5)	251			
SCA: Sickle cell anaemia; ITN/LLIN: insecticide treated nets/long lasting insecticide treated nets; SCC: sickle cell centre; UBTH: University of Benin Teaching Hospital; N: total number of each categorical variable; df: degrees of freedom; χ2: Chi square test; p: p-value; n: frequency						

Table 5: multiple logistic regressions model for the determinants of utilisation of insecticide-treated net/long-lasting insecticide-treated net					
Determinants	Category	B	OR	P-value	95% CI
Clinic attended	SCC				
	UBTH	0.415	0.7	0.07	0.42 - 1.04
Chemoprophylaxis use	No				
	Yes	0.672	2.0	0.00	1.40 - 2.73
ITN/LLIN: Insecticide treated nets/long lasting insecticide treated nets; SCC: sickle cell centre; UBTH: University of Benin Teaching Hospital; OR: odds ratio; B: coefficient; CI: confidence interval					