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The Use of Insecticide Treated Bed Net in Children Under Five Years of Age in Alakahia Community, Rivers State

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Abstract: Insecticide Treated bed Net (ITN) is considered to be the most efficacious of all currently feasible interventions for malaria control in Africa. However, its use is still low in Rivers State. This study sought to evaluate the use of insecticide treated bed net, in under-five children in Alakahia, Rivers State. This was a cross-sectional study carried out from 1st August to 31st October 2014, over a period of 3 months. Three hundred and ninety-nine children-parent/caregiver pairs were recruited. Children, aged 6-59 months were selected using systematic and simple random sampling methods. The data were collected using a structured interviewer-administered questionnaire. A general examination was done followed by collection of blood samples for estimation of packed cell volume and malaria parasitaemia. ITN ownership per household was 60.2%. Of the 240 respondents who owned ITN, 157 (65.4%) used them for their under-five children, but only 50 (31.8%) children slept under an ITN the night before the study. The factors found to influence the use of ITN were number of nets owned and where the net was got. However, purchasing an ITN was the strongest predictor of ITN use (OR =14.091, P= 0.000). The most common reason for non-use of ITN was 'too hot' (19.3%). Ownership and use rates were fair, however consistency in the use of the nets was poor. More efforts should be put into health education for behaviour modification.

Keywords: ITN, Use, Underfive, Child

1. Introduction

Malaria is an infectious disease caused by the protozoan, Plasmodium. It remains the most important parasitic cause of mortality in humans. [1] Human malaria, transmitted by female Anopheles mosquitoes is caused by all of the four members of the genus Plasmodium which are *Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale* and *Plasmodium malariae*. [2] Some of its vectors include *A. fenestus and A. gambiae*.

Malaria exerts a significant health burden on Nigerians and accounts for 60% of outpatient visits to the health facilities, 30% of childhood deaths, 25% of infant deaths and 11% of maternal deaths. [3] It is also responsible for an estimated annual loss of 132 billion naira in the form of treatment and prevention costs or loss of man hours among other losses. [3] Anaemia is one of the main complications of malaria and most severely affects children 1-3 years in areas with high transmission of *P. falciparum*. [4]

The thrust for malaria control is to reduce human mosquito bites. Although an integrated management approach is said to be the best for malaria control, the Insecticide Treated bed Net (ITN) is considered to be the most efficacious of all currently feasible interventions for malaria control in Africa. [5] Its cost effectiveness in preventing malaria–related morbidity and mortality is comparable to measles vaccination. [6]

There are several types of nets available. They vary by size, material and/or treatment. Most nets are made of polyester but nets are also available in cotton, polyethylene, or polypropylene. [7] Only pyrethroid insecticides are approved for use on ITNs. [8] These insecticides have been shown to pose very low health risks to humans and other mammals, but are highly toxic to insects and knock them down, even at very low doses. ITNs are dip-treated using the synthetic pyrethroid insecticide such as permethrin or deltamethrin. [9] Pyrethroids

do not rapidly break down unless washed or exposed to sunlight. [10] The great importance of pyrethroid deposit on the net arises because the body odour of sleepers attracts human seeking (anthropoliphic) mosquitoes to make contact with the net so that many are killed. Thus, with widespread use of treated nets, their mortality will be so high that one would expect a reduction in mean mosquito age and hence a major reduction in the population of mosquitoes. [8]

For effectiveness, it is important that the netting does not have holes or gaps large enough to allow insects to enter. Because an insect can bite a person through the net, the net must not rest directly on the skin. Mosquito nets can be hung over beds, from the ceiling or a frame, built into tents. [11] When hung over beds, rectangular nets provide more room for sleeping without the danger of net coming in contact with the skin, at which point mosquitoes may bite through untreated net. [12] The net is said to be properly used when the corners of the rectangular ITN are attached to the eaves and walls of the room, with the net lowered during sleeping time and tucked under the sleeping mattress or mat, or made to touch the ground all around. This ensures maximum contact between the host seeking mosquitoes and the insecticide treated net, and minimises the contact between the mosquitoes and potentially infective hosts. This is referred to as adherence. [12]

Ownership of an ITN does not always translate to usage. Determining whether suboptimal ITN utilization in a given population is due to lack of availability or a failure to utilize available nets is operationally important in a malaria control context.

A new global guideline on the use of ITN by all members of the community has been issued by the WHO. [13, 14] The WHO now recommends that LLINs be distributed to and used by all people (universal coverage) in malaria endemic areas and not just the most vulnerable groups (underfives and pregnant women). [15]

1.1. Aim

To evaluate the use of insecticide treated bed nets among underfive children in Alakahia, Rivers state

1.2. Specific Objectives

(a). To evaluate the use of Insecticide treated bed nets, in terms of ownership, proper adherence and utilization.

(b). To determine the reasons for non-use ITN among underfive children.

2. Methods

2.1. Study Design

A descriptive cross-sectional study was conducted.

2.2. Ethical Considerations

The study proposal was approved by the ethics committee of the University of Port Harcourt Teaching Hospital. Informed consent was obtained from the village heads and chiefs, while written informed consent was obtained from willing parents/caregivers of eligible underfive children.

The data were collected using a structured interviewer administered questionnaire which was pretested and partially adapted from the study done in Emuoha, Rivers State by Ordinioha. [16] The questionnaire was administered to the head of each household or parents/caregivers. This was used to obtain information on the socio-demographic characteristics of the respondents, answers to questions on malaria infection, ownership and use of ITN, and reasons for non-ownership and not using nets.

Net ownership was ascertained as well as number of nets owned. The nets were inspected to establish the type, state, as well as method of installation. A demonstration of how the nets were deployed every night was requested from the parents/caregivers of children who use the net. Prior to this time, the town crier had gone round the community informing them about the visit to their houses.

The data collected were inputted into SPSS version 20 software and analysed.

3. Results and Discussion

3.1. Socio-demographic Characteristics of the Respondents

A total of 399 children participated in this study. The mean age was 31±14 months and there were slightly more males, 208 (52.1%) than females, 191 (47.9%) with a male to female ratio of 1.1:1. Three hundred and ninety two (98%) caregivers were married while 6 (1.5%) were unmarried. Two hundred and forty one (60.4%) parents/caregivers had secondary education, 8 (2%) had no formal education. Two hundred and eighty seven (71.9%) caregivers were employed while 112 (28.1%) were unemployed.

Two hundred and eighteen (54.6%) respondents were in the lower social class, 122 (30.6%) were in the middle social class while 59 (14.8%) respondents were in the upper social class. Other characteristics of the respondents are shown in table 1.

Table 1. *Socio-Demographic Characteristics of the Respondents.*

Variable	Frequency	Percentage
Child's age (months)		
6-16	78	19.5
17-27	91	22.8
28-38	79	19.8
39-49	98	24.6
50-59	53	13.3
Total	399	100.0
Gender of child		
Male	208	52.1
Female	191	47.9
Marital Status of caregiver		
Married	392	98.2
Unmarried	6	1.5
Others (separated)	1	0.3
Total	399	100.0
Educational status of parent/caregiver		
No formal education	8	2.0
Primary	52	13.0
Secondary	241	60.4

Variable	Frequency	Percentage
Tertiary	96	24.1
No response	2	0.5
Total	399	100.0
Occupational status		
Unemployed	112	28.1
Employed	287	71.9
Total	399	100.0
Social class		
Upper (I-II)	59	14.8
Middle (III)	122	30.6
Lower (IV-V)	218	54.6
Total	399	100.0
Residency status		
Indigenes	101	25.3
Non indigene	297	74.4
No response	1	0.3
Total	399	100.0

3.2. Knowledge of Malaria, It's Treatment and Methods of Prevention

Two hundred and eighty nine (72.4%) of the respondents knew that malaria was acquired from the bite of mosquitoes, while 43 (10.8%) and 35 (8.8%) said it was due to dirty environment and bad water, respectively. Twenty-two (5.5%) respondents did not know the cause of malaria. Two hundred and seventy-seven (69.4%) children had fever about two weeks or more before the study and 246 (61.7%) received treatment at home. Among those that were treated, only 43 (10.8%) children had malaria parasite test done before commencing treatment which showed a parasite rate of 34.9%. One hundred and seventy five (43.9%) respondents said insecticides are used to prevent malaria, while 102 (25.6%) said ITNs are used. Fifty two (13%) respondents did not use anything to prevent malaria. These are shown in tables 2 and 3 below.

Table 2. *Knowledge of malaria and malaria treatment among 399 respondents.*

Variable	Frequency	Percentage
How malaria is acquired?		
Mosquito bite	289	72.4
Bad water	35	8.8
Cold	4	1.0
Dirty environment	43	10.8
Too much oil	4	1.0
Tse -tse fly	1	0.3
Too much food	1	0.3
Don't know	22	5.5
Total	399	100.0
Last time the child had fever		
< 2 weeks ago	98	24.5
≥ 2 weeks ago	277	69.4
Can't remember	21	5.3
Never	1	0.3
Non response	2	0.5
Total	399	100.0
Place of treatment		
At home	246	61.7
Hospital	59	14.8
Church	1	0.2
Health centre	9	2.2
Chemist	6	1.5
No treatment	63	15.8
Non response	15	3.8
Total	399	100.0
Was malaria parasite test done for the child?		
Yes	43	10.8
No	299	74.9
Don't know	2	0.5
No response	55	13.8
Total	399	100.0
Malaria parasite result		
Parasite present	15	34.9
No parasite	5	11.6
Don't know	23	53.5
Total	43	100.0

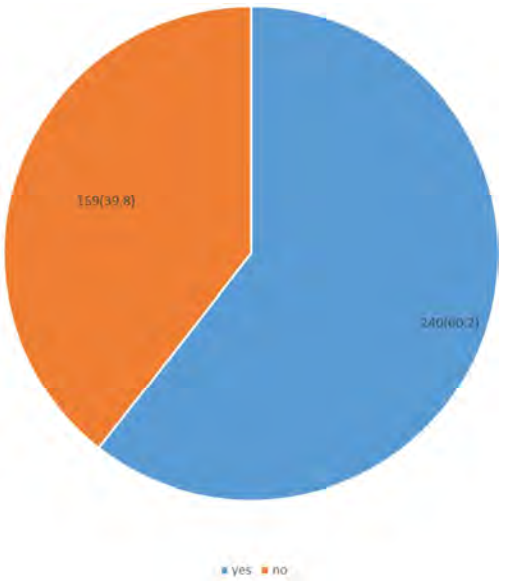
Table 3. *Methods of Prevention of Malaria among the 399 respondents.*

Variable	Frequency	Percentage
Insecticide	175	43.9
Mosquito Coil	5	1.3
Herbs	37	9.3
ITN	102	25.6
Clean environment	6	1.5
Stay away from mosquito	1	0.3
Baby net	1	0.3
Door net	2	0.5
Malaria drugs	2	0.5
Window net	7	1.8
Nothing	52	13.0
Don't know	2	0.5
Non response	7	1.8
Total	399	100.0

3.3. ITN Possession, Source, Characteristics/Time of Acquisition, Utilisation and Factors Affecting Its Use

3.3.1. ITN Possession

Figure 1 shows that out of the 399 respondents, two hundred and forty (60.2%) had ITNs. Those with untreated nets and baby nets were not included in the analysis.



* () - percentages

Figure 1. *ITN ownership status of the respondents.*

Figure 2 shows that out of the 240 respondents who owned ITNs, 105 (43.8%) had one net, while 86 (35.8%) owned two ITNs.

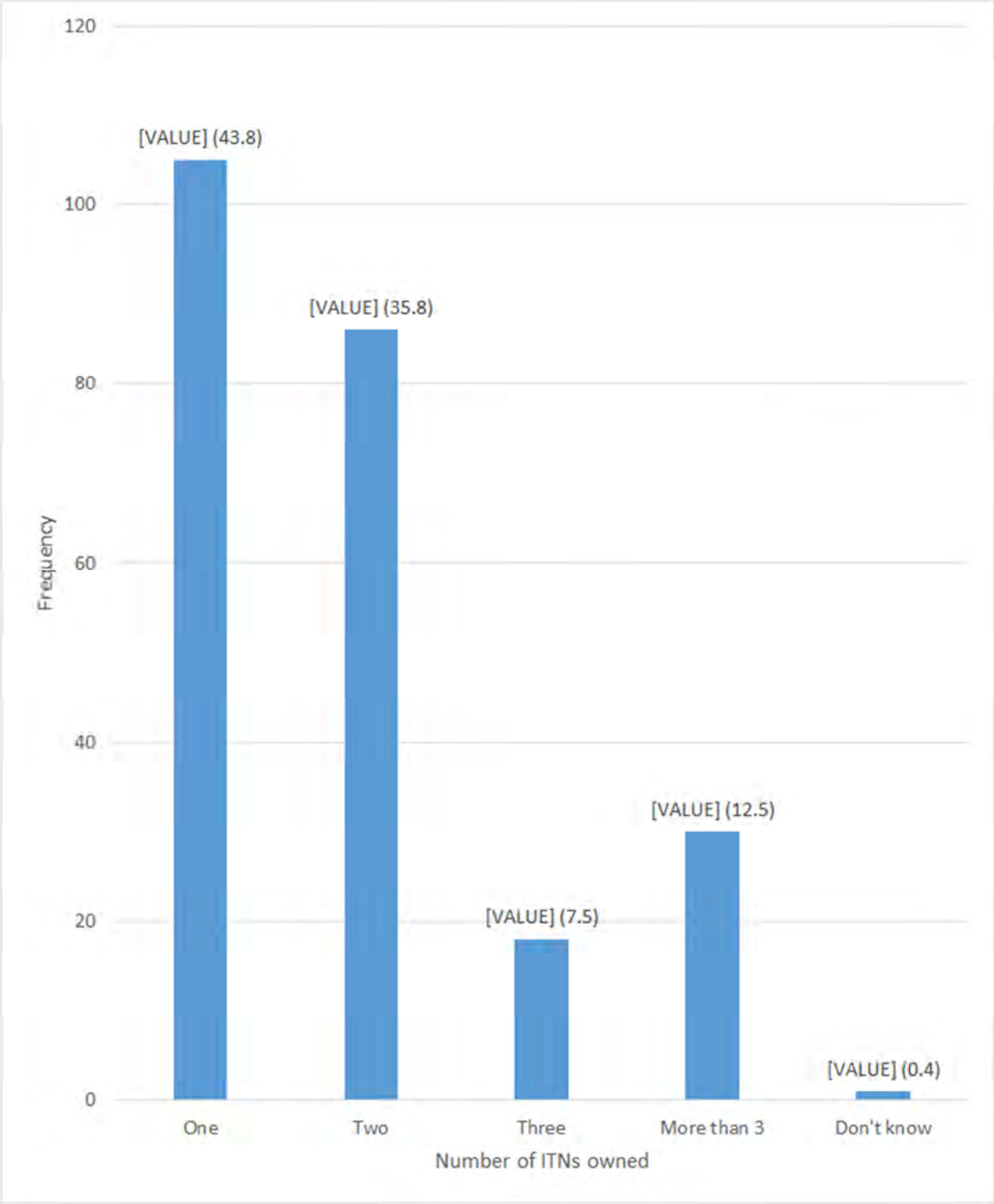


Figure 2. *Number of ITNs owned by the 240 respondents.*

3.3.2. Source of ITNs

As shown in Figure 3 below, 101 (42.1%) caregivers obtained their ITNs from community distribution, 60 (25%) obtained theirs from the health centre while 34 (14.2%) nets were bought.

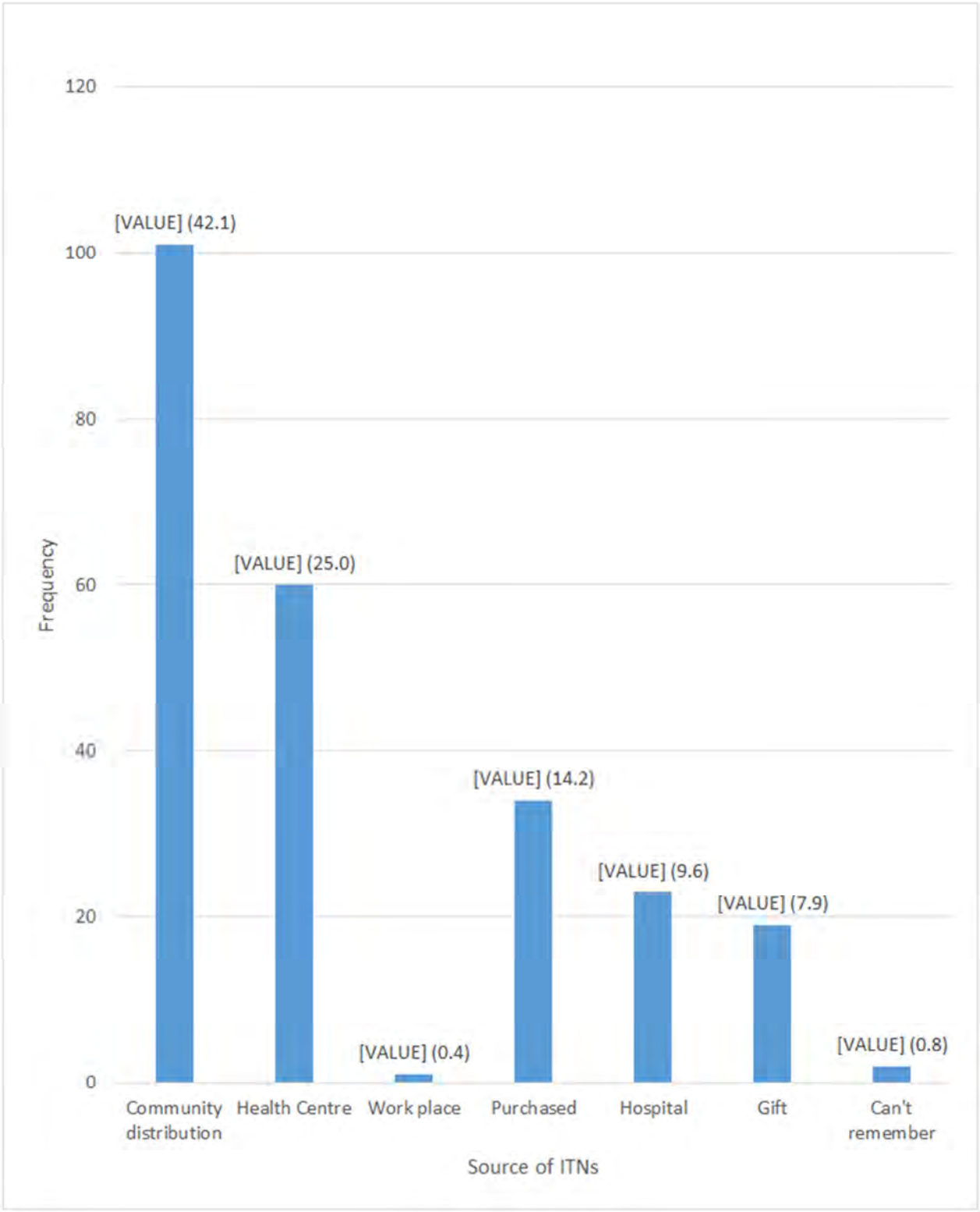


Figure 3. *Source of ITNs.*

3.3.3. Characteristics / Time of Acquisition

Seventy-four (30.8%) respondents got the nets a year or less before the study while 152 (63.3%) respondents got their nets more than a year before the study as shown in Table 4. One hundred and forty five (60.4%) respondents had not washed their nets, while 95 (39.6%) had washed theirs. Long lasting Insecticide Nets (LLINs) made up 98 (40.8%) nets and those with untreated nets and baby nets were not included in the analysis. None of the nets were ITNs that needed re-treatment. One hundred and eight (45%) nets did not have holes while 116 (48.3%) of them were old with holes.

Table 4. *ITN Characteristics among the 240 Respondents.*

Variable	Frequency	Percentage
When ITN was acquired?		
A year or less	74	30.8
More than a year	152	63.3
Can't remember	14	5.9
Total	240	100.0
Ever washed ITN?		
Yes	95	39.6
No	145	60.4
Total	240	100.0
Type of NET		
LLIN	98	40.8
ITN	0	0.0
Don't know	142	59.2
Total	240	100.0
Current state of ITN		
No holes	108	45.0
Old with holes	116	48.3
Don't know	14	5.8
Others	2	0.8
Total	240	100.0

3.3.4. ITN Utilization

Table 5 shows ITN utilization and the proportion of underfive children who slept under an ITN, the night before the study. Only 157 (65.4%) of those who owned the nets used them. Of these 50 (31.8%) children slept under an ITN the night before the study compared to 107 (68.2%) children who slept under the nets more than one night before the study. This meant that 1 out of 3 children who live in households that use ITN slept under an ITN the night before the study.

Table 5. *ITN Utilization by the 240 Respondents who had ITN.*

ITN utilization	Frequency	Percentage
Do you use ITN?		
Yes	157	65.4
No	83	34.6
Total	240	100.0
If yes, when last did your child sleep under it?		
Last night	50	31.8
More than one night ago	107	68.2
Total	157	100.0

3.3.5. Factors Influencing the Use of ITN

The factors influencing ITN use were the number of nets owned and where the net was obtained from (p =0.005, p= 0.002 respectively). The percentages of the number of ITNs owned in those who used ITN and those who did not are as shown in table 6 below.

Table 6. *Factors influencing the Use of Insecticide Treated bed Net.*

Factors	Use of ITN		χ^2	P-value
	Yes (n=157) (%)	No (n=83) (%)		
Number of ITNs Owned				
One	61 (38.9)	45 (54.2)		
Two	66 (42.0)	20 (24.1)	13.026	0.005**
Three	8 (5.1)	8 (9.6)		
More than three	22 (14.0)	10 (12.1)		
Total	157 (100.0)	83 (100.0)		
Where was net gotten?				
Community Distribution	70 (44.6)	37 (44.6)		
Health Centre	37 (23.6)	20 (24.1)		
Purchased	30 (19.1)	4 (4.8)	17.548	0.002**
Hospital	14 (8.9)	9 (10.8)		
Gift	6 (3.8)	13 (15.7)		
Total	157 (100.0)	83 (100.0)		

3.4. Multiple Logistic Regression Analysis for the Predictors of the Use of Insecticide Treated Net

The factors identified to be significantly associated with use of Insecticide Treated Net in bivariate analysis (Table 6) were harvested and subjected to multivariate analysis to rule out confounders. The result of the multiple logistic regression analysis for use of Insecticide Treated Net is shown in the table below. Respondents who owned one ITN were two times less likely to use ITN than those who owned three ITNs (OR = 2.336, *P* = 0.078, 95% CI: 0.166, 1.101). Respondents who got ITN from community distribution were three times more likely to use ITN than those who received it as gifts (OR = 3.390, *P* = 0.027, 95% CI: 1.148, 10.011). Respondents who got ITN from the Health Centre were three times more likely to use ITN than those who received it as gifts (OR = 3.139, *P* = 0.048, 95% CI: 1.012, 9.732).

Respondents who purchased the ITNs were fourteen times more likely to use ITN than those who obtained it as gifts. (OR = 14.091, *P* = 0.000, 95% CI: 3.303, 60.120). Also, respondents who got the ITN from the Hospital were three times more likely to use ITN than those who obtained it as gift (OR=2.995, *P*=0.102, 95% CI: 0.806, 11.139). However, the strongest predictor of whether the ITN was used was if it was 'purchased' (*P* = 0.000), followed by whether the net was obtained from 'community distribution' (*P* = 0.027), and then obtaining the net from a 'health centre' (*P* = 0.048).

Table 7. *Multiple Logistic Regression Analysis of Predictors of the Use of Insecticide Treated bed Net.*

Variables	Odds Ratio	SE	Wald Statistic	P–value	95% CI
Number of ITN owned					
One					
Two	0.428	0.482	3.102	0.078	(0.166, 1.101)
More than Three	1.012	0.504	0.001	0.981	(0.377, 2.720)
Three*	0.310	0.652	3.231	0.072	(0.086, 1.112)
Where ITN was got:					
Distribution	3.390	0.553	4.881	0.027**	(1.148, 10.011)
Health Centre	3.139	0.577	3.924	0.048**	(1.012, 9.732)
Purchased	14.091	0.740	12.774	0.000**	(3.303, 60.120)
Hospital	2.995	0.670	2.680	0.102	(0.806, 11.139)
Gift*					

* Reference Category; ** Significant *P*–value, SE- standard error, CI- confidence interval

3.5. Pattern of Deployment of ITN

Among respondents who use their ITNs, for their under five children, only 55 (35%) of 157 deployed the nets properly and of those who slept under the net the night before the study, only 25 (50%) of 50 slept under properly deployed nets (Table 9). The main occupants of the nets were underfive children (53; 33.8%) alone, closely followed by mothers and their underfive children (48; 30.6%) (Table 8).

Table 8. *Pattern of Deployment of ITN by the Respondents who use ITN.*

Variable	Frequency	Percentage
How do you deploy your ITN		
Over bed or mat	34	21.7
Let down before sleeping	63	40.1
Let down and tucked	55	35.0
Over a door/window	2	1.3
Over door	1	0.6
Over window	2	1.3
Total	157	100.0
How did you hang your ITN last night?		
Let down, not tucked under bed/mat	25	50.0
Let down and tucked under bed/mat	25	50.0
Total	50	100.0
Who sleeps under ITNs?		
Under five children	53	33.8
Mother and Under five	48	30.6
Parents and Under five	29	18.4
Non response	27	10.5
Total	157	100.0

3.6. Reasons for Not Using ITN

Table 9 shows the reasons for not using ITNs. The most common reason for not using an ITN was that the net was 'too hot' (19.3%), and some of the least reasons were "not knowing where it was kept" (1.2%), "no time to hang" (1.2%), "don't know where to hang" (1.2%), and "came home late" (1.2%). Thirteen (15.7%) caregivers had no reason for not using ITNs.

Table 9. *Reasons given by the 83 Respondents for not Using ITN.*

Reasons given for not using the ITN	Frequency	Percentage
Too hot	16	19.3
Low mosquito activity	6	7.2
Nowhere to hang	11	13.3
Chemical fear	3	3.6
Old with holes	9	10.9
Don't know where it was kept	1	1.2
Don't like it	7	8.4
Used for doors	2	2.4
Mother not around	2	2.4
Misplaced it	3	3.6
Forgot to hang	1	1.2
Don't know how to hang	1	1.2
Child travelled	2	2.4
Stressful	1	1.2
Came home late	1	1.2
Left in village	3	3.6
No time to hang	1	1.2
No reason	13	15.7
Total	83	100.0

3.7. Discussion

In this study, it was observed that 72.4% of the respondents knew that malaria was acquired from the bite of a mosquito. This finding is similar to that of Afghanistan and Vanuatu studies [17, 18] where most of the respondents knew that mosquito bites were responsible for malaria infection but at variance with that of Syed et al., [19] where 40 - 60% of the respondents did not know how malaria was acquired. The plausible reason for this high knowledge of mode of transmission of malaria in this study was because 60.4% of the respondents had formal education. Insecticide treated bed nets form a personal protection that have been shown to reduce the incidence of malaria, severe disease and death due to malaria in endemic regions like Nigeria. [20] However, many people still do not own or use it. In this study, the respondents' knowledge on the use of ITN for the prevention of malaria was unsatisfactory (25.6%) considering that majority (72.4%) knew that malaria was acquired through the bite of mosquito. This is similar to the finding of Iyaniwura *et al*., [21] where only 20.9% of the respondents demonstrated good knowledge on the use of ITN.

ITN possession or ownership refers to the number of

households surveyed with at least one ITN. [22] According to the RBM target, there should be at least 2 ITNs per household. In this study, it was found that 43.8% of the respondents owned at least one ITN. This figure is higher than a prior report in most parts of Asia and Africa where, net coverage is less than 10%. This poor state of affairs regarding ITN ownership, as shown by this study is compounded by the fact that LLINs were reportedly distributed to various communities in Nigeria among which are those in the Niger Delta states. [23] Yet the impact of this project which has been integrated into Immunization Plus days, remains to be felt. If these activities have been on-going, the figure obtained in the study is forlorn-hope, a poor show of a programme that has not lived up to expectation. Nevertheless, ownership of ITN, regardless of the number owned per household in this study, was 60.2%. This is higher than findings in Abia and Plateau states. [24] A recent study [16] from Port Harcourt, showed 1.7 nets per household. The Rivers State government has distributed more than two million nets especially on Immunization Plus days and stand alone campaigns in its effort to meet the target of providing two nets per household. [16] This may have accounted for the level of ownership found in this study was the case in Burkina faso where ownership increased substantially after net distribution [39].

Furthermore, slightly higher but similar to the finding in this study, the NDHS 2013, [25] showed that 55% of households nationwide own at least one ITN. Also according to the NDHS 2013, [25] ownership of ITNs has increased in the past five years with 50% of household owning an ITN. This increase was not reflected in this study because, another study, [16] carried out in a semi-urban community in Rivers State 5 years ago showed that all the households in that community owned at least one ITN. The probable reason for this may be because of lack of consistency in net distribution and continued population growth.

In this study, it was found that out of all those who owned ITNs, 65.4% used them. This is much higher than what was obtained from other studies and is probably because the study was conducted during the rainy season when mosquito activity is thought to be more. This was observed in another study in Rivers state [16] carried out during the dry season where only 18.8% of the respondents used their net. The differences observed in these two studies could be explained by the fact that the latter [16] was conducted in the dry season when the temperature is hot and mosquito activity is thought to be less. Lower use of ITNs during the dry season with the assumption of no vectors and therefore no transmission was seen in Ouagadougou in Burkina Faso. [26] In that country, most malaria episodes occur in the hotter months just after the rains. Remarkable seasonality in net use reported in this area highlights the need for education to promote year-round use.

ITNs have to be regularly used and properly deployed to be effective for malaria control. [27] It was observed that of those who used ITN, only 31.8% (less than half) slept under the ITN the night before the study. A similar, but lower prevalence of 17% had been reported in the National Demographic Health Survey of 2013 [21] and previous Nigerian studies. [16, 29, 30] In the literature, it was observed that the rate of regular use of ITNs was low in some African countries. [23, 25, 29] A Ghanaian study [30] reported a rate of 15.5% while Ethiopian [31] and Malawian reports [32] showed rates of 21.1% and 42%, respectively. Higher rates (70% and 73% respectively) were obtained in Bangladesh and Vanuatu.

The predictors of the use of ITN in this study were, nets obtained from community distribution, obtained from a health centre, or purchased. Similarly, obtaining the net from a retail market and from a recent mass campaign were also some predictors identified from a Nigerian study. [33] Other predictors of net use in a Ghanaian study [34] were mother's/guardian's educational status, the number of nets available in the household and whether the nets were bought or not. A Cameroonian study [40] also identified gender, environmental sustainability and the number of bed nets as other predictors of ITN use. The foregoing suggests that more value is placed on ITNs that are purchased as opposed to those obtained free or as gifts. This was shown to be true as shown in an Ethiopian study [35] where paying for an ITN rather than receiving it free was significantly associated with its use. A Nigerian study [36] further supports this fact as respondents who purchased ITNs for use were seen.

Purchasing ITNs was the strongest predictor of use of ITN. Although, only 34 (14.2%) of the 157 caregivers who used ITN bought it, it is worthwhile to look deeply into the factors that made this group purchase ITN. Strengthening this behaviour pattern in this community may impart positively in increasing the use of ITNs.

Several reasons have been given for non-use of ITNs in the literature but discomfort and unavailability are the main reasons for non-use. [37,] In this study, the prominent reasons for non-use of ITNs were 'too hot', 'no- where to hang the nets', 'no reason' and 'old net with holes' with the most common reason being "too hot." This is similar to what was observed in other studies, [37, 40] where discomfort from heat was the most common reason. This was not expected, given that the study was conducted in the rainy season when the temperature is cool especially at night. Findings in another part of Vanuatu [18] also identified excessive heat as the most common reason. Similarly, cross-sectional surveys [16] in Rivers state identified heat as a common reason for non-use of ITN. The latter study was however carried out during the dry season, as stated earlier and this may have accounted for the discomfort of heat experienced by the respondents.

Furthermore, Watanabe *et al., [*18] in Vanuatu, found low malaria risk perception as the most common reason for not using an ITN. The study area was one with low malaria transmission, hence the above reason. These reasons also featured commonly in a review of public literature [37] on the reported reasons for not using a net when one is present. The review included all types of net, whether treated or not. Interestingly, a study conducted in Eastern part of Nigeria

[28] found that more than 40% of the respondents who were literate mothers, had no reasons for not using an ITN. Also, in the Western part of Nigeria, [21] the major reason given for non-use of ITN among Health workers was that it didn't occur to them.

Insecticide treated bed net is properly deployed when the corners of a rectangular ITN are attached to the eaves and walls of a room, lowered before sleeping and tucked under a bed or mat. In this study, out of those who slept under an ITN the night before the study, only half of the under-five children slept under properly deployed ITNs. This has important implications because ITNs have to be properly deployed to be effective for malaria control. [27] Only thirty-five percent of the respondents who used ITNs knew how to properly deploy it. This is similar to studies [16, 33] carried out in other parts of Nigeria where a large number of nets were improperly deployed and others were kept as souvenirs within the household. It is worthy of note that the respondents in one of the previously mentioned studies [33] had very low educational status and this may have been responsible for the improper deployment of the ITNs. Atieli *et al.,* showed this to be true as educational level was significantly associated with ITN deployment.

4. Conclusions

The use of Insecticide treated bed net was poor, even though ownership rated were fair. The knowledge and pattern of deployment of the nets were not also impressive. This has serious implications as it impacts negatively on malaria control. Discomfort from heat still featured as a main reason for inconsistent use of ITNs and it was interesting to know that purchasing an ITN was a strong predictor for using it.

Recommendation

Health education on malaria and utilization of ITNs to prevent it should be given to mothers whenever they come to the health facility to access care.

Limitation

Adherence to the use of ITNs could have been ascertained by observing the children sleep under the net at night and not just asking when the child last slept under the net. This may have introduced some bias.

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