

EFFECT OF HEALTH EDUCATION ON LONG LASTING INSECTICIDAL NETS UTILIZATION AMONG MOTHERS OF UNDER FIVE CHILDREN IN YAMALTU DEBA LGA, GOMBE STATE, NIGERIA

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ABSTRACT

Background: Malaria remains a major global public health challenge. It is the leading cause of death among children below the age of five years and constitutes 10% of the continent's disease burden. The objective of this study was to determine effect of health education on utilization of long lasting insecticidal nets (LLINs) among mothers of under five children in Yamaltu Deba LGA of Gombe state: **Objective:** This study was aimed at determining the effect of health education on LLINs utilization among mothers of under five children in Yamaltu Deba LGA of Gombe State. **Method:** The study was a community-based quasi-experimental intervention where 240 mothers of under five children were selected from two communities using a multi stage sampling technique. Health education was given in the study community and withheld in the control community. Data was collected from both communities before and after the intervention using an interviewer administered structured questionnaire. Data was analyzed using EPI-INFO 3.7.1 and Micro soft Excel software. Result obtained was presented using proportion, Chi-square test was used to assess the relationship between categorical variables and decision taken at $p < 0.05$. **Results:** The mean ages of respondents in study and control communities were 28.9 ± 6.2 and 27.9 ± 6.7 years respectively. At pre-intervention, LLIN ownership was found to be 86.6% and 76.3% while its utilization was 45.4% and 38.1% in both communities. After health education intervention, (LLINs) improved significantly in study community from 42.9% to 89.9% compared with control community which increased from 33.9% to 60.9% and the difference was statistically significant ($P = 0.0001$). **Conclusion:** This study concludes that health education significantly improved utilization. We recommended continuous health education on LLINs utilization in communities especially among mothers of under five children.

Key words: Malaria, Long lasting insecticidal nets, Utilization, Yamaltu

INTRODUCTION

Malaria is caused by infection of red blood cells with protozoan parasites of the genus plasmodium inoculated in to the human host by a feeding female anophiline mosquito.¹

Malaria remains a major global public health challenge. It is the leading cause of death among children below the age of five years and constitutes

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10% of the continent's disease burden.² In 2015 alone, about 212 million cases and 429,000 deaths were recorded globally. Across Africa, many people lack access to basic tools they need to prevent malaria.³ The use of Long Lasting Insecticidal Nets (LLINs) and Indoor Residual Spraying (IRS) has been very effective in reducing the prevalence of malaria in many countries over the years^{4, 5} and the two interventions are the mainstay in the control of vector of malaria thereby reducing the rate of its transmission.⁶ However, use of long lasting insecticidal nets is the most promising among the various components adopted in the control of malaria.⁷⁻¹⁰

The World Health Organization (WHO) in 2007 reviewed its policy on LLINs to include all population at risk. Since the year 2000, use of LLINs has been shown to reduce incidence of malaria by 50% and on average about 5.5 lives can be saved per 1000 vulnerable groups' i.e. pregnant women across all transmission settings.^{11, 12} In sub-Saharan Africa, it is estimated that, 53% population at risk slept under an LLIN in 2015. The proportion of people sleeping inside LLINs is generally close to proportion with access to LLINs. Insecticides treated nets were introduced in Nigeria as an effective means of preventing mosquito bites and malaria transmission following the 2000 Abuja target of 60% LLINs coverage.¹³

Despite high number of LLINs distributed in Nigeria over the years, the utilization rate has been very low. Previous studies have shown that, only 16% of households owned at least one LLIN and less than 5% of pregnant mothers utilized them.^{14, 15} However, there has been a rise in LLINs ownership and utilization in the country as a result of free LLINs distribution across the country. The 2015 Malaria Indicator Survey showed an appreciable increase of 69% in LLINs ownership among household population nationally and 38% of de facto population slept inside an LLIN a night before the survey.¹⁶ Malaria contributes to high burden of infections in the North Eastern states of the country. Hospital-based study indicated a prevalence of 49.2% and 58.3% among under five children attending clinics in Gombe and Adamawa States respectively.^{17, 18} Insecticides treated net ownership in Gombe State was as high as 87% but utilization

was 34%.¹⁴ Of recent, there has been a decrease in the trend of malaria prevalence nationally from 42% in 2010 to 27% in 2015, this could be due to increase in utilization of insecticidal nets where the nets usage increased from 6% in 2010 to 44% in 2015.¹⁶ Some of the reasons for poor utilization of long lasting insecticidal nets were: heat (42%), non availability of the nets (13%), itching (9%), bad smell (6%) and LLINs not big enough (4%).¹⁶ Other studies showed poor awareness, poverty and indifference as some of the reasons for poor LLIN utilization.^{16, 19} Evidence suggest that, malaria prevention and treatment choices are affected by knowledge of the problem.²⁰ A review of the trend of malaria over the years, shows that increase in LLINs utilization and not ownership plays an important role in decreasing the prevalence of malaria. The objective of the study was to determine the effectiveness of health education on LLINs utilization in the study area. The outcome of this would help strengthen LLIN utilization among pregnant mothers.

MATERIALS AND METHOD

Study area

The study was carried out in Yamaltu Deba Local Government Area of Gombe State, Nigeria between the months of March 2018 to June 2018. The experimental study was conducted in Morom community in Yamaltu Deba Local Government Area with a projected population of 12,000 from 2006 census while the control study was conducted in Bula Community in Akko Local Government Area with a projected population of 13,000 from 2006 census.

Study design

A community based quasi experimental study

Study Population

All mothers of under five children living in Morom and Bula communities at the time of the study

Inclusion criteria

Mothers of under five children living with their children in Morom and Bula communities for more than six months

Exclusion criteria

Mothers of under five children on transit or vacation in the study area

Sample size determination

The minimum sample size for each community was determined using the formula:

$$n = [1/(1-f) \times 2 \times (Z^2 + Z\beta) \times P \times (1-P) / (P - P_0)]^2 \quad 29$$

Where n = Minimum sample size per group

$$P = (P_0 + P_1) / 2$$

P = Proportion of mothers who slept inside an LLIN a night before the survey in Gombe State during 2013 National Demographic Health Survey=34%.²⁸

P₁ = Estimate of expected proportion of mothers who slept under insecticide treated net after the health education intervention = 49% i.e. an increase of 15% from (34%-49%)

Z_{1-α} = Standard Normal Deviate at 95% Confidence Interval = 1.96

Z_β = Standard Normal Deviate of 80% Power i.e 0.84

f = Non-response rate =10% = 0.1

$$P = (P_0 + P_1) / 2 = (0.34 + 0.49) / 2 = 0.83 / 2 = 0.415 \sim 0.42$$

$$P_0 = 0.34$$

$$1 - P_0 = 0.58$$

$$n = [1 / (1-f) \times 2 \times (Z^2 + Z\beta)^2 \times P \times (1-P) / (P - P_0)]^2 \quad 29$$

$$n = 1 / (1-0.1) \times 2 \times (1.96+0.84)^2 \times 0.42 \times 0.58 / (0.34-0.49)^2$$

$$n = 4.24/0.0225$$

$$n = 188.4$$

$$n = 189$$

n, 189 being the minimum sample size was however increased to 240 to recruit more respondents who were willing to participate for the benefit of free LLINs at pre-intervention. Therefore, each group had 240 samples.

Sampling Method

Multistage sampling technique was employed for this study. In the first stage, of the 11 Local Government Areas (LGAs) in Gombe State, Yamaltu Deba and Akko LGAs were selected purposively as experimental and control LGA respectively. At the second stage, Difa-Lubo-Kinafa ward was selected from the 11 wards of Yamaltu Deba LGA while Bula ward was selected from the 11 wards of Akko LGA using simple random sampling (SRS) technique by balloting. In the third stage Moron community from Difa-Lubo-Kinafa ward and Bula community from Bula ward were selected through SRS by balloting. In the

fourth stage, the existing household PHC numbering was used to select households and respondents were selected from the households until the required sample size was achieved. In a household with more than one mother/caregiver with under five children only one of them was selected for the interview. Same method was applied for the selection of mothers in the control community.

Data collection

Selected mothers were interviewed using a semi structured interviewer administered questionnaire by trained research assistants, study was piloted at Doho community in Kwami LGA, 50 kilometres from the study area and corrections were effected where gaps were discovered. A base line survey was conducted to assess LLINs ownership and utilization in both the intervention and control communities. Health education was given to the selected mothers in the experimental community for a period of three days. Six classes were used each consisting of 40 mothers per class per session, two sessions were conducted daily where didactic lectures, role play and demonstration of long lasting insecticidal; types of nets, ways of hanging nets and the benefits of using nets was done. Long lasting insecticidal nets were distributed to all participants in both the experimental and control communities. The only difference in intervention was health education which was given to the experimental community only while it was withheld in the control community.

Three months after intervention, respondents were interviewed to determine the effect of health education on LLINs utilization in both the experimental and control communities using the same data collection tools and research team, as pre-intervention survey.

Data Analysis

All data generated at baseline and post-intervention was processed and analyzed using EPI INFO 3.7.1 and Microsoft Excel Software. Socio-demographic data were presented as percentages while quantitative data were described using means and standard deviation. Chi-Square test was used to determine any association between certain

variables and outcome of intervention among mothers. A confidence interval of 95% was used in this study and P-value of <0.05 was considered significant.

Ethical Consideration

Ethical approval was sought from the Gombe State Ministry of Health Ethical Committee. Permission was obtained from the Chairman of Yamaltu Deba and Akko LGAs respectively. Verbal consent was obtained from mothers of under-five before administering the questionnaires,

RESULTS

Four hundred and sixty-eight respondents of 474 were studied at post intervention (238 from Morom and 230 from Bula communities), giving a response rate of 98.7%. Of the 474 mothers recruited for the survey at pre-intervention, 468 (98.7%) of them responded at Post-intervention. The age group 25-29 years old has the highest number of respondents in Morom 80 (33.6%) and Bula 75 (31.8%). Those above the age of 40 years in Morom 2 (0.8%) and Bula 3 (1.3%) constituted the least among the respondents at pre-intervention. The mean age for Morom and Bula communities were 28.9±6.2 and 27.9±6.7 years respectively. Majority of the respondents in Morom 190 (78.8%) and Bula 200 (84.7%) were Muslims. There was low literacy level among the respondents in both communities, the proportion of those who attended only Primary school and those with no formal education in Morom and Bula was 136 (57.1 %) and 142 (60.2 %) respectively. The socio demographic characteristics were similar and comparable from both communities and observed differences were not statistically significant. (Table 1)

Table 1: Socio-demographic characteristics of respondents at pre-intervention

Characteristics	Community		X ²	P-Value
	Study Morom=238	Control Bula=236		
Age (Years)	Group Freq (%)	Freq (%)	3.459	0.6301
15 - 19	14 (5.9)	18 (7.6)		
20 - 24	28 (11.8)	37 (15.7)		
25 - 29	80 (33.6)	75 (31.8)		
30 - 34	56 (23.5)	54 (22.9)		
35 - 39	40 (16.8)	30 (12.7)		
40+	20 (8.4)	22 (9.3)		
Religion			1.9623	0.1613
Christianity	48 (20.2)	36 (15.3)		
Islam	190 (78.8)	200 (84.7)		
Educational Status			0.4476	0.5039
None/Primary	136 (57.1)	142 (60.2)		
Sec/Tertiary	102 (42.9)	94 (39.8)		
Occupation			5.401	0.1450
Farming	54 (22.7)	46 (19.5)		
Trading	82 (34.5)	64 (27.1)		
Civil Service	12 (5.0)	14 (5.9)		
None	90 (37.8)	112 (47.5)		
Marital Status			2.152	0.142
Married	221(92.9)	210 (89.0)		
Divorce/Widow	17 (7.1)	26 (11.0)		

Ownership of LLIN was found to be very high in Morom (86.6%) and Bula (76.1%) communities at base line. The proportion of respondents who slept inside an LLIN a night before the survey in Morom and Bula was 45.4% and 38.1% respectively. There was no statistically significant difference when the intervention groups were compared on LLIN ownership. (P=0.110) Majority of respondents in Morom 168 (72.4%) and Bula 195 (88.6%) got their LLINs from the village Primary Health Centres, only 9.5% and 2.7% in Morom and Bula purchased LLINs from the market. When the intervention groups were compared on source of LLIN at pre-intervention, there was a statistically significant difference.

($P < 0.01$). Respondents gave different reasons why they did not sleep inside an LLIN night before the survey. (Table 2)

Table 2: Reasons for not sleeping inside a net by the respondents at pre-intervention

Reasons	Intervention Group		Total (%)
	Morom (%)	Bula (%)	
Heat	51 (37.5)	76 (48.7)	127 (43.5)
Itching	9 (6.6)	12 (7.7)	21 (7.2)
Difficulty Breathing	14 (10.3)	12 (7.7)	26 (8.9)
Difficulty Hanging	25 (18.4)	20 (12.8)	45 (15.4)
No reason	37 (27.2)	36 (23.1)	73 (25.0)
Total	136 (100)	156 (100)	292 (100)

$\chi^2 = 4.725$, $P = 0.317$, $df = 4$

At post-intervention, the proportion of respondents who slept inside LLIN a night before the survey in Morom as a result of health education increased from 45.4% to 89.9% and the difference was statistically significant ($P < 0.01$). In Bula community, where health education was withheld, despite an increased from 38.1% to 62.6% the difference was not statistically significant. ($P = 0.110$) (Table 3).

Table 3: Utilization of LLINs among study and control groups at pre-intervention and post-intervention

	Pre-intervention		Post-intervention	
	Yes (%)	No (%)	Yes (%)	No (%)
Morom (Study)	108 (45.4)	130 (54.6)	214 (89.9)	22 (10.1)
Bula (Control)	90 (38.1)	146 (61.9)	144 (62.6)	86 (37.4)

$\chi^2 = 2.556$, $P = 0.110$, $df = 1$

$\chi^2 = 51.54$, $P = 0.001$, $df = 1$

DISCUSSION

The proportion of respondents who own nets at the time of survey in Morom and Bula were 86.6% and 76.3% this finding was similar to the 2015 Malaria Indicator Survey in which the percentage of household who owns ITNs was 87% but finding was contrary to similar studies conducted among mothers in Southern Ethiopia (15.8%), Ghana (57.2%) and Ibadan Nigeria (44.2%) where nets ownership was lower in all study areas.^{16, 22, 30.}

Respondents who slept under a net a night before the survey evidenced by net hanging on their beds (defacto) in Morom and Bula was 45.4% and 38.1% respectively. Similar findings were obtained in other studies assessing net utilization during pregnancy among mothers in Ibadan (31.6%), Enugu (39.1%) and the 2015 Malaria Indicator Survey in Gombe State (34%). The Nigerian Malaria Indicator Survey 2015 found a higher percentage of 55% in de facto population who slept under LLIN at the national level. This higher value could be due regional differences as the southern states recorded higher values compared to the northern region where this study was carried out. Other studies in Ogun State Nigeria and Southern Ethiopia found 75% and 73.3% of women who slept under an LLIN night before survey. This could be due to difference in literacy level where it is higher in areas recording high level of LLINs utilization. However, another study in Ijebu-Ode, Ogun State found only 28.5% of net utilization among nursing mothers which was lower than our findings.^{16, 21, 23, 27.}

One of the targets set at the Abuja summit April 2000 was to have 60% of population at risk sleeping under insecticide treated nets by 2015. To achieve this, LLINs need to be made available, affordable and most importantly, improving its utilization. In this study area, and many other areas across Africa, LLINs were made available and accessible through free community and ante natal clinics distribution however, nets utilization has remained very low. In this study area, the Abuja target of 60% net utilization, among population at risk has not been achieved despite huge investment by Global Fund, World Bank Malaria Booster Project and the Presidential Malaria Initiative.

Respondent's source of information on LLIN, source of nets and reasons why respondents do not sleep under nets are some of the factors that influence respondent's ability to use LLIN. This study found 84.9% and 68.7% of respondents in Morom and Bula respectively who said their source of information on LLIN was from the village health clinics. Similarly, a study conducted to assess knowledge, attitude and practice on malaria and ITN utilization among pregnant mothers in Southern Ethiopia found 96.5% of respondents who

reported they received information from health clinics precisely by a Community Health Worker. Contrary to the above findings, the Malaria Indicator Survey 2015 found radio to be the main source of information in 70% of the respondents at the national level and 91% of respondents in Gombe State.¹⁶ Despite the fact that radio is the most commonly used medium of communication in the study area, this study found radio to be the least source of information on LLIN. This study and others showed the importance of health education communication at health facilities especially during ante natal visits and routine immunization services. Long lasting insecticidal nets ownership was found to be high in this study as 86.6% and 76.3% of respondents in Morom and Bula owned an LLIN at pre-intervention. This finding was similar to a study conducted in Ogun State Nigeria,¹³ but higher than other studies in North Eastern Nigeria and Ghana.^{20, 22} In this study, more than 75% of respondents in Morom and Bula communities got their LLINs from clinics; this was contrary to another study conducted in Southern Ethiopia where 99% of respondents indicated free community distribution as source of their nets.²¹ Since net ownership does not guarantee utilization, respondents give different reason why they did not sleep inside LLIN night before the survey. In Morom and Bula almost half of respondents said discomfort due to heat was the reason why they did not sleep inside nets. While others complained of Itching, difficulty in hanging nets at night, about a quarter give no reason at all. The 2015 Malaria Indicator survey and another study in middle belt Ghana found similar result, contrary to a study in southern Ethiopia where 69.9% of respondents said they did not sleep under net because there were no mosquitoes.^{16, 21, 22} Heat could be a limiting factor to LLIN utilization, this study was conducted in March through June during the peak of dry season and onset of rains where extreme temperatures are recorded.

Prevalence of LLIN utilization among respondents in intervention community has increased from 45.4% to 89.9% while control community recorded an increase from 38.1% to 62.6%, the difference in LLIN utilization was statistically significant when the two communities were compared. Various

studies across Africa, to determine effect of health education on net utilization found health education a very important tool in motivating mothers to use LLINs at home. A study in Ogun State, Nigeria recorded an increase in insecticidal nets utilization from 29.5% to 72.6%, another study in Jos, Nigeria recorded an increase from 4.6% to 88.4%, other studies found an increase of 28.8% to 89.6% and 19.2% to 82.2% in Enugu, Nigeria and Sudan respectively. Findings in intervention communities were statistically significant compared with the control communities.²³⁻²⁶

This study shows a statistically significant increase in utilization of LLINs after health education in the intervention community. However, net utilization did not improve significantly in the control community where health education was withheld. Factors that may influence the use of LLINs have been related to cost and availability of LLINs.²³ However, this study found other factors like heat and poor understanding of the benefits of LLINs responsible for low utilization of LLINs among participants.

Limitations

It would have been much easier to administer the questionnaires in English, but majority of the respondents do not understand English but use Tera and Fulani as medium of communication. To avoid passing inappropriate messages to the respondents, research assistants were trained to minimize errors that may arise during interview.

CONCLUSION

This study concludes that, LLINs ownership does not guarantee their utilization, it however proved that health education significantly improved LLIN utilization among respondents. We recommend health education especially targeting mothers of under five children in the communities.

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