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Full length research paper

Effect of long lasting insecticide treated net on incidence of Malaria among people living with HIV/AIDS in Bassa Local Government Area of Plateau State, North Central Nigeria.

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Malaria and HIV are among the two most important global health problems of our time; together, they cause more than four million deaths per year. HIV and malaria prey on vulnerable individuals and make their situation even more perilous by attacking the most productive and active members of the society. Long Lasting Insecticide Treated Nets (LLITNs) represent a practical and effective means of preventing malaria in Africa. This study aimed to determine the effect of LLITNs on the incidence of malaria among People Living with HIV/AIDS (PLHIV).A quasi experimental study conducted among 84 PLHIV. EPI info statistical software version 3.5.4 was used for data analysis and 95% confidence interval was used with p ≤ 0.05 considered statistically significant. The mean age of the respondents in this study was 33.9 ± 11.5 years. There was significant improvement in the consistency of use of LLITNs 6 months post intervention (P = 0.029). Marked reduction in the incidence of malaria among the respondents 3 and 6 months post intervention (P < 0.001) was also obtained. This study has demonstrated significant reduction in the incidence of malaria among PLHIV significantly following provision of LLITNs supported with appropriate health education.

Keywords: Incidence, Malaria, PLHIV, LLITNs

INTRODUCTION

Malaria and HIV are among the two most important global health problems of our time; together, they cause more than four million deaths per year (Whitworth, 2004; WHO, 2004). HIV and malaria prey on vulnerable individuals and make their situation even more perilous by attacking the most productive and active members of the society. Malaria costs Africa an estimated $12 billion annually and a major factor in the erosion of development in some of the poorest countries of the world (WHO, 2004). Malaria has slowed economic growth in African countries by an estimated 1.3% per year, the compounded effects of which are a gross domestic product level that is now as much as 32% lower than it would have been had malaria been eliminated as a problem from Africa in 1960 (WHO, 2004; Abu-Raddad, 2007). Malaria and HIV/AIDS are the leading causes of poverty with shared determinants of vulnerability (WHO, 2004; Abu-Raddad, 2007). LLITNs represent a practical and effective means of preventing malaria in Africa. However, its utilization is low and requires priority attention in order to bring to the barest minimum the

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morbidity and mortality from these this dual menaces (FMOH, 2005). Hence, this study was conducted to determine the effect of LLITNs on the incidence of malaria among PLHIV accessing treatment, care and support services in Seventh Day Adventist (SDA) hospital Jengre Bassa Local Government Area of Plateau State.

METHODS

Study Area

Plateau State is located in North Central Zone of Nigeria with an area of 26,899 square kilometres, the State has an estimated population of 3.2 million (Plateau State, 2013; National Bureau of Statistics, 2006). It is bounded by Bauchi State to the Northeast, Kaduna State in to the Northwest, Nassarawa State to the Southwest and Taraba State to the Southeast. Plateau State has 17 Local Government Areas (LGAs) and 3 senatorial zones. There are a total of forty health facilities offering HIV/AIDS treatment, care and support services in Plateau State of which 21 are secondary health facilities, 16 primary health facilities and 3 tertiary health facilities (Plateau State, 2013). Seventh Day Adventist Hospital Jengre is one of the secondary health facilities in Plateau State providing comprehensive HIV/AIDS treatment, care and support services supported by AIDS Prevention Initiative Nigeria (APIN).The Seventh-Day Adventist Hospital Jengre is a mission hospital which was established in 1947 with bed capacity of 75 and staff strength of 70 (SDA, 2011). It is a secondary health care institution which offers specialist and general medical care. The service units in the hospital are the Outpatient Department (OPD), Emergency Unit and comprehensive HIV/AIDS care unit. The hospital has a wide network of clients particularly in the northern part of the country. SDA Jengre commenced provision of comprehensive HIV/AIDS services supported by APIN in the year 2004. The hospital has a total of 563 adults of Anti Retroviral Therapy (ART) as at the time of this study. The ART clinic runs on once a week (every Tuesday) (SDA, 2011).

Study Population

This comprised of PLHIV receiving HIV/AIDS treatment, care and support services in SDA Hospital Jengre who were resident in Bassa LGA.

Study Design

The study was a quasi experimental study with pre – intervention and post-intervention phases using quantitative method of data collection. This study was conducted in three phases: baseline, 3 months and 6 months after intervention.

Inclusion and Exclusion Criteria

PLHIV who were 18 years and above residing in Bassa LGA and who had been enrolled into the HIV/AIDS adult care programme for twelve weeks and above were included in the study. PLHIV below 18 years of age residing outside Bassa LGA enrolled into the adult HIV/AIDS care programme less than 12 weeks were excluded from the study. Twelve weeks was used as one of the criteria because the respondents would have made at least three consecutive visits to the hospital since enrolment and the respondents' contact would have been established by the hospital's home based care team.

Sample Size Determination

The sample size was calculated using standard acceptable formula and 33.3% (Onyenekwe *et al*., 2007) proportions of the PLHIV with malaria parasitaemia from a previous study was used and a minimum sample size of 84 was obtained after accounting for possible attrition.

Sampling Technique

A multi-stage sampling technique was used in this study.

Stage I

From the list of seventeen LGAs in Plateau State, Bassa LGAs was selected by balloting using simple random sampling technique.

Stage II

SDA Hospital was selected from the list of 3 secondary health facilities providing HIV/AIDS treatment, care and support services in Bassa LGA of Plateau State using simple random sampling technique by balloting.

Stage III

A list of 290 PLHIV who met the inclusion criteria was drawn from the monthly clinic booking register of all the 563 clients accessing HIV/AIDS treatment care and support services at Seventh-Day Adventist Hospital. A computer generated table of random numbers using WINPEPI statistical software was used to select of 84 participants from the 290 eligible respondents.

Preparation for Data Collection

Advocacy visit was paid to the Medical Director and the management of the Seventh Day Adventist Hospital Jengre to solicit for the hospital's support. Four resident doctors from the Department of Community Medicine Jos University Teaching Hospital (JUTH) were trained as research assistants to aid with the administration of questionnaires as well as participating in the health education. The tool of data collection was pre-tested in a secondary health in another LGA of the state. This helped in making appropriate corrections where necessary.

Ethical Consideration

Anonymity and confidentiality of the information obtained was assured and maintained. Ethical clearance was obtained from Ethical Review Committee of JUTH, Jos.

Data Collection Instrument

A semi – structured interviewer administered questionnaire was used to obtain information from the participants.

Pre intervention

A brief explanation was given to all eligible participants on the objectives of the study by the research team led by the principal researcher. Respondents were give opportunities to ask questions and seek clarifications about the study. Voluntary participation and option of opting out of the study at any stage of the study was thoroughly expressed to the participants.

The laboratory investigation for the presence of malaria was conducted using Rapid Diagnostic Test kits (RDTs) by two laboratory scientists from the public health laboratory of the Department of Community Medicine JUTH. RDT provided a more accurate result than presumptive diagnosis and could be used at any chosen location. RDTs gave results in about 15 minutes and so anti-malaria treatment was instituted promptly for the patients with positive RDT result. Artemisinin based anti-malaria was provided free for the respondents with presence of malaria with the RDT at all the phases of the study.

Data Collection

Four trained research assistants participated in the data collection prior to the intervention as well as at the 3 months and 6 months post intervention phases of the study after a detailed explanation as to the purpose of the study was given to all the eligible respondents and verbal as well as written informed consent was obtained from each subject before the administration of the questionnaire.

Intervention

LLITNs were provided to all the participants including those who already had after a session of health education that focused on types of mosquito nets, benefits of insecticide treated bed net and information on the importance of consistent use of LLITNs as well as actions to be taken to prevention malaria. The session also included demonstration on the way the LLITNs should be mounted and used. Pamphlets and posters providing relevant information on LLITNs were also used as tools during the session which were given to all the participants to take home to serve as reminder tools. The active ingredient in LLITNs distributed to the participants was deltamethrin 1.8g/kg made of 100% polyeththylene and had National Agency for Food Drugs Administration and Control (NAFDAC) registration A5-0121. The production date of the LLITNs was 03/2010, expiry date 03/2015, batch number V0844D and produced by Sumitomo Chemical CO. LTD for P-Life ® USA. The RDT kits used for assessment of malaria was produced by Access Bio ® expiry date November 2015. The mobile phone numbers of the participants were obtained from all the participants who had mobile phones and the phone numbers of the closest persons to those without mobile phones were also obtained. This was used for sending monthly reminder bulk text messages on the benefit of consistent use of LLITNs and for reminder messages for the scheduled monthly health information reinforcement visit. The hospital hand cards of the participants were used to specify the dates for monthly meetings with research team in the hospital health information reinforcement. This monthly meeting was scheduled to coincide with the respondents meeting clinic follow up visits. The monthly health information reinforcement was done at second, fourth and fifth months after the intervention.

Post Intervention

Three and six months after the intervention, quantitative data was again collected with the same data collection instruments from the respondents as well as test for malaria parasite using RDTs.

Data Analysis

Data analysis was done using Epi info™ statistical

Table 1: Socio-demographic characteristics of the respondents

Variables	n = 84 Frequency	Percentage
Age (years)		
18-27	30	35.7
28-37	33	39.3
38-47	9	10.7
48-57	6	7.1
58-67	6	7.1
Mean age	33.9 ± 11.5 years	
Sex		
Female	66	78.6
Male	18	21.4
Religion		
Christianity	68	81.0
Islam	16	19.0
Marital Status		
Single	9	10.7
Married	54	64.3
Widowed	21	25.0
Level of Education		
Non formal	24	28.6
Primary	39	46.4
Secondary	12	14.3
Tertiary	9	10.7
Ownership of at least one LLITNs prior to the study		
Yes	16	19.0
No	68	81.0

software package version 3.5.4 developed by CDC 1600 Clifton Rd. Atlanta, GA 30333 USA. A 95% confidence level was used for the study and a $P \leq 0.05$ was considered statistically significant.

Grading of Responses

Grading of consistency of use of LLITNs

Use of LLITNs with response of always use all through the study period was assessed as consistent use of LLITNs. Use of LLINs with responses such as most times, sometimes, rarely and never use all through the study period was assessed as inconsistent use of LLITNs.

RESULT

Eighty four (84) PLHIV participated in the study at both the pre-intervention and post-intervention phases of the study giving a response rate of 100%. The age range of the respondents in this study was 18-67 years with mean age of 33.9 $\pm$ 11.5 years. Majority (78.6%) of the respondents were female. Christianity was the predominant religion of the respondents while 54 (64.3%) of the respondents were married. The highest level of education attained by respondents (46.4%) was primary. Only few (19.0%) of the respondents had LLITNs prior to the commencement of the study. See Table 1. All the participants were provided free LLITNs at the beginning of the study inclusive of the few respondents who had LLITNs prior to the study. The assessment of utilization of LLITNs at 6 month post intervention revealed that 76 (90.5%) of the respondents slept under LLITNs the night prior to the assessment which was higher than the 69 (82.1%) at 3 month post intervention (P = 0.116). The consistency of use of LLITNs showed statistically significant improvement following the intervention as the proportion of the respondents who consistently used LLITNs increased from 41 (48.8%) 3 months post intervention to 55 (65.5%) 6 months post intervention (P = 0.029). See Table 2

The incidence of malaria following the intervention reduced significant from 35.7% pre intervention to 10.7% 3 months post intervention (P < 0.001). Similarly, the incidence of malaria also reduced from 35.7% pre intervention to 6.0% 6 months post intervention which was statistically significant (P < 0.001). See Table 3. Consistent use of LLITNs at both stages of the post intervention phase of the study had positive effect on incidence of malaria as only 1 (2.4%) of the respondents who consistently used LLITNs had positive RDT result as against 8 (18.6%) of the respondents with inconsistent use of LLITNs having positive RDT result 3 months post intervention (P = 0.018). See Table 4

DISCUSSION

The age range of the respondents in this study was 18 – 67 years with age group 28 – 37 years accounting for the highest proportion of 33 (39.3%). The mean age of respondents was 33.9 ± 11.5 years. The findings of this study had similarities with that of a study done in Beira Mozambique which found the mean age to be 38 ± 15 years (Saracino *et a*l., 2012). Another Nigeria study

Table 2: Utilization of LLITNs among the respondents in the study

Parameters	3 month post intervention (n = 84) Frequency (%)	6 months post intervention (n = 84) Frequency (%)	χ^2	df	P – value
Use of LLITNs the night prior to the assessment					
Yes	69 (82.1)	76 (90.5)	2.47	1	0.116
No	15 (17.9)	8 (9.5)			
Total	84 (100.0)	84 (100.0)			
Consistency of Use of LLITNs					
Consistent	41 (48.8)	55 (65.5)	4.76	1	0.029
Inconsistent	43 (51.1)	29 (34.5)			
Total	84 (100.0)	84 (100.0)			

df = degree of freedom, LLITNs = Long Lasting Insecticide Treated Nets

Table 3: Incidence of malaria among the respondents

Parameters	Pre intervention (n = 84) Frequency (%)	3 months post intervention (n = 84) Frequency (%)	χ^2	df	P – value
RDT Result					
Positive	30 (35.7)	9 (10.7)	14.73	1	<0.001
Negative	54 (64.3)	75 (89.3)			
Total	84 (100.0)	84 (100.0)			
	Pre intervention Frequency (%)	6 months post intervention Frequency (%)			
RDT Result					
Positive	30 (35.7)	5 (6.0)	22.56	1	<0.001
Negative	54 (64.3)	79 (94.0)			
Total	84 (100.0)	84 (100.0)			

df = degree of freedom, RDT = Rapid Diagnostic Test

conducted among PLHIV also found the mean age to be 33.5 ± 9 years showing agreement with what was found in this study (Wondimeneh *et al*., 2013). Other studies carried out in Uganda and Cameroon were also in agreement with findings of this study (Uganda Population Service Commission, 2005; Njunda *et al*., 2012).

This study had more female respondents which is in agreement with findings of studies done in Nigeria, Cameroon and Ethiopia which gave a predominantly female respondents (Wondimeneh *et al*., 2013; Njunda *et al*., 2012; Uneke *et al*., 2005; Onyenekwe *et al*., 2007). However, another Nigerian study had a contrary finding of more male respondents (Akinbo *et al*., 2009). Most of the respondents in this study were married with about a quarter been widowed, this is at variance with the findings of an Ugandan study which revealed that 51% of the respondents were widowed (Uganda Population Service Commission, 2005).Improvement in utilization of LLITNs the night before the assessment was observed 6 months after intervention when compared with the 3 months post intervention phase. This high level of use of LLITNs a night before assessment could be attributable

Table 4: Relationship between use of LLITNs and incidence of malaria

Use of LLITNs	RDT result at 3 months post intervention		χ2	df	P - value
	Positive Frequency (%)	Negative Frequency (%)			
Consistent use	1 (2.4)	40 (97.6)	-	-	0.018*
Inconsistent use	8 (18.6)	35 (81.4)			
Total	9	75			
	RDT result at 6 months post intervention				
	Positive Frequency (%)	Negative Frequency (%)			
Consistent use	1 (1.8)	54 (98.2)	-	-	0.046*
Inconsistent use	4 (13.8)	25 (86.2)			
Total	5	79			

df = degree of freedom, RDT = Rapid Diagnostic Test, * = Fishers exact

to the health education component of the intervention as well as the provision of LLITNs provided to all the respondents. Studies done in Uganda, Ethiopia, Malawi and Nigeria reported findings similar to that of this study in which more than half of the respondent slept under LLITNs a night prior to assessment (Cohee et al., 2009; Dagne *et al*., 2008; Makombe et al., 2007; Ye et al., 2012). Other studies had findings contrary to that of this study as only 12%, 37.2% and 37% of the respondents respectively in some Nigerian studies slept under LLITNs a night preceding the assessment (WHO, 2005; Tobin-West et al., 2011; Blackburn et al., 2006). The similarity of the findings of this study on utilization of LLITNs with other studies may be explained by value of the free distribution of LLITNs to the participants in these studies strengthen by provision of repeated health information on its use. Whereas, in the studies with contrary results it could be that LLITNs ownership was low as well as the possibility of unfavorable climatic condition such as heat. Consistent use of LLITNs improved 6 months post intervention when compared with the level at 3 months post intervention which was statistically significant. A study done in Kenya reported 49.5% and 61.6% of the respondents consistently used LLITNs during dry and rainy seasons respectively (Atieli et al., 2011). Another study done in Uganda however reported a lower level of consistent use of LLITNs (Uganda Population Service Commission, 2005).The incidence of malaria reduced significantly both at 3 and 6 months post intervention respectively in comparison with the pre intervention incidence. Also, this study demonstrated positive statistically significant relationship between consistency of use of LLITNs and incidence of malaria after the intervention. This marked reduction in the incidences of malaria could be attributable to the high level of consistency of use of LLITNs provided as the intervention in this study. A study conducted in Kampala Uganda also corroborated the findings of this study with significant reduction in incidence of malaria following the use of ITNs (Henry J Kaiser family foundation, 2005). Another study also reported findings in support of this study in which the use of ITN produced marked reduction in the frequency of clinical episodes of malaria as the users of ITNs as compared to non users of ITNs over a period of 12 months (Aliyu et al., 2009). An Iranian study also brought to light the effect of use of LLITNs on the incidence of malaria as there was 96.6% reduction in the incidence of malaria with use of LLITNs (Soleimani-Ahmadi et al., 2012). This study and other studies have brought to light the effectiveness of LLITNs as a tool for malaria prevention as LLITN does not only prevent mosquito bite but also kills mosquitoes thereby reducing mosquito density with resultant reduction in the incidence of malaria not only among the users of LLITNs but the community at large. However, this study could not access the actual mosquito density in the area before and after the study thereby recommending that more studies be conducted to assess the effect of use of LLITNs on the mosquito density in the area.

CONCLUSION

This study has demonstrated significant reduction in the incidence of malaria among PLHIV significantly following provision of LLITNs supported with appropriate health education. This implies that malaria prevention can be achieved through provision of LLITNs in synergy with other simple but practicable means of information reinforcement

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Source of funding: No external funding was used for the study

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