Prime Scholars Library

Full Length Research Paper

Available online at
https://primescholarslibrary.org/

Medical Advances and Case Report

Vol. 8(4), pp. 46 – 55, August, 2020

Evaluation of the use and non-use of long-lasting insecticidal nets among ladies in age of child-bearing who are not right now pregnant in Nigeria

Srinivasa Rao Mutheneni and Suryanarayana Murty

WHO Regional Office for the Western Pacific, Manila, Philippines.

Abstract

The health of women is not only linked to reproductive issues but also to efforts in health promotion, improved nutritional status and general well being of girls and adolescents from infancy to adulthood. The aim was to evaluate the use and non-use of long lasting insecticidal nets (LLIN) among women in child-bearing age in Nigeria. This survey employed cross-sectional survey to collect data from households on coverage and use of LLINs. The study took place in 2007, five months after the distribution of LLINs, coinciding with the second raining period of the year and a time of high malaria transmission during the wet season. In the 1,756 households sampled, the ratio of women in child-bearing age to currently pregnant women was 8.2 to 1. The probability of having a woman in reproductive age in the household is 50 times more than having a pregnant woman. Overall, there was a significant difference in the proportion of pregnant women who slept under any net (χ^2 = 23.2; p = 0.000003; odds ratio (OR) = 1.89; confidence interval (CI) = 1.46, 2.46) or under an LLIN (χ^2 = 15.17; p = 0.0001; OR = 1.73; CI = 1.31, 2.28) night before survey compared to women in child-bearing age. A significant proportion of currently pregnant women took IPT1 only compared to WCBA in their last pregnancy (χ^2 = 524.04; p = 0.000000; OR = 35.2; CI = 22.6, 54). Use of LLINs among women in child-bearing age (WCBA) in Nigeria is low. Aggressive approach is needed to increase the utilization of LLIN among WCBA to improve use among pregnant women.

Keywords: Women in child-bearing age, currently pregnant women, long lasting insecticidal nets, intermittent preventive treatment, malaria, school children.

INTRODUCTION

In order to set a strong basis for good maternal and infant health, it is necessary for women in child bearing age (WCBA) to engage in or be guided along healthy living. Some of the fundamental elements for a healthy life may include the consumption of healthy diet, drinking adequate clean water, doing moderate but regular exercise and having adequate rest. In addition, WCBA should avoid obesity, use of tobacco, narcotic or hard drugs and consumption of alcohol as well as avoid abusive relationships (Utah Department of Health, 2012). Furthermore, WCBA may also be able to promote their well-being and live healthier and longer lives through regular screening for cancer and other illnesses. These healthy habits in childbearing years can improve birth

outcomes, support life-long health, and may prevent premature death for women (Utah Department of Health, 2012).

Preventive health activities are important for reducing illness and detecting disease in early, treatable stages. However, policies and guidelines addressing health of teenagers and that of women in child-bearing age are scanty in sub-Saharan Africa (SSA). This may be responsible for the region having the highest rate of teenage pregnancy (Treffers, 2003; United Nations Children's Fund (UNICEF), 2001), mostly due to early marriage, custom and tradition, high level of sexual activity, lack of general sex education and low access to affordable contraceptive option. Specifically in malaria control programs, WCBA, a group that includes teenagers and adolescents, are often not specifically considered as "high-risk group" along with pregnant women, and they should, for obvious reasons.

Looking at literature, there are few quantitative or qualitative studies that have reported the use of malaria control commodities such as long lasting insecticidal nets (LLINs) and artemisinine-based combination therapies (ACTs), among this potential "at-risk" group. Though studies have documented access, ownership, coverage and utilization (Belay and Deressa, 2008; Thawani et al., 2009; Wagbatsoma and Aigbe, 2010), as well as cost implication (Jimoh et al., 2007) and willingness-to-pay (Onwujekwe et al., 2004) for preventive (Menendez et al., 2008) or curative (Onwujekwe et al., 2012) malaria commodities among general population and in reference to pregnant women, hardly has there been a reference to WCBA. Most Malaria Control Programs at country level either focus primarily on pregnant women and neglect WCBA or lump them together under the umbrella of "universal coverage" (Roll Back Malaria, 2012; Federal Ministry of Health, 2010). The symptoms relating to this deficiency may not be unconnected with the perceived low utilization of intermittent preventive treatment (IPT) and LLIN among pregnant women (KEMRI-Wellcome, 2012).

Though WCBA may not be currently pregnant, they could have been pregnant earlier and the pregnancy was either carried to term or aborted. Furthermore, some of them may be currently pregnant but are yet unaware of the pregnancy while some are likely to get pregnant within a month after LLIN has been distributed, thus missing out in ownership and use of the commodity. In some cases, especially in first pregnancy, tradition demands that a woman does not tell others that she is pregnant until the pregnancy shows and by this time she is already infested with malaria parasites. In Nigeria, malaria is responsible for up to 11% of maternal death (Federal Ministry of Health, 2004). The World Health Organization (WHO) Expert Committee on Malaria recommends that intermittent preventive treatment (IPTp) and long lasting insecticidal nets (LLIs) be used to mitigate the effects of malaria in pregnancy (WHO, 2004).

Since malaria in pregnancy increases the risk of maternal anaemia, maternal mortality, abortion, prematurity, intrauterine growth retardation, intrauterine death and low birth weight (Anya, 2004; van Geertruyden et al., 2004; Tako et al., 2005), there is need to protect not only those who are currently pregnant but also all those who have the greatest potential to be pregnant at any time - the WCBA. We sought to examine the pattern of ownership and use of malaria commodities among WCBA in 16 Local Government Areas of Nigeria. Our aim was to evaluate the extent of utilization of LLIN among this potentially "at-risk" group with a view to improve on this, if found inadequate, so as to achieve further reduction in the morbidity as well as mortality associated with the disease among the WCBA specifically and among pregnant women in general.

MATERIALS AND METHODS

This population-based study relating to use of LLINs among WCBA used household data on Nigerian females aged 15 to 49 years who resided in selected 16 Local Government Areas (LGAs) in the 6 zones of the country during the period 2007 through 2008. The study compares these data with those from currently pregnant women. Currently, pregnant women using LLIN were used as the primary referent population because data on them provide more precise rates with which to compare use of LLIN among WCBA.

Study population

We targeted WCBA, (12 to 49 years) who self-identified as Nigerians belonging to and resident in the area of study and not just visiting. These comprise of those in South-west zone who are predominantly of the Yoruba ethnic group whose ancestors occupy the geographic area that is now known as Owo in Ondo State, Ogo-Oluwa in Oyo State, Irepodun/Ifelodun in Ekiti State and both Badagry and Ikorodu in Lagos state. Those that reside in South-east and South-south zones of the country occupy different geographical zones and are respectively of the Ibo, Ijaw, Edo, Ibibio and other ethnic groups. The Ibos in land-locked South-east zone occupy Aninri in Enugu State and Ukwa West in Abia State; the coastal Ijaws in South-south zone are in Brass within Bayelsa State, and Ogu-Bolo in Rivers State; the Aniomas occupy Oshimili North in Delta State and the Binis are in Edo State. The other component of the study population are of Hausa Fulani stock in North-west (Bungudu in Zamfara State) and in North-east (Gulani in Yobe State). The North-central zone (Ilorin in Kwara State) consists of mixed ethnic groupings of Yorubas and Hausa/Fulani stock mainly.

The study design

The study was a cross-sectional multi-stage random cluster-sample survey designed to estimate with acceptable precision selected ITN indicators in areas where integrated LLIN-EPI campaigns were conducted in Nigeria. The populations to be covered by the survey, the universe of all, were the households in the 48 LGAs, children age 0 to 5 years, pregnant women and WCBA (15 to 49 years). In this report, emphasis is laid more on LLIN coverage among WCBA.

Sample size calculation

This has been described elsewhere (Afolabi et al., 2009). Briefly,

.

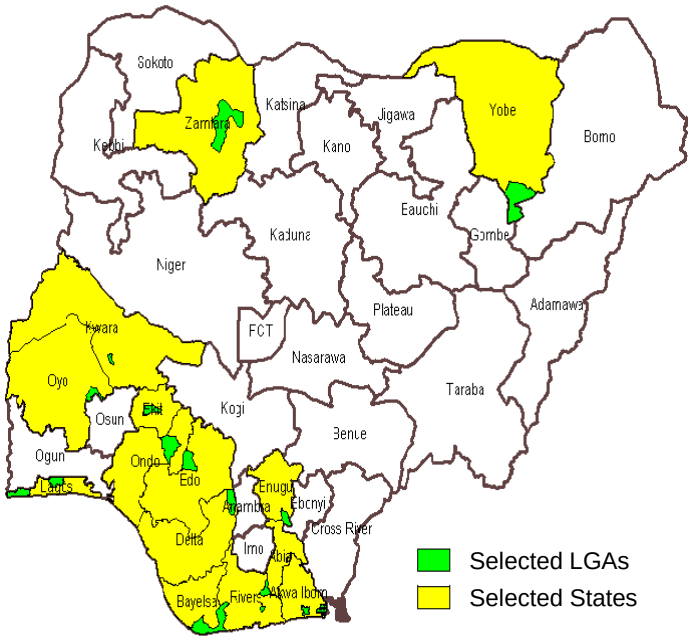

Figure 1. Map of Nigeria showing States and LGAs selected for the survey.

the 2006 population census puts the population size of the 48 LGAs in the study areas at 8,546,280 and the average household size in Nigeria is estimated to be 5 persons (National Population Commission, 2003) translating to about a total of 1,709,256 households in the 48 LGAs. Therefore, to achieve a 3% precision (level of error) with 95% confidence level, assumed proportion of 0.5 and presumed desired change of 20%, a sample of 1,712 households was required for meaningful analysis (the sample size was adjusted to none response rate of 10%). This translated to 107 households per LGA and 10.7 per cluster. Rounding up the cluster size to 11 households therefore meant drawing a minimum sample size of 1,760 (110 households per selected LGA, and 11 per cluster).

Selection of the households

A multi-stage sample design aimed at selecting 1,760 households from 16 LGAs drawn from 24 states was adopted with equal allocation to all the 16 LGAs (that is, 110 households per LGA). The first stage was the selection of 16 LGAs from all the project states. The list of all the 48 LGAs and the states in which they are located was first arranged by geo-political zone. This was to eliminate the concentration of LGAs to be selected in a particular geo-political zone. The 16 LGAs were then selected using systematic sample selection procedure. The second stage involved the selection of enumeration areas (EAs), which for the purpose of this survey were the clusters, from each LGA. To ensure that all EAs in the selected LGAs were given an equal chance of being selected, the frame of all localities and their EAs in the selected LGAs were obtained and 10 clusters systematically selected from each LGA. The third stage was the selection of households from each of the 10 selected clusters. Thrice the number of required households (that is, 33 households) was listed and then 11 households systematically selected. A sketch maps of the selected clusters and households and a brief description of how to reach them was then prepared. Since population wise, the EAs are not equal in size, the household listing continued until the required number of 33 households was obtained. Those who fell outside the age range of 15 to 49 years, those just visiting and hospitalized patients were excluded from the study. Participants whose ages were not ascertained were also excluded.

Data management including analysis

Source of data on the use of LLIN was the household survey carried out in 16 LGAs using a pre-tested questionnaire served to household heads by field-workers who were trained for three days. Where the household head was absent, a proxy was interviewed to complete the data from such household. The questionnaire was pilot-tested at Kuje, FCT, an area not involved in the study and relatively far away from Ilorin, a study site within the same zone. The main independent variables were socio-economic status which included educational status, employment and income level. Primary data were manually entered into questionnaires on the field and double-checked for an error by field supervisors. Where an error, an omission or inappropriate information was detected, the field worker was asked to go back to the household where the error was detected. The data were then collated and entered into IBM compatible desk top computers located within WHO premises, Asokoro, Abuja. EPI-INFO version 6 statistical software was used to perform the analysis. Non-parametric tests were used for determining the significance of associations of variables. The overall prevalence of missing data in this study was less than 5%. Average (Av.) number of WCBA or of PW per HH was calculated by the simple formula:

$$\text{Average} = \frac{No.\ of\ WCBA\ (or\ PW)}{No.\ of\ households\ surveyed}$$

Where WCBA = Women in child-bearing age and PW = pregnant women.

Ethical review

The protocol for this survey was well-scrutinized before being approved by the National Malaria and Vector Control review board. Written or verbal informed consent was received from all participating households.

RESULTS

This study was conducted in 16 LGAs within 14 states of the 6 geo-political zones of Nigeria (Figure 1). In all, 1,756 households were surveyed (Table 1) in which there was an average of 0.17 currently pregnant woman (CPW) per household, compared to 1.4 WCBA per household, indicating that, for every 1 CPW there was 8.2 WCBA who have the potential to be pregnant at any time, if they are not yet obviously pregnant. There were 0.18 CPW to 1.4 WCBA in South-East zone, 0.19 CPW to 1.3 WCBA in South-south, 0.13 PW to 1.3 WCBA in South-West, 0.27 PW to 1.7 WCBA in North-West, 0.08 PW to 1.5 WCBA in North-Central and 0.18 PW to 1.4 WCBA in North-East zones, respectively. The proportion of WCBA, compared to CPW, was significantly higher in South-West ($\chi^2 = 4.80$; $p = 0.03$; OR = 1.37; CI = 1.03, 1.81) and North-Central ($\chi^2 = 6.37$; $p = 0.01$; OR = 2.35; CI = 1.19, 4.64) than in other zones. The proportion of WCBA in surveyed HH was considerably higher than that of

Table 1. Distribution of currently pregnant women (CPW) and women in child-bearing age (WCBA) in households of survey (2007).

Parameter	Total HH	No. of currently PW				No. of Women in child-bearing age					
		0	1	2	Total	0	1	2	3	4	Total
State-LGA					**South-East zone**						
Abia-Ukwa West	110	92	18	0	18	2	76	21	7	4	155
Enugu-Aninri	110	89	21	0	21	8	75	11	9	7	152
Total	220	181	39	0	39*	10	151	32	16	11	307*
*χ^2 = 0.03; p = 0.87; OR = 0.97; CI = 0.68, 1.39											
					South-South zone						
Akwa Ibom-Eket	110	86	24	0	24	2	95	10	2	1	125
Akwa Ibom-Mbo	110	89	18	3	24	20	30	21	18	21	210
Bayelsa-Brass	110	94	16	0	16	20	52	25	9	4	145
Delta-Oshimili North	110	98	12	0	12	27	71	8	4	0	99
Edo-Owan West	111	90	20	1	22	6	83	15	7	0	134
Rivers-Ogu Bolo	107	81	25	1	27	10	66	21	6	4	142
Total	658	538	115	5	125*	85	397	100	46	30	855*
*χ^2 = 3.08; p = 0.08; OR = 0.80; CI = 0.63, 1.03											
					South-West zone						
Ekiti-Irepodun/Ifelodun	109	94	13	2	17	15	57	17	10	10	161
Lagos-Badagry	110	95	14	1	16	0	93	13	2	2	133
Lagos-Ikorodu	110	97	13	0	13	1	79	24	4	2	147
Ondo-Owo	110	105	5	0	5	10	82	11	5	2	127
Oyo-Ogo Oluwa	110	89	21	0	21	8	67	23	5	7	156
Total	549	480	66	3	72*	34	378	88	26	23	724*
*χ^2 = 4.80; p = 0.03; OR = 1.37; CI = 1.03, 1.81											
					North-West zone						
Zamfara-Bungudu	110	84	22	4	30*	1	49	47	9	4	186*
*χ^2 = 1.98; p = 0.16; OR = 0.75; CI = 0.50, 1.12											
					North-Central zone						
Kwara-Ilorin West	110	102	7	1	9*	8	65	19	11	7	164*
χ^2 = 6.37; p = 0.01; OR = 2.35; CI = 1.19, 4.64											
					North-East zone						
Yobe-Gulani	109	90	18	1	20*	18	45	30	14	2	155*
χ^2 = 0.03; p = 0.86; OR = 0.96; CI = 0.59, 1.55											
Total	1756	1475	267	14	295	156	1085	316	120	17	2384

In all for every PW (pregnant women) there are 8.2 WRA.

CPW and consequently, having a WCBA in a HH is about 50 times more likely than having a CPW (χ^2 = 1949.45, p = 0.0000, OR = 49.32, CI = 40.21, 60.50) (Table 2).

Use of LLINs

Eight hundred and ninety one (51%) of households surveyed had any net while 738 (42%) had insecticide treated nets in the form of LLINs (Figure 2). The highest percentage of the ownership and assumed usage of "any net" (88%) and of LLIN (84%) was in Owo LGA in Ondo state, South-west Nigeria. Ilorin West LGA in Kwara state recorded the lowest "any net" (17%) and the lowest ITN/LLIN (6%) use. In general, LLINs were found more in

.

Table 2. Percent distribution of currently pregnant women (CPW) and women in child-bearing age (WCBA) in households of survey (2007).

Parameter	Frequency (%)	
	Women in child-bearing age	Women in child-bearing age
Household with	1598 (90.8)	295 (16.8)
Household without	162 (9.2)	1475 (83.2)
Total	1760	1760

χ^2 = 1949.45; p = 0.0000; OR = 49.32; CI = 40.21, 60.50.

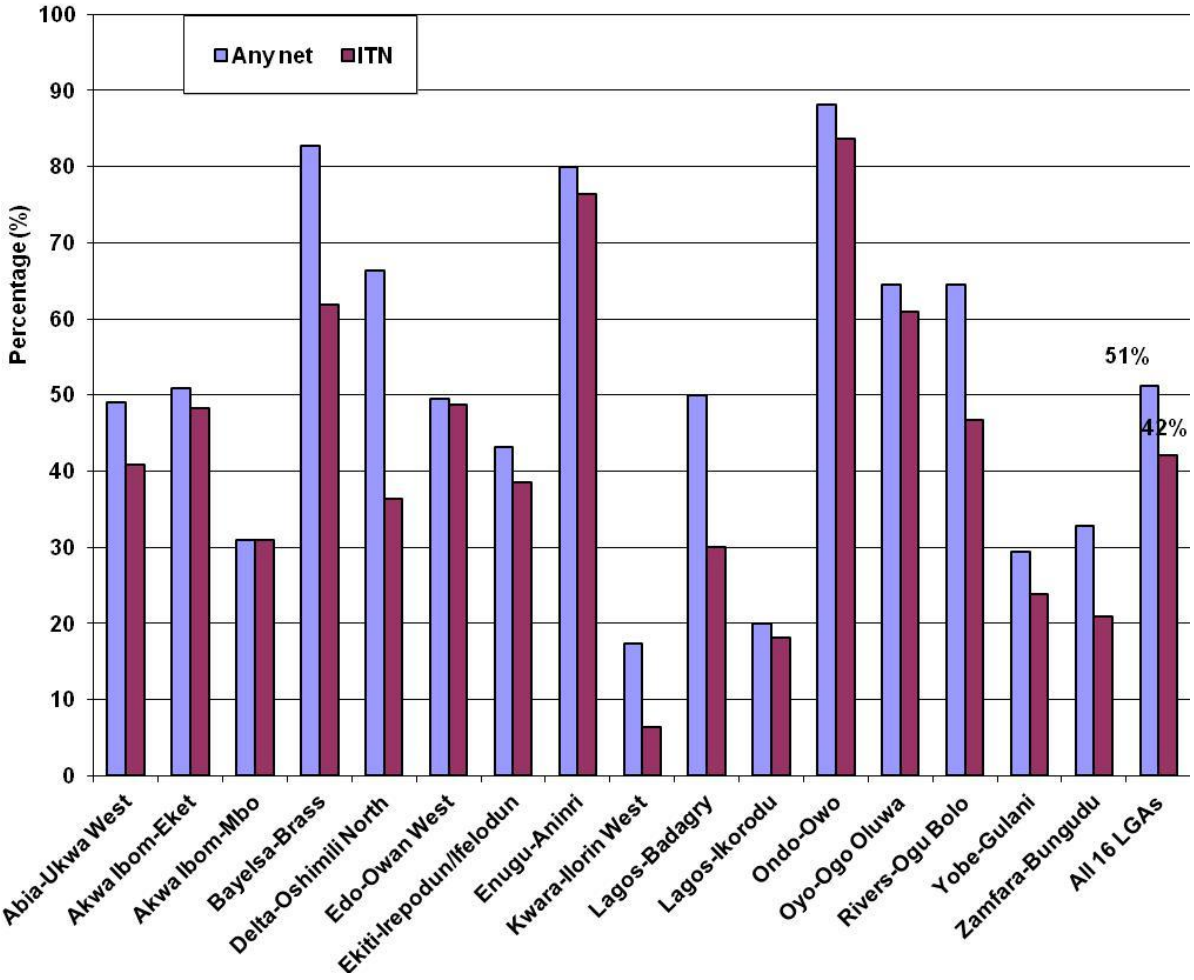

Figure 2. Percentage of households with any mosquito net and ITN by LGA.

southern states of the country than in the northern states. Figure 3 illustrates the percentage of households with at least 1 mosquito net of any type by wealth quintile. The ownership of LLIN ranged from 53% among the poorest to 56% among the least poor. Almost equal percentage of households had any net hanging (69%) and LLIN (68%) hanging during the survey. Ikorodu LGA in Lagos state had the lowest percentage of "any net" and of LLIN hanging while Owo in Ondo state and Gulani in Yobe state had the highest percentage (91%) of "any net" and of LLIN hanging (Figure 4). The percentage use of LLINs by CPW and by WCBA in different zones of the country was staggered. For example, 36% of CPW and 23% of WCBA slept under LLIN the night before survey in South-east zone, 0% CPW and 12% WCBA did so in North-Central zone. Overall, there was a significant difference in the proportion of pregnant women who slept under any net (χ^2 = 23.2; p = 0.000003; OR = 1.89; CI = 1.46, 2.46) or under an LLIN (χ^2 = 15.17; p = 0.0001; OR = 1.73; CI = 1.31, 2.28) night before survey compared to WCBA.

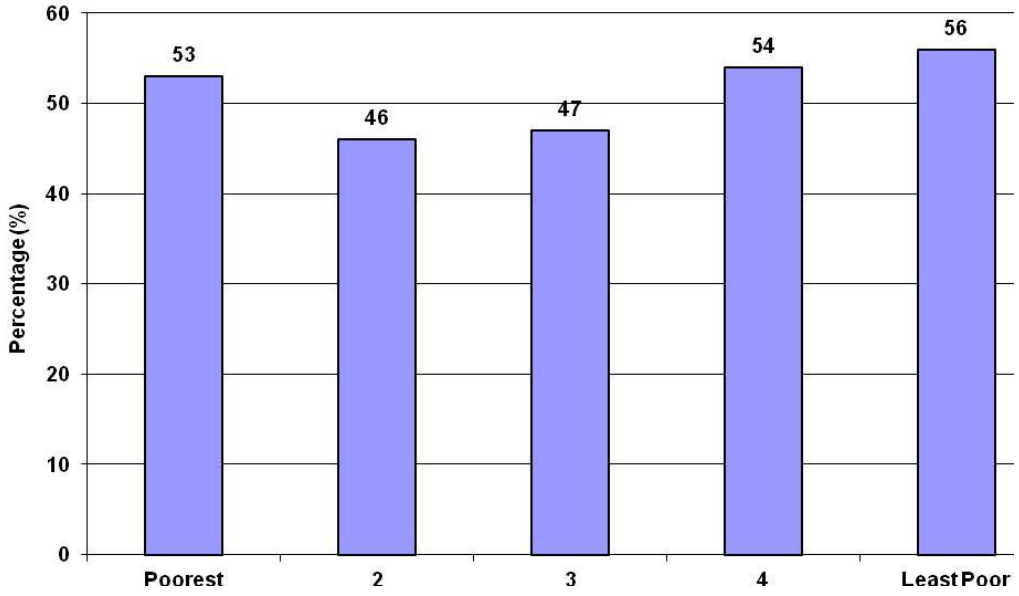

Figure 3. Percentage of households with at least 1 mosquito net of any type by wealth quintile.

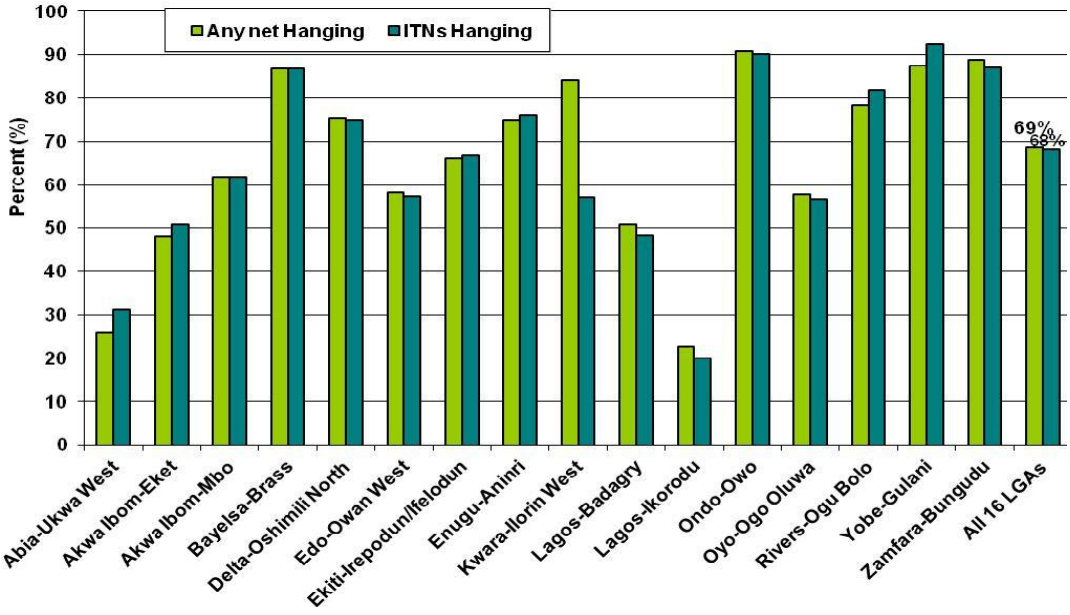

Figure 4. Percentage of households with mosquito nets of any type that have any net hanging and percentage of households with ITNs that have ITNs hanging.

Table 3 also shows that CPW are about twice as likely to sleep under any net or under an LLIN than WCBA.

Use of IPT in current and in past pregnancy

Data was collected on use of sulphadoxine-pyrimethamine (SP) as intermittent preventive treatment (IPT) of malaria during present or immediate past pregnancy. Results from this study show that, overall, a significant proportion of CPW took IPT1 only, compared to the last pregnancy of WCBA ($\chi^2 = 524.04$; p =0.000000; OR = 35.2; CI = 22.6, 54) and that CPW were 35 times more likely to take at least IPT1 compared to WCBA. Furthermore, CPW were about thrice more likely to take IPT1 and IPT2 ($\chi^2 = 7.85$; p = 0.005; OR = 2.56; CI = 1.29, 5.05) than WCBA in their last pregnancy (Table 4). Responses from CPW and WCBA also showed

.

Table 3. Proportion of currently pregnant women (CPW) and women in child-bearing age (WCBA) who slept under any net or under Long Lasting Insecticidal Nets (LLINs) in households (HH) within various Local Government Areas (LGAs) night before survey (2007).

Parameter	CPW				WCBA		
			Frequency (%)			Frequency (%)	
	Total HH	Total	Slept under any net	Slept under LLIN	Total	Slept under any net	Slept under LLIN
State-LGA				**South-East zone**			
Abia-Ukwa West	110	18	3(16.7)	3(16.7)	155	7 (4.5)	6(3.9)
Enugu-Aninri	110	21	11(52.4)	11(52.4)	152	63(41.4)	63(41.4)
Total	220	39	14(35.9)!	14(35.9)*	307	70 (22.8)!	69 (22.5)*
! χ^2 =3.22; p=0.07; OR=1.90; CI=0.94, 3.84					*χ^2=3.4; p=0.06; OR=1.93; CI= 0.95, 3.92		
				South-South zone			
Akwa Ibom-Eket	110	24	6 (25.0)	6 (25.0)	125	14 (11.2)	14(11.2)
Akwa Ibom-Mbo	110	24	7 (29.2)	7 (29.2)	210	22 (10.5)	18 (8.6)
Bayelsa-Brass	110	16	9 (56.2)	6 (37.5)	145	79 (54.5)	63(43.4)
Delta-Oshimili North	110	12	8 (66.7)	2 (16.7)	99	38 (38.4)	22(22.2)
Edo-Owan West	111	22	6 (27.3)	6 (27.3)	134	17 (12.7)	16(11.9)
Rivers-Ogu Bolo	107	27	15 (55.6)	12 (44.4)	142	53 (37.3)	50(35.2)
Total	658	125	51 (40.8)!	39 (31.2)*	855	223 (26.1)!	183 (21.4)*
!χ^2 =11.7; p=0.0006; OR=1.95; CI=1.33, 2.88;					*χ^2=5.97; p=0.01; OR=1.67; C =1.10, 2.51		
				South-West zone			
Ekiti-Irepodun/Ifelodun	109	17	3 (17.6)	3 (17.6)	161	13 (8.1)	13 (8.1)
Lagos-Badagry	110	16	3 (18.8)	2 (12.5)	133	26 (19.5)	13 (9.8)
Lagos-Ikorodu	110	13	0 (0.0)	0 (0.0)	147	5 (3.4)	5(3.4)
Ondo-Owo	110	5	5 (100.0)	5 (100.0)	127	52 (40.9)	49(38.6)
Oyo-Ogo Oluwa	110	21	7 (33.3)	7 (33.3)	156	28 (17.9)	27(17.3)
Total	549	72	18 (25.0)!	17 (23.6)*	724	124 (17.1)!	107 (14.8)*
!χ^2 = 2.77; p = 0.09; OR =1.61; CI = 0.91, 2.84					*χ^2 = 6.26; p = 0.01; OR =2.07; CI = 1.16, 3.70		
				North-West zone			
Zamfara-Bungudu	110	30	8 (26.7)!	4 (13.3)*	186	35 (18.8)!	23 (12.4)*
!χ^2 = 0.99; p = 0.32; OR =1.57; CI = 0.65, 3.82					*χ^2 = 0.02; p = 0.88; OR = 1.09; CI = 0.35, 3.41		
				North-Central zone			
Kwara-Ilorin West	110	9	0 (0.0)!	0 (0.0)*	164	20 (12.2)!	19 (11.6)*
χ^2 = not valid							

Table 3. Contd.

North-East zone							
Yobe-Gulani	109	20	7 (35)!	6 (30.0)*	155	26 (16.8)!	23 (14.8)*
!χ^2 = 3.82; p = 0.05; OR =2.67; CI = 0.97, 7.34					χ^2 = 2.93; p = 0.09; OR = 2.46; CI = 0.86, 7.06		
Overall	1756	295	98 (33.2)!	80 (27.1)*	2391	498 (20.8)!	424 (17.7)*
!χ^2=23.2; p=0.000003; OR =1.89; CI = 1.46, 2.46					χ^2=15.17; p=0.0001; OR = 1.73; CI = 1.31, 2.28		

Table 4. Results of χ^2 analysis of currently pregnant women who took IPT and other medications and women in child-bearing age who took IPT and other medications in their last pregnancy.

Zone	Currently pregnant women				WCBA-last pregnancy			
		Frequency (%)				Frequency (%)		
	n	Took IPTI only	Took IPTI+IPT2	Took other medications	n	Took IPTI only	Took IPTI+IPT2	Took other medications
SE	39	31 (79.5)	2 (5.1)	24 (61.5)	307	1 (0.3)	7 (2.3)	136 (44.3)
SS	125	43 (34.4)	3 (2.4)	35 (28.0)	855	13 (1.5)	89 (10.4)	271 (31.7)
SW	72	6 (8.3)	4 (5.6)	32 (44.4)	724	9 (1.2)	57 (7.9)	331 (45.7)
NW	30	7 (23.3)	0 (0.0)	8 (26.7)	186	2 (1.1)	4 (2.2)	26 (14.0)
NC	9	2 (22.2)	0 (0.0)	2 (22.2)	164	2 (1.2)	13 (7.9)	98 (59.8)
NE	20	2 (10.0)	0 (0.0)	2 (10.0)	155	2 (1.3)	8 (5.2)	22 (14.2)
Total	295	89 (30.2)*	9 (3.1)**	103 (34.9)***	2391	29 (1.2)*	178 (7.4)**	884 (37.0)***

*χ^2=524.04; p=0.000000; OR =35.2; CI = 22.6, 54.8, **χ^2=7.85; p=0.005; OR =2.56; CI = 1.29, 5.05 and ***χ^2=0.48; p=0.49; OR =1.09; CI = 0.85, 1.41

that about 35% of CPW and 37% of WCBA took other medications during their pregnancy, though the difference did not reach a level of significance.

DISCUSSION

This study, the first to provide a detailed description of use of LLIN and IPT among women in child-bearing age in Nigeria, reveals several notable characteristics and determinants of malaria control among this group of people in the population. Firstly, women in child-bearing age far out-number pregnant women in the households. This alone puts them in a condition whereby they can get pregnant at any time and therefore are potentially an “at risk” group in malaria endemic areas of the country. Secondly, though a large number of WCBA are present in households, very few of them slept under protective measures such as LLIN when compared to currently pregnant women. From all indications, African women have restricted access to fiscal and societal powers which contributes to their attaining inferior levels of education and lack of autonomy (Birn et al., 2009).

Almost one-fifth of illnesses and deaths among WCBA in developing countries are pregnancy related and at least one woman dies every minute (529,000/year) due to maternal causes such as primary hemorrhage, infection, eclampsia (seizures), obstructed labor, complications from abortion and ectopic pregnancy (WHO, 2005).

These illnesses could be prevented or at least reduced by providing needed support against infection to WCBA. Women in child-bearing age need strength before they become pregnant especially younger ones who may be experiencing their first pregnancy. The provision of LLIN is a sure means to make certain that WCBA do not enter their pregnancy already in anaemic state (Brieger, 2012).

Malaria in pregnancy is a major public health concern in Nigeria and other sub-Saharan African countries as it has many deleterious effects on both the mother and the fetus underscoring the significance of making available to this group of people adequate and "effective protection and case management" (Crawley et al., 2007). There are multiple barriers to women in child-bearing age, especially the poorest who are likely to have malaria (Somi et al., 2007), accessing formal health care such as perceived quality of care (Litvack and Bodart, 1993), lack of knowledge as well as distance from health services (Mwenesi et al., 1995) transport cost and treatment cost (Nyamongo, 2002; Onwujekwe et al., 2008).

Women in child-bearing age are not specifically targeted by information, education and communication (IEC) or behavioral change communication (BCC) of malaria control programs. Most of the previous reports on malaria morbidity and mortality have not considered non-pregnant WCBA as a distinct group but rather have included them as a heterogeneous group represented as teenagers or adolescents. This might be due to the fact that this is a diverse group whose age ranges from 12 to 49. For precisely this reason, malaria control programs should identify and target, initially, the younger WCBA, especially students. This may involve collaborating with line-ministries such as Education, Youth, Sports and Social Developments. Younger WCBA can be reached at schools, during sporting events, at youth meetings, at musicals and through specific radio and television programs.

By focusing on WCBA population, we have undertaken an initial step towards clarifying the minimal utilization of LLINs and neglect of this group of women in malaria control programs. For example, only 21% of WCBA compared with 33% of currently pregnant women slept under any net and only 18% of WCBA compared with 27% of pregnant women slept under an LLIN night before survey. To increase the percentage of pregnant women that have access to and who utilize malaria control commodities, it is imperative to "catch them young" at least at the earliest stage of becoming a woman or better still at the primary school level. Understanding the dynamics of use of LLIN by WCBA is essential for developing effective prevention and intervention strategies to reduce the burden of malaria not only in this population but also among pregnant women and in the society at large.

This study has begun the process of identifying the characteristics of WCBA who are at risk of malaria when not pregnant and are at higher risk of the disease when pregnant. Notably, not being fully protected while not pregnant might constitute an elevated risk factor for WCBA during pregnancy. This elevated risk may be associated not only with pyrexia in pregnancy but also with maternal conditions such as placenta praevia, pre- and/or post-partum haemorrhages, abortion and anaemia. Congenital malformation (Patel and Adhia, 2005), intra-uterine growth retardation (Allen et al., 1998), miscarriage (Friedrich, 2012) and still birth (Bader et al., 2012.) are possible effects on the fetus while low birth weight (Kabanywanyi et al., 2008) and death in the first year of life due to immature lungs are possible effect on the baby. Health facilities should be organized to provide Integrated Management of Women's Illnesses (IMWI), not only for screening of malaria among WCBA or during pregnancy but also for communicable and non-communicable diseases such as cervical and breast cancers, hypertension, diabetes, pregnancy-related illnesses, reproductive health, toxoplamosis, HIV and even mental health.

Malaria control programs should focus on distributing LLINs to primary school pupils who are likely to influence their parents, siblings, peers not at school and the entire community to sleep under an LLIN. Furthermore, strategies such as focused antenatal care (FANC), IEC and behavioral change communication (BCC) should also specifically target WCBA with appropriate health messages regarding sleeping under LLINs. In this way, use of LLIN in pregnancy will increase and maternal and child morbidity and mortality will decrease in accordance to the expectations of the Millennium Development Goals (MDGs).

Limitations

Several limitations of this study should be noted. One is selection bias, due to the nature of the survey. Thorough screening prior to sample selection would have minimized selection bias and ensure group homogeneity. Some of the women in child-bearing age could not pro-duce authentic evidence of their ages. Another limitation is attrition, and this was minimized where possible. Thirdly, we did not ask the WCBA specifically of other medications used during their last pregnancy.

ACKNOWLEDGEMENT

The World Health Organization Country office in Nigeria supported the National Malaria Control Program of the Federal Ministry of Health to conduct this survey.

REFERENCES

Afolabi BM, Sofola TO, Fatunmbi BS, Komakech W, Okoh F, Saliu O, Otsemobor P, Oresanya OB, Amajoh CN, Fasiku D, Jalingo I (2009).

Household possession, use and non-use of treated or untreated mosquito nets in two ecologically diverse regions of Nigeria – Niger Delta and Sahel Savannah. Malaria J. 8:30.

Allen SJ, Raiko A, O'Donnell A, Alexander NDE, Clegg JB (1998). Causes of preterm delivery and intrauterine growth retardation in a malaria endemic regions of Papua New Guinea. Arch Dis Child Fetal Neonatal Ed 79:F135-F140.

Anya SE (2004). Seasonal variation in the risk and causes of maternal death in The Gambia: malaria appears to be an important factor. Am. J. Trop. Med. Hyg. 70:510–513.

Bader E, Alhaj AM, Hussein AA, Adam I (2012). Malaria and stillbirth in Omdurman Maternity Hospital, Sudan. Int. J. gynaecol. obstetr. Available at http://scholar.qsensei.com/content/1mt15c. Accessed on July 21.

Belay M, Deressa W (2008). Use of insecticide treated nets by pregnant women and associated factors in a predominantly rural population in northern Ethiopia. Trop. Med. Int. Hlth. 13(10):1303-1313.

Birn A, Pillay Y, Holtz TH (2009). Textbook of International Health. 3rd Ed., Oxford University Press 259-261.

Brieger BB (2012). Women and Nets II not only during pregnancy. Available at http://www.globalhealthhub.org/2012/06/17/women-and-nets-ii-not-only-during-pregnancy/. Accessed on July 6.

Crawley J, Hill J, Yartey J, Robalo M (2007). Review: From evidence to action? Challenges to policy change and programme delivery for malaria in pregnancy. Lancet Infect. Dis. 7:93-104.

Federal Ministry of Health. National Guidelines and Strategies for Malaria Prevention and Control during Pregnancy. Lagos: Federal Ministry of Health, Nigeria 2004: 31.

Federal Ministry of Health, Nigeria. Malaria Indicator Survey, 2010

Friedrich MJ (2012). Malaria and miscarriage. JAMA, 307(7):655-656.

Jimoh A, Sofola O, Petu A , Okorosobo T (2007). Quantifying the economic burden of malaria in Nigeria using the willingness to pay approach. Cost Eff Resour Alloc. 5:6.

Kabanywanyi AM, MacArthur JR, Stolk WA, Habbema JDK, Mshinda H, Bloland PB, Abdulla S, Kachur SP (2008). Malaria in pregnant women in an area with sustained high coverage of insecticide-treated bed nets. Malaria J. 7:133.

KEMRI-Wellcome Trust Research Programme. Available at http://www.kemri-wellcome.org Accessed on July 8, 2012.

Litvack JI, Bodart C (1993). User fees plus quality equals improved access to health care: results of a field experiment in Cameroon. Soc Sci. Med. 37:369-383.

Menendez C, Bardaji A, Sigauque B, Romagosa C, Sanz S, Serra-Casas E, Eusebio M, Berenguera A, Catarina D, Carlota D, Denise N, Alfredo M, Jaume O, Inacio M, John JA, Samuel M, Pedro LA (2008). A randomized placebo-controlled trial of Intermittent Preventive Treatment in pregnant women in the context of Insecticide-treated-nets delivered through antenatal Clinic. Plos ONE 3(4):e1934, doi:10.1371/journal.pone.0001934.

Mwenesi H, Harpam T, Snow RW (1995). Child malaria treatment practices among mothers in Kenya. Soc. Sci. Med. 40:1271-1277

National Population Commission. Nigeria Demographic and Health Survey 2003 Available at http://www.measuredhs.com/pubs/pdf/FR148/00FrontMatter.pdf. Accessed on July 22, 2012.

Nyamongo IK (2002). Health care switching behaviour of malaria patients in a Kenyan rural community. Soc. Sci. Med. 54:377-386

Onwujekwe O, Uzochukwu B, Eze S, Obikeze E, Okoli C, Ochonma O (2008). Improving equity in malaria treatment: relationship of socio-economic status with health seeking as well as with perceptions of ease of using the services of different providers for the treatment of malaria in Nigeria. Malaria J. 7:5.

Onwujekwe O, Hanson K, Fox-Rushby J (2004). Inequalities in purchase of mosquito nets and willingness-to-pay for insecticide-treated nets in Nigeria: Challenges for Malaria Control. Malaria J. 3:6

Onwujekwe OC, Soremekun EO, Uzochukwu B, Shu E, Onwujekwe O (2012). Patterns of case management and chemoprevention for malaria in pregnancy by public and private sector health providers in Enugu State, Nigeria. BMC Res Notes 5(1):211 22551039.

Patel ZM, Adhia RA (2005). Birth Defects Surveillance Study. Indian J. Pediatrics 72:489-491.

Roll Back Malaria. Global Malaria Action Plan for a malaria-free world. Available on http://www.rollbackmalaria.org/gmap/2-2a.html. Accessed on July 22, 2012.

Somi MF, Butler JR, Vahid F, Njau J, Kachur SP, Abdulla S (2007). Is there evidence for dual causation between malaria and socioeconomic status? Findings from rural Tanzania. Am. J. Trop. Med. Hyg. 77:1020-1027.

Tako EA, Zhou A, Lohoue J, Leke R, Taylor DW, Leke RF (2005). Risk factors for placental malaria and its effect on pregnancy outcome in Yaounde, Cameroon. Am. J. Trop. Med. Hyg. 72:236–242.

Thawani N, Kulkarni MA, Sohani S (2009). Factors associated with coverage and usage of Long-Lasting Insecticidal Nets in Madagascar. J. Trop. Med. 451719. doi: 10.1155/2009/451719.

Treffers PE (2003). [Teenage pregnancy, a worldwide problem]" (in Dutch; Flemish). Ned Tijdschr Geneeskd 2003, 147(47):2320– 5. PMID 14669537.

UNICEF (2001). A League Table of Teenage Births in Rich Nations PDF (888 KB). Retrieved July 7, 2006.)

Utah Department of Health. Report on maternal and infant health. Available on http://health.utah.gov/opha/publications/other/mih/chaptr2.pdf (1997). Accessed on July 12, 2012.

van Geertruyden JP, Thomas F, Erhart A, D'Alessandro U (2004). The contribution of malaria in pregnancy to perinatal mortality. Am. J. Trop. Med. Hyg. 71:35–40.

Wagbatsoma VA, Aigbe EE (2010). ITN utilization among pregnant women attending ANC in Etsako West LGA, Edo State, Nigeria. Niger J. Clin. Pract. 13(2):144-8.

WHO (2004). A Strategic framework for malaria prevention and control during pregnancy in the African region. Volume 01. Brazzaville: WHO Regional Office for Africa.

WHO (2005). World Health Report: Make every mother and child count. Geneva.