

Original Research Article**PATTERN OF BEDNET OWNERSHIP AND USAGE OF INSECTICIDE TREATED BEDNET (ITN) AMONG PREGNANT WOMEN IN NIGERIA (REVIEW OF 2003 AND 2008 NDHS)****ABSTRACT**

INTRODUCTION: Malaria in pregnancy imposes great burden on the country in terms of maternal morbidity, anaemia and low birth weights for children. World Health organization recommended ITN usage for pregnant women to reduce the burden of malaria in pregnancy. There have been various interventions put in place by government to make ITN available thereby ensuring usage but there has never been a documentation to describe the effectiveness of these strategies. This study reviewed the pattern of bed net ownership and ITN usage among pregnant women.

METHODOLOGY: This study was a comparative cross-sectional population based study in which a secondary data review and analyses of NDHS 2003 and 2008 data were done. Frequencies, charts and chi square test using Stat calc of Epi-Info statistical software were used to investigate the pattern of trend of ITN usage.

RESULTS: Pregnant women that owned bed net increased significantly from 12.9% in 2003 to 22.9% in 2008 ($X^2=41.07$, $p<0.000000001$). Pregnant women that slept under ITN also increased significantly from 1.2% in 2003 to 5.0% in 2008 ($X^2=22.46$, $p=0.0000021$). There was significant increase in the ownership of bed net and usage of ITN over the years in all the categories of residence, region, wealth index, education, literacy, partner's education, work status, marital status and religion.

CONCLUSION: This study found out that despite the fact that ITN was introduced widely across Nigeria, bed net ownership and ITN usage were still low and hereby calls for intensified campaign on awareness of practicing usage of ITN.

KEYWORDS: Malaria in Pregnancy, Bed nets ownership, Insecticide Treated Nets usage,

INTRODUCTION

Malaria being a public health problem in about ninety countries worldwide was estimated to be responsible for about 3,000 deaths per day worldwide (Syed *et al.*, 2009). Malaria control still remains a challenge in Africa where 45 countries are endemic for malaria in which over 500 million people are susceptible. Malaria in pregnancy is a major cause of morbidity and/or mortality in both the mother and her newborn baby. The situation is worse in first pregnancies as they are yet to develop immunity against *Plasmodium falciparum*, the major malaria parasite specie causing malaria in pregnancy (Nwagha *et al.*, 2009). Pregnant women are particularly vulnerable to malaria because pregnancy reduces a woman's relative immunity to malaria, thus making her more susceptible to the infection and increasing the risk of illness, severe anaemia, and even death. This immune-suppression during pregnancy is more marked during the first 24 weeks of gestation than in the third trimester. Many researchers have reported high prevalence rates of malaria in pregnancy in different parts of Nigeria, ranging from 19.7% to 72.0% (Kagu *et al.*, 2007). Thus, pregnant women, need effective protective measures to ensure their survival and improve birth outcome. One of the WHO's recommendation for proper management of malaria during pregnancy is that pregnant woman must sleep under an Insecticide treated bednet (ITN). Roll Back Malaria (RBM) was initiated in 1998 while ITN was introduced in 2001. The objectives were to rapidly scale up the country-wide and equitable distribution of ITN to pregnant women and to establish sustainable Public Private Mix (PPM) mechanisms for replacement of ITN. There were some laid-down targets which were, at least 80% of households must have two or more ITNs by 2010 and at least 80% of pregnant women sleep under ITN by 2010 and sustain until 2013 (Nigeria Strategic Plan, 2009-2013). To ascertain good coverage of ITNs across all states in Nigeria, the Federal Government/RBM partners procured and

distributed about 10million ITNs between 2000-2005 and additional 1.6million ITN between 2006-March 2007. WHO's report in 2010 also showed that ITN distribution has increased from 3million in 2002 to about 20million in 2008.

To achieve equitable distribution among pregnant women of different socio-economic status, the Federal Government introduced three major channels of ITN distribution. They are free distribution through mass campaigns and routine distribution (ANC), subsidized distribution through mass campaigns and community based distributions and at cost ITN distribution through retail market, institutional sales and local production. There was also an integration of the distribution of ITN into Antenatal care so that each pregnant woman can have access to ITN throughout Nigeria. To resolve the issue of cost and affordability, Federal Ministry of Health (FMOH) distribution scheme was focused on free ITNs to rural areas and poorer households combined with subsidized commercial ITN to urban and richer households (Baume et al., 2009). ITN works well but coverage and usage are still the most important thing. With all the strategies and interventions put in place to make bednet and ITN available for pregnant women since the inception of RBM initiatives, a study has to be carried out to evaluate the effectiveness of these interventions. This study then evaluated the pattern or trends of bednet ownership and ITN usage by pregnant women in Nigeria thereby revealing the difficulties that might hinder the achievement of the RBM goals.

METHODOLOGY

This is a comparative cross-sectional population-based study. It is a secondary data analysis of data from 2003 and 2008 NDHS. For this study, the ownership of bednet and usage of ITN among the pregnant women aged 15-49 years in Nigeria were compared using the 2003 and 2008 NDHS using the primary survey, a national study (NDHS 2003 and 2008) for Nigeria.

Nigeria is made up of 36 states and a Federal Capital Territory (FCT), grouped into six geopolitical zones: North Central, North East, North West, South East, South South, and Southwest. The population covered by the 2003 and 2008 NDHS was defined as the universe of all women age 15-49 in Nigeria while the unit of enquiry were the pregnant women aged 15-49 years. The NDHS sample was selected using a stratified, two-stage cluster design consisting of a total of 365 clusters, 165 in urban and 200 in rural areas for 2003 survey and 888 clusters, 286 in the urban and 602 in the rural areas selected in 2008 survey. A total of 883 pregnant women of age group 15-49 were interviewed in 2003 while 3397 pregnant women in all households were interviewed in 2008 for the ownership and usage of ITN. The primary data were collected using questionnaires administered to the selected pregnant women of age group 15-49 years. Window SPSS version 15.0 and Epi-Info software (Statcalc) were used for re-analyses of the available data. The independent variables reviewed were age of the pregnant women, residence (Urban/Rural), geopolitical zones, wealth quintile, education level, religion and marital status while the dependent variable were ownership of bednet and usage of ITN. The descriptive statistics such as frequencies were used to summarize quantitative variables while qualitative variables were summarized with proportions and cross-tabulations. Frequencies, charts and chi square test using Statcalc of Epi-Info statistical software were used to investigate the pattern of trend of ITN usage. All analyses were done at 5% level of significance and 95% confidence interval. An ethical approval for the re-analyses was collected from National Demographic and Health Survey (NDHS) in releasing the data related to malaria preventive and control measures among pregnant women of age group 15-49 in Nigeria.

RESULTS

A total of 848 and 3547 pregnant women were analysed in 2003 and 2008 respectively. The age of the respondents range from 15-49years with mean age of 27.03years in 2003 and 27.06years in 2008. The modal age of the pregnant women interviewed was 25years for both 2003 and 2008. Majority (65.7% in 2003 and 73.2% in 2008) interviewed were in the rural areas while 73.5% (2003) and 68% (2008) were from the northern parts of Nigeria. Less than half (41.7% in 2003 and 48.9% in 2008) were in the poor wealth index category, while 50% (2003) and 47.3% (2008) had no formal education.

Table 1: Socio-demographic characteristics for pregnant women interviewed

		2003	2008
Variable		Frequency (%)	Frequency (%)
Residence	Urban	291 (34.3)	949 (26.8)
	Rural	557 (65.7)	2598 (73.2)
	Total	848 (100.0)	3547 (100.0)
Region	North Central	124 (14.6)	644 (18.2)
	North East	207 (24.4)	774 (21.8)
	North West	292 (34.4)	993 (28.0)
	South East	66 (7.8)	324 (9.1)
	South South	87 (10.3)	413 (11.6)
	South West	72 (8.5)	399 (11.2)
	Total	848 (100.0)	3547 (100.0)
Region recode	North	623 (73.5)	2411 (68.0)
	South	225 (26.5)	1136 (32.0)
	Total	848 (100.0)	3547 (100.0)
Wealth Index	Poorest	181 (21.3)	954 (26.9)
	Poorer	173 (20.4)	782 (22.0)
	Middle	188 (22.2)	710 (20.0)
	Richer	170 (20.0)	567 (16.0)
	Richest	136 (16.0)	534 (15.1)
	Total	848 (16.0)	3547 (100.0)
Education	None	425 (50.1)	1676 (47.3)
	Primary	195 (23.0)	759 (21.4)
	Secondary	191 (22.5)	900 (25.4)
	Higher	37 (4.4)	212 (6.0)
	Total	848 (100.0)	3547 (100.0)

Marital status	Never married	17 (2.0)	87 (2.5)
	Currently married	819 (96.6)	3432 (96.8)
	Formerly married	12 (1.4)	28 (0.8)
	Total	848 (100.0)	3547 (100.0)
Religion	Christianity	303 (35.7)	1475 (41.8)
	Islam	534 (63.0)	1977 (56.1)
	Others	11 (1.3)	74 (2.1)
	Total	848 (100.0)	3526 (100.0)

Table 2 Frequency table of bednet ownership

		2003	2008		
Variables		Frequency(%)	Frequency(%)	X ² values	P values
Bednet ownership					
	No	737 (87.1)	2733 (77.1)		
	Yes	109 (12.9)	810 (22.9)	41.07	0.0000000*
	Total	846 (100.0)	3543 (100.0)		

Table 2 shows that 12.9% of pregnant women reported to have bednet in 2003. This proportion however increased to 22.9% in 2008. Table 3 shows pattern of bednet ownership with respect to different sociodemographic characteristics of the respondents. The pattern was statistically significant, $X^2=41.07$, $p=0.00000000$. The proportion of pregnant women in urban residences who owned bednet increased over the years from 10.0% in 2003 to 21.3% in 2008 which was significant at $X^2=18.53$, $p=0.0000167$. There was also a significant increase($X^2=22.09$, $p=0.0000026$) in the proportion of rural dwellers that owned bednet from 14.4% in 2003 to 23.4% in 2008. Urban residence experienced a higher increase over the years. Overall, in the geopolitical regions in Nigeria, there was an increase in the proportion of those that owned bednet over the years although the increase was only significant in North East, North West, South East and South West regions. There was statistically significant increase in the proportion of pregnant women in the Northern ($X^2=23.77$, $p=0.0000011$) and Southern ($X^2=33.97$, $p=0.000000$) parts of Nigeria that owned bednet from 2003 to 2008. Those in the Northern part experienced higher ownership of bednet than those in the Southern parts for both

2003 and 2008 though the increase in the Southern parts was higher than that of the Northern parts. In terms of wealth index, there was statistically significant increase in the pattern of bednet ownership over the years from 2003 to 2008 among the respondents in poorer, middle, richer and richest wealth indices except for those in the poorest wealth index which had little increase in proportion of ownership. Respondents in the rich wealth index category had lower percentage of bednet ownership in 2003 and had the highest in 2008 as compared to those in the poor wealth index category. There was a statistically significant increase in bednet ownership among respondents that had no education($X^2=9.11$, $p=0.0025393$), primary($X^2=11.26$, $p=0.00079$) and secondary($X^2=27.22$, $p=0.0000002$) over the years but was no significant increase among those with higher education. There was significant increase in the proportion of illiterate ($X^2=15.68$, $p=0.0000750$), partial literate ($X^2=6.67$, $p=0.00981$) and literate ($X^2=25.14$, $p=0.0000005$) pregnant women that owned bednet from 2003 to 2008. Pregnant women with partners that have higher education owned bednet more than any other group and this was statistically significant ($X^2=13.45$, $p=0.0002450$). There was also a statistical significant increase in the proportion of Christian($X^2=22.75$, $p=0.0000018$) and Muslim($X^2=21.94$, $p=0.0000028$) that owned bednet in their households from 2003 to 2008. Higher proportion of Muslim pregnant women owned bednet compared to Christiana for both years though there was a higher increase among the Christians. However, this was statistically significant at $X^2=7.67$, $P=0.022$ (table 3)

Table 3: PATTERN OF BED NET OWNERSHIP BY PREGNANT WOMEN

Variable	2003		2008		X ² values	P values
	Yes (%)	No(%)	Yes (%)	No(%)		
Residence						
Urban	29(10.0)	260(90.0)	202(21.3)	746(78.7)	18.53	0.0000167*
Rural	80(14.4)	477(85.6)	608(23.4)	1987(76.4)	22.09	0.0000026*
Region						
North Central	13(10.5)	111(89.5)	111(17.3)	530(82.7)	3.57	0.0587760
North East	47(22.7)	160(77.3)	230(29.8)	543(70.2)	4.00	0.0454699*
North West	31(10.7)	259(89.3)	230(23.2)	763(76.8)	21.55	0.0000035*
South East	7(10.6)	59(89.4)	73(22.5)	251(77.5)	4.78	0.0287597*
South South	11(12.6)	76(87.4)	78(18.9)	335(81.1)	1.91	0.1665267
South West	0(0.0)	72(100.0)	88(22.1)	311(99.9)	19.53	0.0000099*
Region recode						
North	91(14.7)	530(85.3)	571(23.7)	1836(76.3)	23.77	0.0000011*
South	18(8.0)	270(92.0)	239(21.0)	897(79.0)	33.97	0.0000000*
Wealth Index						
Poorest	33 (18.2)	148(81.8)	182 (19.1)	770(80.9)	0.08	0.7806059
Poorer	27 (15.6)	146(84.4)	190 (24.3)	592(75.7)	6.09	0.0135802*
Middle	19 (10.1)	169(89.9)	180 (25.4)	528(74.6)	20.17	0.0000071*
Richer	20 (11.9)	148(88.1)	136 (24.0)	431(76)	11.31	0.0007695*
Richest	10 (7.4)	126(92.6)	122 (22.8)	412(77.2)	16.45	0.00005*
Education Level						
None	68 (16.1)	355(83.9)	382 (22.8)	1292(77.2)	9.11	0.0025393*
Primary	23 (11.8)	172(88.2)	172 (22.7)	587(77.3)	11.26	0.0007898*
Secondary	11 (5.8)	180(94.2)	199 (22.2)	699(77.8)	27.22	0.0000002*
Higher	7 (18.9)	30(81.1)	57 (26.9)	155(73.1)	1.05	0.3061303
Literacy						
Can't read at all	78(15.1)	439(84.9)	487(23.1)	1624(76.9)	15.68	0.0000750*
Can read part	3(6.3)	45(93.7)	48(22.6)	164(77.4)	6.67	0.0098095*
Can read fully	25(9.3)	244(90.7)	273(22.9)	917(77.1)	25.14	0.0000005*
Partner's Education						
None	50 (15.6)	270(84.4)	285 (21.6)	1032(78.4)	5.72	0.0167454*
Primary	20 (10.0)	181(90.0)	162 (22.5)	559(77.5)	15.55	0.0000804*
Secondary	15 (7.8)	177(92.2)	199 (20.7)	761(79.3)	17.65	0.0000266*
Higher	17 (16.0)	89(84.0)	140 (34.5)	266(65.5)	13.45	0.0002450*
Religion						
Christianity	27(8.9)	276(91.1)	304(20.6)	1170(79.4)	22.75	0.0000018*
Islam	81(15.2)	451(84.8)	490(24.8)	1484(75.2)	21.94	0.0000028*
Others	1(9.1)	10(90.9)	14(18.9)	60(81.1)	0.64	0.3803297

Table 4: Frequency table for any bednet usage by pregnant women

Variable	2003	2008	X ² values	P values
Any bednet usage				
No	793 (93.6)	3109 (87.7)		
Yes	54 (6.4)	438 (12.3)	24.53	0.0000007*
Total	847 (100.0)	3547 (100.0)		

Table 4 shows that only 6.4% of respondents slept under any bednet in 2003 and there was a significant increase to 12.3% in 2008 ($X^2=24.53$, $p=0.0000007$). Table 5 shows the trend of any bednet usage among pregnant women from 2003 to 2008 with respect to their sociodemographic characteristics. Pregnant women in rural residences slept more under bednet than those in the urban residence both in 2003 and 2008. There was a significant increase in the proportion of pregnant women in urban ($X^2=9.64$, $p=0.0019$) and rural ($X^2=13.92$, $p=0.0001911$) residences that slept under bednet from 2003 to 2008. All the geo-political regions in Nigeria experienced increase in the proportion of pregnant women that slept under bednet from 2003 to 2008 except for the South South that dropped by 0.2% but this was not statistically significant ($X^2=0.00$, $p=0.9441347$). Those in the South west had the highest increase from 0.0% in 2003 to 12.3% in 2008 as compared to other regions. There was increase in the usage of bednet among the respondents that reside in the Northern and Southern parts of Nigeria over the years though higher proportion of the pregnant women in the Northern parts slept under bednet both for 2003 and 2008. This increase was however significant for North ($X^2=18.37$, $p=0.0000181$) and South ($X^2=17.47$, $p=0.0000291$). There was also increase in the proportion of pregnant women in various categories of wealth index that slept under any bednet from 2003 to 2008 though there were statistically significant increase for those in poorer, middle, richer and richest categories. Among the pregnant women in the various levels of education ranging from no education, primary, secondary education, there was a significant increase in the usage of bednet while the proportion of pregnant women in higher education that slept under any bednet increased from 2003 to 2008 but not statistically significant ($X^2=0.12$, $p=0.7325$). Higher proportion of the

pregnant women that were illiterate slept under bednet more than those that were partially and fully literate for both 2003 and 2008. Though there was a general increase in the proportion of illiterate, partial literate and literate pregnant women that slept under bednet from 2003 to 2008 but increase only among the illiterate and literate pregnant women were statistically significant. Usage of bednet increased significantly among pregnant women that had partner's with no education($X^2=9.17$, $p=0.00245$), primary($X^2=8.56$, $p=0.00344$), secondary($X^2=9.57$, $p=0.00198$) and higher($X^2=3.89$, $p=0.0487$) from 2003 to 2008. There was an increase in the proportion of Christian and Muslim pregnant women that slept under bednet from 2003 to 2008 though higher proportion of Muslim pregnant women slept under bednet more than the Christian pregnant women for both 2003 and 2008. This increase was however statistically significant for the Christians($p=0.00151$) and Muslims($p=0.0000318$). There was an increase in the proportion of currently and formerly married pregnant women that slept under any bednet from 2003 to 2008. There was an observed significant increase in the usage of any bednet among pregnant women currently married at $X^2=27.74$, $p=0.0000001$. There was a reduction in the proportion of pregnant women that were never married that slept under bednet from 23.5% in 2003 to 3.4% in 2008 which was significant at $X^2=9.13$, $p=0.002507$)

Table 5: Pattern in association between Socio demographic variables and any bednet usage

Independent Variables	2003		2008		X ² values	P values
	Yes(%)	No(%)	Yes(%)	No(%)		
Residence						
Urban	13 (4.5)	278(95.5)	99 (10.4)	850(89.6)	9.64	0.0019004*
Rural	41(7.4)	515(92.6)	339(13.0)	2259(87.0)	13.92	0.0001911*
Region						
North Central	7 (5.6)	117(94.4)	60 (9.3)	584 (90.7)	1.76	0.1845860
North East	18(8.7)	188(91.3)	127 (16.4)	647 (83.6)	7.59	0.0058594*
NorthWest	18(6.2)	274(93.8)	130 (13.1)	863 (86.9)	10.63	0.0011156*
South East	3(4.5)	63(95.5)	35 (10.8)	289(89.2)	2.44	0.1182035
South South	8(9.2)	79(90.8)	37 (9.0)	376 (91.0)	0.00	0.9441347
SouthWest	0(0.0)	72(100.0)	49 (12.3)	350 (87.7)	9.87	0.0016811*
Region recode						
North	43 (6.9)	579(93.1)	317 (13.1)	2094(86.9)	18.37	0.0000181*
South	11 (4.9)	214(95.1)	121(10.7)	1015(89.3)	17.47	0.0000291*
Wealth Index						
Poorest	17 (9.4)	164 (90.6)	112 (11.7)	842 (88.3)	0.83	0.3615703
Poorer	12 (6.9)	161 (93.1)	115 (14.7)	667 (85.3)	7.42	0.0064625*
Middle	12 (6.4)	175 (93.6)	96 (13.5)	614 (86.5)	7.05	0.0079114*
Richer	8 (4.7)	162 (95.3)	68 (12.0)	499 (88.0)	7.51	0.0061387*
Richest	5 (3.7)	131 (96.3)	47 (8.8)	487 (91.2)	3.98	0.0461257*
Literacy						
Can't read at all	40 (7.7)	478(92.3)	288(13.6)	1825(86.4)	13.31	0.0002646*
Can read part	2 (4.2)	46(95.8)	27 (12.7)	185 (87.3)	2.90	0.0885718
Can read whole	12 (4.5)	257(95.5)	121(10.2)	1071(89.8)	8.59	0.0033850*
Partner's Education						
None	20(6.2)	301(93.8)	160 (12.1)	1160 (87.9)	9.17	0.0024537*
Primary	11(5.5)	189(94.5)	93 (12.9)	628 (87.1)	8.56	0.0034433*
Secondary	7(3.6)	186(96.4)	104 (10.8)	857 (89.2)	9.57	0.0019768*
Higher	10(9.4)	96(90.6)	70 (17.2)	336 (82.8)	3.89	0.0486799*
Religion						
Christianity	13(4.3)	290(95.7)	148 (10.0)	1327(90.0)	10.07	0.0015080*
Islam	39 (7.3)	494(92.7)	278 (14.1)	1699(85.9)	17.31	0.0000318*
Others	2(18.2)	9 (81.8)	11 (14.9)	63(85.1)	0.08	0.5316172
Marital status						
Never married	4(23.5)	13 (76.5)	3 (3.4)	84 (96.6)	9.13	0.0025077*
Currently married	50(6.1)	768(93.9)	433 (12.6)	2999(87.4)	27.74	0.0000001*
Formerly married	0(0.0)	12(100.0)	2 (7.1)	26 (92.9)	0.90	0.4846154

*Significant at p<0.05

Table 6: Frequency table for Insecticide Treatment Net usage

Variable		2003	2008	X ² values	P values
ITN usage					
	No	801 (98.8)	3371 (95.0)		
	Yes	10 (1.2)	176 (5.0)	22.46	0.0000021*
	Total	811 (100.0)	3547 (100.0)		

Table 6 shows that there was also a statistically significant increase $X^2=22.46$, $p=0.0000021$ in the proportion of pregnant women that slept under Insecticide Treated Nets(ITN) from 1.2% in 2003 to 5.0% in 2008.

Table 7 shows the pattern of ITN usage among pregnant women from 2003 to 2008. Higher proportion of respondents in the urban residences slept under an ITN than those in the rural residences in both years. There was a general and statistically significant increase in the usage of ITN from 2003 to 2008 for urban($X^2=14.33$, $p=0.0001534$) and rural($X^2=12.42$, $p=0.0004243$) residence. There was significant increase in the usage of ITN among pregnant women in the geo-political zones from 2003 to 2008. There was a significant increase in the usage of ITN among pregnant women in Northern ($X^2=15.94$, $p=0.0000655$) and Southern ($X^2=9.41$, $p=0.00216$) regions from 2003 to 2008. In 2003, there was similar proportion in usage of ITN in both the Northern and Southern regions but in 2008, there was a remarked increase in usage in the Southern region compared to the Northern region. There was increase in the proportion of respondents in the categories of wealth index that slept under ITN. Those in the middle, richer and richest wealth indices slept under treated bed net more than those in the poorest and poorer categories both in 2003 and 2008. There was significant increase in all the wealth index categories in ITN usage in both years under review, with usage increasing significantly from the poorest to the richest. Also, there was increase in use of ITN with increase in education level in both 2003 and 2008. This increase was statistically significant in each level of education group in the both years. The literate pregnant women slept under ITN more than the illiterate pregnant women both in 2003 and 2008. There was a significant increase in the usage of

ITN among all the categories of pregnant women. Partner's education level was seen to influence use of ITN among their wives in both review years. Pregnant women who had husbands with high level of education used ITN more than those whose husbands had little or no education and this was statistically significant. From this study, women who visited the antenatal clinic used ITN more than those who did not in both years and also recorded higher increase in usage in 2008. This observation is statistically significant ($X^2=258.64$, $p=0.0000000$). There was observed and significant increase in use of treated bednet in 2003 and 2008

Table 7: Pattern in association between Socio demographic variables and ITN usage from 2003 to 2008

Variables	2003		2008		X ² values	P values
	Yes(%)	No (%)	Yes (%)	No (%)		
Residence						
Urban	38 (3.4)	1074 (96.6)	640 (16.8)	3159 (83.2)	22.15	0.0000025*
Rural	18 (0.9)	1939 (99.1)	865 (8.2)	9718 (91.8)	132.76	0.0000000*
Region						
North Central	4 (0.8)	488 (99.2)	305 (12.1)	2214 (87.9)	57.02	0.0000000*
North East	14 (1.9)	730 (98.1)	223 (6.8)	3070 (93.2)	26.26	0.0000003*
North West	23 (2.4)	929 (97.6)	308 (7.7)	3698 (92.3)	34.32	0.0000000*
South East	1 (0.4)	254 (99.6)	144 (12.2)	1041 (87.8)	32.05	0.0000000*
South South	6 (2.1)	286 (97.9)	216 (12.5)	1514 (87.5)	27.81	0.0000001*
South West	8 (2.4)	326 (97.6)	309 (18.7)	1340 (81.3)	55.24	0.0000000*
Region recode						
North	41 (1.9)	2147 (98.1)	836 (8.5)	8982 (91.5)	6.84	0.0088905*
South	15 (1.7)	866 (98.3)	669 (14.7)	3895 (85.3)	112.84	0.0000000*
Wealth Index						
Poorest	3 (0.4)	698 (99.6)	121 (3.1)	3741 (96.9)	16.42	0.0000507*
Poorer	5 (0.8)	650 (99.2)	193 (5.6)	3238 (94.4)	28.19	0.0000001*
Middle	10 (1.6)	599 (98.4)	333 (12.1)	2428 (87.9)	59.24	0.0000000*
Richer	16 (2.7)	569 (97.3)	476 (19.7)	1936 (80.3)	99.16	0.0000000*
Richest	22 (4.2)	497 (95.8)	382 (19.9)	1534 (80.1)	72.73	0.0000000*
Education						
None	12 (0.8)	1509 (99.2)	364 (5.1)	6794 (94.9)	55.87	0.0000000*
Primary	13 (1.8)	723 (98.2)	356 (11.1)	2862 (88.9)	61.18	0.0000000*
Secondary	21 (3.0)	688 (97.0)	604 (18.3)	2699 (81.7)	104.23	0.0000000*
Higher	10 (9.7)	93 (90.3)	181 (25.7)	522 (74.3)	12.78	0.0003504*
Literacy						
Can't read at all	15 (0.8)	1845 (99.2)	528 (5.9)	8438 (94.1)	83.52	0.0000000*
Can read part	7 (3.5)	191 (96.5)	111 (11.8)	832 (88.2)	11.97	0.0005406*
Can read whole	34 (3.5)	944 (96.5)	848 (19.5)	3508 (80.5)	147.98	0.0000000*
Partner's Education						
None	12 (1.0)	1148 (99.0)	251 (4.4)	5464 (95.6)	29.54	0.0000001*
Primary	4 (0.6)	706 (99.4)	264 (9.3)	2561 (90.7)	62.45	0.0000000*
Secondary	20 (2.7)	731 (97.3)	589 (15.7)	3162 (84.3)	90.95	0.0000000*
Higher	18 (5.4)	318 (94.6)	335 (22.0)	1187 (78.0)	49.60	0.0000000*
Marital Status						
Never married	1 (1.3)	78 (98.7)	48 (13.9)	298 (86.1)	10.02	0.0015472*
Currently married	52 (1.8)	2836 (98.2)	1409 (10.3)	12288 (89.7)	213.83	0.0000000*
Formerly married	3 (2.9)	99 (97.1)	48 (14.2)	290 (85.8)	9.69	0.0018482*

Continuation of Table 7: **Pattern in association between Socio demographic variables and SP uptake from 2003 to 2008**

Variables	2003		2008		X ² values	P values
	Yes(%)	No(%)	Yes(%)	No(%)		
Religion						
Christianity	17 (1.5)	1131 (98.5)	807 (13.6)	5107 (86.4)	138.03	0.0000000*
Islam	39 (2.1)	1826 (97.9)	674 (8.3)	7435 (91.7)	88.40	0.0000000*
Others	0 (0.0)	54 (100.0)	13 (4.6)	268 (95.4)	2.60	0.0971898
Currently working						
No	16 (1.4)	1136 (98.6)	456 (8.7)	4796 (91.3)	73.61	0.0000000*
Yes	40 (2.1)	1866 (97.9)	1045 (11.6)	7987 (88.4)	158.00	0.0000000*
Antenatal visit						
No	5 (0.5)	1044 (99.5)	102 (1.8)	5598 (98.2)	9.79	0.0017581*
Yes	50 (2.6)	1902 (97.4)	1281 (16.6)	6436 (83.4)	258.64	0.0000000*
Type of bednet						
None	56 (2.0)	2795 (98.0)	1275 (10.2)	11165 (89.8)	200.34	0.0000000*
Treated bednet	0 (0.0)	42 (100.0)	139 (17.4)	662 (82.6)	8.73	0.0031346*
Untreated bednet	0 (0.0)	176 (100.0)	91 (8.0)	1050 (92.0)	15.08	0.0001031*

*significant at p<0.05

DISCUSSION

WHO recommended that each household must have at least two bednet and that pregnant women must sleep under an Insecticide Treated bednet(ITN) as guidance on prevention and control of malaria among pregnant women. This study however describes the pattern of bednet ownership in households and usage of ITN among pregnant women in Nigeria. The age of the respondents range from 15-49 with the mean age of 27.03years in 2003 and 27.06years in 2008.The median age was 27years while the modal age of all the respondents interviewed is 25years for 2003 and 2008 respectively.

Pattern of bednet ownership among pregnant women

Bed net ownership among pregnant women varies with various independent socio-demographic factors from 2003 to 2008. The result showed that there was a general increase in the proportion of pregnant women that own bed net in their households from 2003 to 2008 which is also supported by the report published by NDHS 2008. Bed net ownership by pregnant women

is higher in the rural areas compared to the urban areas which might be as a result of the focus of malaria preventive and control measures to the rural zones at the initiation of RBM. The implication is that more malaria episodes might occur in the urban areas which might cause upsurge of malaria endemic in Nigeria.

In terms of wealth index, more pregnant women in the poor category have bed net than those in the rich category in 2003 but in 2008, more pregnant women in the rich wealth index owned bed net compared to those in the poor category. This might be as a result of free distribution of bed net to the lower SES in the early stage of bed net introduction due to their weak affordability while the change in the ownership among the rich pregnant women might be as a result of high SES, good willingness to pay, affordability. The result conforms to that of a study done by Guyatt and Snow, in 2004 to evaluate the willingness to pay and ability to pay for ITN in Kenya. It was found out that about 97% of the housesteads were willing to pay for ITN. The implication of this outcome is that pregnant women in the rich household might have less burden of the disease while the poor pregnant women might experience a higher vulnerability to malaria because of their inability to afford or to pay for a bed net.

Education of the respondents and their partners follow the same pattern with proportion of those with higher education having bed net more than those in other levels of education. This shows that education being part of the instrument used in measuring socio-economic status affects bednet ownership. The might cause the lower class pregnant women that were unable to have quality education to have more malaria attack during pregnancy.

Religion might also play a part in the explanation of pattern in the bed net ownership in which higher percentage of Muslim pregnant women have bed nets more compared to the Christians and those in other religion both in 2003 and 2008. This is however expected because

higher percentages of the respondents interviewed in the years were from the Northern part of Nigeria where Islam religion is majorly being practised.

Pregnant women in the Northern part of Nigeria owned bed net in their household more than those in the Southern parts of Nigeria both in the two years. There was an increase from 2003 to 2008. This might be as a result of uneven distribution and availability of bed nets throughout the geo-political zones of the country. This implies that pregnant women in the southern part of Nigeria are likely to have maternal parasitaemia compared to those in the Northern part.

Pattern of any bednet usage among pregnant women

Any bed net usage also shows a pattern different from that of ownership in which there was a slight decrease in the proportion of those that actually slept under bed net as compared to those that owned bed net. This was shown by a study carried out by Pettifor *et al* in 2008 to describe bed net ownership and usage in Kinshasa, DRC. It was found out that among 351 women interviewed at the beginning of the study, 33% owned a bed net and 25% reported to have slept under the bed net the previous night. This shows that not all the pregnant women that owned bednet used them. Hence, achievement of RBM's goals might not be realistic if we focus only on distribution of bed net and neglect the actual usage of bed net. Individuals have given several complaints on the usage of bed net. It was emphasized in a study by Chukwuocha et al in 2010 that the cost of ITNs followed by their non availability was constraints to their usage. Similarly, over half of participant in all the 10 FGDs thought that the chemicals used to treat the nets were very harmful to adults, children and pregnant women. All these excuses show that there is a wrong or poor perception of usage of bed net.

Higher percent of pregnant women in the rural residences slept under bed net as compared to those in the urban residences both in 2003 and 2008. This is expected because most of the pregnant women in the urban areas might have other means of preventing malaria. The households might have door and window net and the respondents might use Insecticide repellent Sprays, mosquito coils and creams which might not be practised by those in the rural areas.

There wasn't significant effect of education of the pregnant women and that of their partners/husband on the usage of bed net though there was an increase of bed net usage by pregnant women from 2003 to 2008. This is well supported by a study carried out in Zambia by Kaona *et al.*, 2000. It was found out that knowledge of malaria has positive association with level of education but no significant relationship was found between education and the use of bed nets.

In terms of marital status, higher proportion of the singles slept under bed net in 2003 whereas in 2008, those that were currently married slept under bed net more than other pregnant women. All pregnant women experienced increase in the usage of bed net from 2003 to 2008 except the single pregnant women in which there was a reduction in the proportion that slept under bed net from 2003 to 2008. The implications this might have on the single pregnant women is enormous because most of them might be primigravidae which makes them more vulnerable to malaria thereby causing low birth weight for the baby, anaemia, premature delivery etc. This is supported by the study by Pettifor *et al* in 2005 in which the married women were about 2.7times more likely to have bed net and 3.2times more likely to sleep under bed net than the singles. The married women are more likely to receive different types of support from their partner during pregnancy which might be different for the singles.

Malaria preventive strategies for pregnant women were incorporated into ANC for effective management of malaria in pregnancy. There was a great increase in the proportion of pregnant women that visited ANC that slept under bed net from 2003 to 2008 compared to the increase in the proportion of pregnant women. This however shows a promising and positive effect in the usage of malaria preventive and control measures and increase in the awareness and integration of the malaria interventions in ANC.

More Muslim respondents slept under bed net than the Christians respondents both for 2003 and 2008. This might be as a result of higher bed net ownership among the Muslim pregnant women.

The pattern of bed net usage can also be explained in terms of wealth index as one of the major socio-economic factors. The results showed that more women that belonged to poorest and poorer categories slept under bed net as compared to the richer and richest categories both in 2003 and 2008. This observation might be due to the fact that sleeping under bed net is the only available option for those in the poor category of wealth index because of their lower SES while those in the rich category might decide to use IPT, door and window net, IRS, mosquito repellent, creams because of their high SES.

Pattern of ITN usage among pregnant women

The percentages of pregnant women that slept under ITN were still low both in 2003 and 2008 though there was a slight increase in the proportion from 2003 to 2008. This finding supports that of the study carried out by Baume *et al.*, 2008 to evaluate gains in awareness, ownership and use of ITN in Nigeria and three other countries. It was found out that 0% of pregnant women slept under ITN in 2000 while 4.4% slept under ITN in 2004 while 5% and 31% of pregnant women slept under ITN in 2000 and 2004 respectively in Senegal.

Residence plays an important role in the usage of ITN. In 2003, more pregnant women in the rural areas slept under ITN but there was a change in 2008 in which more of the respondents in the urban areas slept under IN. This might be as a result of free or subsidized distribution of ITN in the rural settlement than the urban areas. It might also be as a result of low SES, poor affordability and poor willingness to pay of the respondents in the rural areas. The increase in the urban areas might be as a result of high SES and good affordability of pregnant women. A similar picture regarding the relationship between SES and malaria-specific knowledge emerged from Malawi, where knowledge and appropriate use of ITNs was found to be lower in rural (poorer) compared to urban (less poor) households (Holtz *et al.*, 2002).

In terms of wealth index, the pattern shows that there was a steady increase in the usage of ITN among pregnant women from poorest to richest for both 2003 and 2008 and also an increase in the usage from 2003 to 2008 for all the categories of wealth index. This shows that pregnant women in the richer category of wealth index slept under ITN than those in the poor category. This might be due to high SES, higher affordability and high willingness to pay for ITN among the pregnant women in the richer category of wealth index. poverty appears still to be the most important barrier to net use with more than 80% of households without a net in one Malawian study reporting "lack of money" and 13% reporting "can't afford them" as the reason (Holtz *et al.*, 2002). The authors of this study concluded that poverty and the expense of the ITN were the chief reasons for the lack of nets in these rural households. An ITN social marketing project in Tanzania found similar results, with the most common constraint on net ownership reported as affordability (Hanson and Worrall, 2002).

Level of education of pregnant women also played an important role in describing the pattern of ITN usage. The findings show that more pregnant women with higher education slept

under ITN as compared to other levels both for 2003 and 2008. Also, pregnant women that have partners with higher education slept under ITN than other educational level for both 2003 and 2008. Net ownership/usage has also been related to the educational levels of households members. This is a complicated relationship since educational attainment can be a proxy for SES and is also likely to have an independent bearing on an individual's ability to understand and access information regarding malaria prevention methods. In Malawi it was found that net ownership was less common in households where the head/caretaker had not completed primary school and in homes where the house had mud walls or a grass roof (a proxy for low SES) (Holtz *et al.*, 2002). There is some evidence to show that educational attainment is related to the acquisition of malaria specific knowledge. In a study on ITN use in Benin (Rashed *et al.*, 1999) suggest that there may be a threshold effect, with ITN acquisition increasing among those men who have completed secondary, but not primary, education.

There was a significant association at $p < 0.10$ between working status of the pregnant women and the usage of treated bed net. Those that were not working slept under treated bed net more in 2003 compared to those working but higher percentage of pregnant women slept under treated bed net more in 2008. This might be due to the fact that those working have a higher affordability power to purchase ITN than those that were not working because of their earning power. This is however different from a study done in Democratic Republic of Congo in 2005. It was found out that women currently employed were about 0.6 times more likely to sleep under net (Pettifor *et al.*, 2008).

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