ORIGINAL ARTICLE

Utilization of insecticide treated nets among pregnant women in Enugu, South Eastern Nigeria

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Abstract

Background: The goal of roll back malaria partnership is to achieve universal coverage for all populations at risk using appropriate interventions for prevention and case management.

Objective: The objective of this study is to determine the use of insecticide treated nets (ITNs) and other anti-vector measures among pregnant women in an area hyper-endemic for malaria.

Materials and Methods: Questionnaires were administered to a cross-section of 832 consecutive pregnant women attending antenatal care in three hospitals in Enugu, Nigeria that have high client flow for maternity services. Data collected were analyzed using descriptive and inferential statistics by means of the Statistical Package for Social Sciences (SPSS) version 16. *P*-value of less than 0.05 was considered statistically significant.

Results: The mean age of the women was 33.2 ± 2.9 (range: 15-45) years. Three hundred and fifty nine (43.1%) women owned insecticide treated nets (ITNs), however 325(90.5%) slept under the nets during the index pregnancies; equivalent to 39.1% utilization rate among the 832 women studied. Out of the 325 (39.1%) women that used ITNs; 236 (28.4%) used it singly, while 89 (10.7%) used it in combination with other anti-vector measures. Educational status and social class of the women had strong association with the use of ITNs ($P < 0.0001$). Women who used ITNs were significantly less likely to have acute malaria, anaemia and babies with low birth weight than women who did not use ITNs ($P < 0.05$).

Conclusion: The use of ITNs is poor among pregnant women in Enugu, but associated with favorable maternal and feto-neonatal outcome. Future measures to increase its use should consider improvement in educational level and social class of our women.

Key words: Insecticide treated nets, Malaria, Nigeria, pregnancy

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Introduction

Malaria is a major public health problem in tropical and subtropical regions of the world.[1] South Sahara Africa harbours 80-90% of the world malaria burden[2,3] and about 19-24 million women are at risk of malaria during pregnancy.[2] The effects of malaria in pregnancy are enormous and include maternal anaemia, intrauterine growth restriction, low birth weight, and premature deliveries among others.[4] It contributes up to 11% of maternal mortality in the region.[5]

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The disease often results from infection with Plasmodium falciparum which accounts for over 80% of the world malaria burden.[6] The impact of the other three human species (P. vivax, P. ovale, and P. Malariae) is less well understood.[6] Pregnant women and children under five years are more susceptible than the general population.[5] Among the pregnant women, the primigravidae are the most susceptible.[7] The primigravidae are susceptible to placental

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infection because of the novel receptor chondroitin sulphate A (CSA), which binds a subpopulation of the plasmodium parasites.[8] Women become relatively resistant to falciparum malaria over successive pregnancies as they acquire antibodies against this CSA binding placental parasite forms.[9]

In Nigeria, the burden of malaria in pregnancy has over the years prompted the search for ways of reducing its effects to the barest minimum. The strategies adopted were packaged in the Abuja Declaration of African Summit on Roll Back Malaria in April 2000 in which African regional leaders expressed commitment to ensuring that 60% of pregnant women in malaria endemic areas accessed effective malaria preventive services by the year 2005.[10] These strategies included the use of insecticide treated nets (ITNs) amongst others.[5]

The use of ITNs is very effective in the control of malaria in pregnancy,[11] and it is estimated to be twice as effective as the untreated nets.[12] Some researchers have noted that women who used ITNs had significantly fewer preterm deliveries, and babies with higher mean birth weight than women who did not use ITNs.[11,13] Nevertheless, the use of ITNs is still limited mainly because of its unavailability and cost, and partly because of the discomfort associated with the nets and the women's fear of possible effects of the impregnated chemicals on them and their unborn babies.[14]

Prevention of malaria during pregnancy via the use of ITNs is no doubt one of the major interventions aimed at reducing maternal and infant morbidity and mortality rates, and thus achieving the fourth, fifth and sixth Millennium Development Goals (MGDs). This study therefore aimed at determining the use of this evidence-based malaria preventive strategy (ITNs) and the socio-demographic factors associated with its use among pregnant women in an area hyper-endemic for malaria.

Materials and Methods

This was a cross-sectional survey of pregnant women attending antenatal care in Enugu, south-eastern Nigeria. The study took place during the rainy season between March and October 2009. Enugu is located in the hilly tropical rain forest about 230 m above sea level.[7] The average annual temperature is between 23.1°C and 31°C with a rainfall of 1520 to 2030 mm.[7] There are two major seasons; rainy season (March to October) and dry season (November to February). It has a mixed rural and urban population of 722,664 inhabitants of which 52.1% are female.[15] The area is hyper-endemic for malaria and Plasmodium falciparum is predominantly implicated.[7] Further details of the study area have been described in a recent study.[16] The study was carried out in three hospitals; two teaching hospitals which are tertiary health facilities [University of Nigeria Teaching Hospital (UNTH), and Enugu State University Teaching Hospital Parklane (ESUTH-Parklane)] and the Mother of Christ Specialist hospital (MOCSH), a private mission hospital funded by the Immaculate Heart Sisters which provide antenatal services, delivery, emergency obstetric and family planning services. The three settings operate the usual traditional model of antenatal care but have very high client flow for maternity.

The women were consecutively selected from the various antenatal clinics of the three hospitals following individual counselling of the consenting women. Data was obtained using structured questionnaires administered by trained interviewers who interpreted the contents to those with poor understanding of English in their local dialects. Ethical clearance for the study was obtained from the Institutional Review Board of the UNTH, Enugu. The questionnaires covered the women's socio-demographic characteristics, ownership and utilization of ITNs, as well as the use of other anti-vector (mosquito control) measures, and the maternal and feto-neonatal outcome associated with the use and non-use of ITNs. The calculated minimum sample size was 174, but a total of 864 questionnaires were administered. Statistical analysis was both descriptive and inferential at 95% confidence level using Statistical Package for Social Sciences (SPSS) computer software version 16 (SPSS Inc. Chicago, IL, USA). Frequency tables were generated for relevant variables. Continuous variables were analyzed using mean ± SD and student's *t*-test while the discrete variables were analyzed using the Chi-square test. *P*-value of less than 0.05 was considered statistically significant.

Acute malaria was defined as the occurrence of clinical features of malaria such as fever, headache, body pains, etc. in addition to laboratory diagnosis of positive parasitaemia on peripheral blood film examination. Anaemia was defined as any record of haemoglobin estimation of less than 11gm/dl. Preterm delivery was defined as any delivery occurring before 37 completed weeks of gestation. Stillbirth was defined as any delivery occurring after period of viability (28 weeks) without the baby showing any sign of life at birth.

Low birth weight was defined as birth weight of less than 2.5 kg. Social class was defined using a scoring system based on the educational level of the woman and her husband's occupation or that of the caregiver for the single pregnant woman as described in a previous study.[17]

Results

Eight hundred and sixty four questionnaires were administered but eight hundred and thirty two were correctly filled, giving a response rate of 96.3%. The mean age of the respondents was 33.2 ± 2.9 (range: 15-45) years. Most of the women were married 776 (93.3%) while 24 (2.9%) were single. One hundred and sixty five (19.3%) had

tertiary education, 442 (53.1%) had secondary education, 185 (22.2%) had primary education and 40 (4.8%) had no formal education. Primigravida constituted 23.1% (n = 192) of the pregnant women, multigravid women 71.3% (n = 593) while the remaining 5.6% (n = 47) were grand multigravid women.

Out of the 832 women, 359 (43.1%) owned insecticide treated nets (ITNs). Of the 359 women who owned ITNs, 325(90.5%) slept under the nets during the index pregnancies; equivalent to 39.1% utilization rate among the 832 women studied. One eighty four (56.6%) of the ITNs users, claimed to have slept under the nets daily; equivalent to 22.1% compliance rate. Out of the 325 (39.1%) women that used ITNs; 236 (28.4%) used it singly, 27 (3.2%) in combination with mosquito coils, 25 (3.0%) in combination with insecticides spray, 24 (2.9%) in combination with window screen, 9 (1.1%) in combination with mosquito coils and window screen, and 4 (0.5%) in combination with insecticides spray and window screen. One hundred and ninety eight (23.8%) women used mosquito coils alone, 172 (20.7%) used window screen alone, 54 (6.5%) used insecticides spray alone, 26 (3.1%) combined mosquito coils and window screen, 18 (2.2%) combined insecticides spray and window screen, while 31 (3.7%) did not use any anti-vector measure during the index pregnancy. Of the 325 (39.1%) women that used ITNs, 173 (20.7%) obtained the ITNs at the hospitals free while 152 (18.3%) bought the ITNs from the open market. The reasons given for non-usage of ITNs by the 507 (60.9%) women include: ITNs cause discomfort and excessive heat 28.0% (n = 142), chemicals in the nets harm babies in the womb 7.9% (n = 40), ITNs are too costly for them 3.9% (n = 20), and ITNs are not easily available 3.9% (n = 20). The remaining 285 (56.2%) did not have any reasons for non usage of ITNs. The educational status and the social class of the women had significant association with the use of ITNs ($P < 0.0001$). Details of the association between the women's socio-demographic characteristics and the use of ITNs are shown in Table 1.

Among the 325 women that used ITNs and 507 women that did not use ITNs in pregnancy, 198 and 309 respectively delivered in the hospitals where they received antenatal care and the rest were lost to follow up. Analysis of the records of the women who delivered in the hospitals where they received antenatal care shows that 16 (8.1%) out of 198 women that used ITNs had acute malaria in pregnancy while 77(24.9%) out of 309 that did not use ITNs had acute malaria. The observed difference was statistically significant [OR = 0.26 (95% CI 0.15, 0.47)]. Similarly, anaemia occurred significantly less in women that used ITNs than in women that did not use ITNs [87 (43.9%) vs. 204 (65.7%); OR = 0.40 (95% CI 0.28, 0.58)]. Women that used ITNs were less likely to have preterm delivery than women that did not use ITNs but the association was not statistically significant [23 (11.6%) vs. 44 (14.2%); OR = 0.79 (95% CI 0.46, 1.36)].

Similarly, women that used ITNs were less likely to have stillbirth than women that did not use ITNs but the

Table 1: Socio-demographic characteristics of the women and the use of ITNs*

	Used ITNs		
	Yes (%)	No (%)	*P* value
Age	33.1±2.7	33. 2±2.8	0.61
Marital status			
Single	9 (2.8)	15 (3.0)	
Married	305 (93.8)	471 (92.9)	
Widowed	6 (1.8)	10 (2.0)	
Divorced/Separated	5 (1.5)	11 (2.1)	0.98
Educational status			
None	7 (2.2)	33 (6.5)	
Primary	48 (14.8)	137 (27.0)	
Secondary	191 (58.7)	251 (49.5)	
Tertiary	79 (24.3)	86 (17.0)	<0.0001
Social class			
I	114 (35.1)	102 (20.1)	
II	87 (26.8)	63 (12.4)	
III	72 (22.2)	162 (32.0)	
IV	34 (10.5)	124 (24.5)	
V	18 (5.5)	56 (11.0)	<0.0001
Gravidity			
Primigravida	65 (20.0)	127 (24.5)	
Multigravida	241 (74.2)	352 (69.4)	
Grand multigravida	19 (5.8)	28 (5.5)	0.28

*t-test for continuous variable, χ^2 test for categorical variables

Table 2: Comparison of maternal and feto-neonatal outcome among pregnant women that used ITNs and those that did not use ITNs

	Used ITNs			
	Yes (n=198)(%)	No (n=309)(%)	*P* value	Or (95% CI)
Maternal outcome				
Acute malaria	16 (8.1)	77 (24.9)	<0.0001	0.26 (0.15, 0.47)
Anaemia	87 (43.9)		<0.0001	0.40 (0.28, 0.58)
Preterm delivery	23 (11.6)	44 (14.2)	0.47	0.79 (0.46, 1.36)
Feto-neonatal outcome				
Stillbirth	6 (3.0)	21 (6.7)	0.10	0.43 (0.17, 1.08)
Low birth weight	27 (13.6%)	69 (22.3%)	0.02	0.55 (0.34, 0.89)

association was not statistically significant [6 (3.0%) vs. 21 (6.7%); OR = 0.43 (95% CI 0.17, 1.08)].

However, babies of women who used ITNs were significantly less likely to have low birth weight than babies of women that did not use ITNs [27 (13.6%) vs. 69 (22.3%); OR = 0.55 (95% CI 0.34, 0.89)]. Further Details of the relationship between ITNs use/non-use and maternal and feto-neonatal outcome are shown in Table 2.

Discussion

The study demonstrated that 39.1% of the women used ITNs. This figure is rather too poor considering that this strategy has been shown to hold the key to malaria prevention in pregnancy.[18] Even though the use of ITNs in this population is much greater than the 5% overall estimated national use according to the Nigerian Demographic and Health Survey (DHS) of 2008,[19] the figure still falls highly short of the World Health Assembly (WHA) target of 80% use among pregnant women by the end of 2010.[19] The figure is also far below the ITNs use rate of 77% among pregnant women in Uganda obtained by the Malaria Indicator Survey (MIS) of Uganda in 2009.[19] However, it is similar to the 31.6% utilization rate obtained in a recent study from Ibadan, south-western Nigeria.[20] The implication of this low ITNs use by our women is that the uptake of this evidence based global strategy aimed at eradicating malaria is still poor in our population, and thus the possibility of achieving the malaria related MDGs (4,5,6) is very remote in our environment. What is even more worrisome is the level of ignorance and misconception obtained in this study among our women regarding the safety of ITNs use in pregnancy. Despite the strong evidence on the safety of ITNs in pregnancy,[19] a good proportion of our women still have reservations in its use because of unfounded fear of deleterious effects on their unborn babies. This is further evidenced in the study by the finding of strong association between the women's educational status and the use of ITNs. It may imply therefore that improving the educational status of our women may help dispel this misconception regarding its safety and thus improve the uptake of ITNs among our pregnant women. This finding is similar to report from Kinshasa, Congo (DRC) in 2008.[21] Cost and availability are other factors identified to hinder the use of ITNs by our women. ITNs are meant to be readily available and distributed free of charge to people at risk particularly the pregnant women and children. In a country where family budgets/expenditures rarely include health needs, not many families are ready to part with 450 Naira ($3.8), which is the average prevailing per unit market price of ITN in Nigeria.[22] This fact is further corroborated in the study by the finding of strong association between the social class of the women and the use of ITNs. Thus expanding the education and employment opportunities of the women and their husbands may guarantee the uptake of ITNs by our women. Furthermore, it is worrisome that almost half of the women that used ITNs in the population bought them from the open market which implies that ITNs that are meant to be distributed free of charge by the Government/Partners are still being hijacked by some unscrupulous personnel for selfish purposes as noted by previous authors.[7] Scaling up the distribution of ITNs at no cost to the end users may improve the utilization of ITNs by our women.

The study also demonstrated some degree of use of other anti-vector measures including mosquito coils, insecticides spray and window screens. The safety of mosquito coils and insecticides spray is highly questionable as it is often associated with cough, catarrh and other respiratory symptoms, and their effectiveness have not been well studied. Similarly, the effectiveness of window screen on the other hand is poor as it only serves as barrier to mosquitoes and does not kill the vectors.[19] Thus, a single hole on the screen could allow the entrance of many mosquitoes with its attendant consequences. Nevertheless, the use of these two measures (mosquito coils and window screen) by the women is similar to findings from a previous study in Ibadan, south-western part of the country in 2008.[12]

This study further demonstrated a favourable clinical impact of ITNs use in pregnancy on maternal and feto-neonatal outcome similar to findings from previous studies.[11] Thus the high burden of acute malaria and anaemia among pregnant women living in malaria endemic areas can largely be reduced by use of ITNs in pregnancy. Furthermore, the incidence of low birth weight and by implication its adverse effect on childhood survival can largely be overcome by encouraging the use of ITNs in pregnancy.

This study is limited by the fact that it focused on those mosquito control measures that are most commonly practiced by the study population. Thus it is possible that certain adjunct control measures existed that were occasionally employed by the participants but not covered in the questionnaire. Secondly, since the questionnaires were interviewer administered, it is possible that some biases might have occurred in the choice of some of the responses obtained from the respondents.

Conclusion/Recommendation

Despite the favourable maternal and feto-neonatal outcome associated with ITNs, its use among pregnant women in Enugu is poor. Scaling up free distribution of ITNs in the short term and improvement in education and social class of the populace in the long run will enhance the use of ITNs in the area.

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