ORIGINAL ARTICLE

Knowledge and Use of Insecticide Treated Nets Among Pregnant Women in Enugu Urban

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Received: February 25th, 2020
Accepted: April 26th, 2020

DISCLOSURE
The authors declare that no conflict of interest exists and no relevant or material financial interests relates to the research described in this paper

ABSTRACT

Background: Malaria in pregnancy has severe negative effects on maternal health and birth outcomes. Avoiding contact with mosquitoes by use of insecticide treated mosquito nets (ITNs) can prevent or reduce disease burden. A recent synthesis of data from national malaria control programmes has shown that levels of knowledge and utilization of ITNs by pregnant women in many sub-Saharan African countries remain far below national and global strategic targets.

Objective: To investigate the level of knowledge and use of ITNs in prevention and control of malaria among pregnant women attending antenatal clinics in health facilities in Enugu metropolis.

Methodology: A cross-sectional descriptive survey of 350 pregnant women drawn from three Local Government Areas in Enugu metropolis participated in the study. Descriptive statistics, Logistic regression and Spearman's correlation were used for data analyses.

Results: The level of awareness of ITNs among female urban dwellers in Enugu is high (98.3%), with radio and television (178; 50.9%) being the main sources of information. The predominant sources of these nets are health centres (281; 74.6%) and markets (35; 10%). Most women only used the nets when they wish to sleep at night (213; 60.9%) and the nets were only washed when dirty (62; 18.4%). Consistent use of nets was observed among most women (239; 68.3%) and usually when there was increased perceived risk of exposure to mosquitoes. Age, educational level, marital status and number of children were determinants of ITN use ($p < 0.05$).

Conclusion: Majority of the pregnant women totaling 316 (90%) had adequate knowledge of use of ITNs for malaria prevention and control. Knowledge also translated to improved use of ITNs among the respondents. The findings also revealed that knowledge of ITN use and social factors (age, education, ethnicity, marital status and number of children) had significant influences on the use of ITNs.

***Key Words**: Knowledge, Utilization, Insecticide treated nets, Pregnant women, South-East Nigeria*

INTRODUCTION

Malaria has posed a great challenge to public health because it has remained one of the major causes of morbidity and mortality. Globally, there are at least 300-600 million acute cases of malaria each year, resulting in over one million deaths.[1] World Health Organization (WHO) in 2010 revealed that over 92 million cases of malaria occur every year in sub-Saharan African alone.[2] Malaria exerts an enormous toll on lives, medical cost and days of labour lost. The disease causes 30-50% of inpatient admissions, is instrumental to 40% of total public health expenditure and up to 30% of outpatient visits in malaria endemic areas.[3] Malaria contributes to at least 10,000 maternal deaths and to at least 200,000 newborn deaths annually and is presently the second greatest cause of child mortality in Africa and still the greatest killer of children in Nigeria.

Statistics in 2010 suggested that there were 655,000 malaria-related deaths globally.[7] Review of studies carried out in sub-Saharan Africa between 2000 and 2011, reports that prevalence of malaria in pregnant women attending antenatal clinics was 29.5% in East and Southern Africa and 35.1% in West and Central Africa.[8]

In Nigeria, maternal mortality is among the highest in the world, with a mortality ratio exceeding 800 per 100,000 live births in most zones of the country.[9] About 63% of hospital attendance in Nigeria health care facilities is caused by malaria.[7] The financial loss due to malaria burden is estimated at about 132 billion Naira ($797 million) annually in form of treatment cost, prevention cost and loss of man-hours.[10]

Low birth weight, a complication of malaria in pregnancy is estimated to account for over 100,000 infant deaths annually in Africa.[11] This explains why control efforts focus on the period of pregnancy. [9]

Insecticide treated nets (ITNs) were introduced in Nigeria as an effective means of preventing mosquito bites and malaria transmission through the Roll back malaria programme.[12] Pregnant women and children aged 0 to 5 years were the main target population. Following this giant stride programme, studies have shown that ITN use in pregnancy reduced the incidence of malaria in pregnancy and hence the incidence of pregnancy related complications such as premature deliveries, low birth weight babies, maternal anaemia and intra uterine fetal deaths.

The burden is borne by Africa where 91% of deaths occurred with pregnant women and children under five years of age at risk. Nigeria ranks highest in malaria cases throughout the world, with up to 100 million malaria cases and about 300,000 deaths from the disease each year.[13] Despite the efforts of the Nigerian government in promoting ITN use in pregnancy along with other evidence-based interventions for malaria control, from the Abuja Summit, the levels of ITN use by pregnant women have remained low.[14,15] The result of the most recent Demographic and Health Survey conducted in Nigeria showed that utilization of rate of ITN is below 10%.[16]

A recent synthesis of data from national malaria control programmes, shown that levels of knowledge and utilization of ITN by pregnant women in many other sub-Saharan African countries remain far below national and global strategic targets.[17] Several studies have identified poor perception about, and low use of ITNs among pregnant women.[6] Hospital records from two tertiary hospitals in Enugu, the University of Nigeria Teaching Hospital and Enugu State Teaching Hospital

revealed that 11% and 18% respectively, of admissions in 2014 were due to malaria in pregnancy. Despite the efficacy of ITNs in preventing malaria infection in pregnancy and widespread policies and substantial financial investment in ITN distribution, reported coverage of pregnant women with ITN was only 17% in sub-Saharan Africa, which includes Nigeria where malaria related complications like maternal aneamia, stillbirths, low birth weight and intrauterine growth restrictions are still high[7,18]

The researchers after observing the high hospital admissions (11%) in the practice facility as a result of malaria among pregnant women were prompted to study the knowledge and use of ITN in prevention and control of malaria among pregnant women attending antenatal clinics in health facilities in Enugu Urban.

Specific objectives of the study include: to determine the level of knowledge of ITNs in the prevention and control of malaria by pregnant women in Enugu urban, to determine the proportion of pregnant women in Enugu urban that use ITNs, to identify the pattern of use of ITNs among pregnant women in Enugu urban, to ascertain the social factors that influence the use of ITNs among pregnant women in Enugu Urban and .to establish the association between knowledge and use of ITNs among pregnant women in Enugu urban.

METHODOLOGY

Study Site

This was a cross-sectional descriptive survey carried out in Enugu urban area. Enugu metropolis is the capital city of Enugu State, South-East Nigeria. It comprises three local government areas of Enugu North, Enugu South and Enugu East. The municipality is located at the foot of Miliken Hill. The area is divided into districts for ease of location and communication. The districts include Coal camp, Uwani, Iva Valley, Ogui, Asata, Obiagu and New Layout. Others are New Haven, Independence Layout, Agbani Road, Achara Layout, Garriki, Trans Ekulu, Government Reserved Area (G.R.A.), Abakpa and Emene.

The municipality has an estimated land area of 203,863 square kilometers with a projected population of 977,157 (National Population Commission, 2018) The area is largely cosmopolitan with pockets of indigenous inhabitants around Ogui, Obiagu, Abakpa and Emene. Most of the inhabitants are civil servants, traders and students.

There are many health facilities located in the municipality; among them are those owned by federal, state and local government councils, Christian denominations, private organizations and individuals. The area lies in the tropical rain forest zone and has three main seasons namely: the rainy season (April-October), the harmattan (November-January), and dry season (October-November, then January – April). The climate is hot and humid with a mean temperature of 30.6◦C, humidity greater than 60% and altitudes of less than 2000 meters above sea level.

Study Design

The population for the study consisted of pregnant women between the ages of 15 and 49 years, who registered for antenatal care in the various primary healthcare facilities in the three local government areas from August 2014 to November 2014.

The total number of women who fell into this category was estimated at 5,998.[9] A sample size of 379 pregnant women was drawn using the formula for calculating sample size by

Creative Research System, 2012, which gave a sample size of 345.[9]An addition of 10% to cater for possible non response yielded a final calculation of 379.

Multistage sample technique was employed in the selection of study participants. The first stage involved clustering the population into the already existing local government areas, while the second stage involved selection of two health facilities from each of the three local government areas by simple random method. Convenience sampling was used to select respondents from the antenatal clinics of the health facilities. Only those willing to participate in the study were selected. Proportionate allocation using the formula:

$$\frac{\text{monthly facility patient load} \times \text{sample size}}{\text{Total patient load}}$$

was used to determine the number of respondents from each facility and simple random sampling was used to identify respondents within each facility. Iji Nike Cottage Hospital and Abakpa Nike Health Center, Poly sub-districts Hospital and Ogbete Coal Camp Health and then Uwani Cottage Hospital and Amaechi Cottage Hospital from Enugu East, Enugu North and Enugu South LGAs respectively. Their respective population sizes are 366, 59, 2309, 35, 997 and 133 pregnant women, bringing the total population to 3,899. Sample sizes were drawn from each health facility. The samples are 36, 6, 244, 3, 97 and 13 respectively, making a total sample size of 379 pregnant women after adjusting for 10% nonresponse

Study Tool

Questionnaire developed by the researcher was the only tool for data collection. The questionnaire was used to interview the women in order to elicit information on the women's knowledge of and use of insecticide treated nets in the prevention and control of malaria during pregnancy.

The interviewer administered questionnaire comprised of closed and open ended questions. The total number of items was 35, drawn strictly based on extensive literature on ITNs and along the stated objectives of the study.

To establish reliability of the instrument, a pilot study was conducted. Forty copies (approximately 10% of the estimated sample size) of the questionnaire were administered to pregnant women in Nsukka, another urban community located 1-hour travel time from the study site. Test-retest method was used to collect data and Cronbach's Alpha was used to calculate the reliability of the instrument. An alpha of 0.751 and a standardized item (inter item) coefficient of 0.811 were obtained for the research instrument and therefore deemed reliable.

Ethical Issues

Ethical clearance was obtained from the Enugu State Ministry of Health Ethical Committee. Administrative permits were obtained from the Local Government Areas used. Permission was obtained from the heads of the various health facilities that were used, while written informed consent was obtained from the respondents before administration of the questionnaire. Confidentiality of respondents' information was strictly observed.

A letter of identification signed by the Head of Nursing Sciences Department, University of Nigeria, Enugu Campus, was used to introduce the researcher to the various officers in charge of the health facilities during a courtesy visit. Formal briefing with regards to the purpose and objectives of the study was done. Date and time for the

collection of data was fixed. Four research assistants; two nurses, one community health extension worker and one Nigerian Certificate in Education holder, were trained to help in data collection. Data collection was from August to November 2014. Data were collated and analysed using SPSS version 20.

RESULTS

Out of a total number of 379 questionnaires administered, 350 were correctly completed and returned giving a total response rate of 92%. Table 1 reveals that out of 350 respondents 10(2.9%) were within the ages of 14 and 19 years, greater number of respondents 142(40.5%) fell within 25 and 29 years while the least number 3(0.7%) fell within 50 years and above.

Whereas 197 (16.3%) of the respondents attained tertiary education, 145(41.4%) attained secondary education, and 4(1.1%) attained primary education. Regarding religions, 332(94.9%) were Christians, 13(3.7%) were Muslims while 4(1.1%) and 1(0.3%) were pagans and traditionalists respectively. Most of the study participants were Ibo (79.5%), while Yoruba, Hausa and other ethnic minorities accounted for 7.1%, 6% and 7.4% of the respondents respectively.

The major occupation of the respondents was trading 136(38.9%), 111(31.7%) were civil servants and 42(12.0%) were housewives. Furthermore, the table shows that majority of the respondents (327; 93.4%) were married, 16(4.6%) were single while 2(0.6%) and 5(1.4%) were divorced and separated, respectively.

With regards to number of pregnancies, majority 109(31.1%) were pregnant for the first time, 79(22.6%) twice, 69(19.7%) three times while 20(5.7%) had been pregnant up to seven times and above. On their number of children, 130(37.1%) respondents had one child, 97(22.6%) had two children, while 6(1.7%) had up to seven children and above. As regards the age of their present pregnancy, majority 138(39.4%) were between 5 and 7 months, 121(34.6%) were between 8 and 9 months, while 57(16.3%) were in the second to fourth months of their pregnancy.

There were different levels of awareness about various symptoms of malaria. The most common symptoms identified were fever (283; 80.9%), headache (243; 69.4%), loss of appetite (231; 66.0%) and feeling cold (223; 63.7%). The least common symptoms identified by respondents were weakness (214; 61.1%), body and joint pains (154; 44.0%), vomiting (123; 35.1%) and eyes becoming yellow (66; 18.9%). 80 respondents ticked more than one option.

While a majority of the respondents 308(88.0%) identified mosquito bites as a mode of transmission of malaria, 147(42.0%) said malaria is got from drinking dirty water, 101(28.9%) said working in the sun transmits malaria, 46(13.1%) said malaria is transmitted from being in the rain, 52(14.9%) said malaria is transmitted from cold weather while 14(4.0%) said malaria is transmitted from another person suffering from malaria.

Figure 1 shows that 337(96.3%) of the respondents had suffered from malaria while 13(3.7%) have never suffered from malaria. Majority of the respondents, 316 (90.3%) identified sleeping under ITN as a malaria preventive measure, 213(60.9%) ticked keeping the surrounding clean, 97(27.7%) ticked use of mosquito coil, 103(29.4%) avoiding being in the sun, 73(20.9%) and 74(21.1%) using repellant cream and spray respectively. Also, 137(39.1%) said malaria

Table 1. Demographic characteristics of respondents (n=350)

Characteristic	Freq	%
Age		
14-19	10	2.9
20-24	63	18.0
25-29	142	40.5
30-34	81	23.2
35-39	36	10.3
40-44	11	3.1
45-49	4	0.9
50+	3	0.7
Educational level		
No primary education	4	1.1
Primary education	4	1.1
Secondary education	145	41.4
Tertiary education	197	56.3
Religion		
Christianity	332	94.0
Islam	13	3.7
Pagan	4	1.1
African traditional	1	0.3
Ethnicity		
Ibo	278	79.5
Yoruba	25	7.1
Hausa	21	6.0
Others	26	7.4
Occupation		
Trader	136	38.9
Civil servant	111	31.7
House wife	43	12.0
Other	61	17.4
Marital status		
Married	327	93.4
Single	16	4.6
Divorced	2	0.6
Separated	5	1.4
Number of pregnancies		
One	109	31.1
Two	79	22.6
Three	69	19.7
Four	32	9.1
Five	19	5.4
Six	9	2.6
Seven and more	20	5.7
None	13	3.7
Number of children		
One	130	37.1
Two	97	22.6
Three	43	12.3
Four	22	6.3
Five	12	3.4
Six	5	1.4
Seven and above	6	1.7
None	53	15.1
Age of pregnancy (months)		
2-4	57	16.3
5-7	138	39.4
8-9	121	34.6
No response	34	9.7

can be prevented by taking anti malaria drugs. Respondents ticked more than one option.

On control measures to prevent malaria, 264(75.4%) of the respondents slept under ITN, 242(69.1%) cleared grasses and maintained environmental sanitation, 158(45.1%) sprayed the house with insecticide, 195(55.7%) disposed stagnant water and ensured good drainage while 158(45.1%) took anti malaria drugs.

Figure 2 shows that 344(98.3%) of the respondents have heard of insecticide treated nets while 6(1.7%) have never heard of ITN. One hundred and seventy-eight (50.9%) respondents got their information about ITN from radio/TV, 129(36.9%) from health workers, 36(10.2%) from friends/neighbours while 7(2.0%) got theirs from posters.

Regarding the types of nets used by the respondents, 240(68.6%) used treated nets, 50(14.3%) used long lasting insecticide treated nets, 16(4.6%) used untreated nets while 40(11.5%) did not know whether the nets they used were treated or not. Two hundred and eighty-one (74.6%) of the respondents got their nets from a health centre/clinic, 35(10%) bought from the market, 20(5.7%) from a pharmacy and 8(2.3%) bought from shops. For the length of time that the respondents had used ITN in their houses, 132(41.4%) had used an ITN for 1-11 months, 91(28.5%) for 12 or more months, 55(17.2%) for 2-4 weeks while 41(12.9%) said they had used ITN for 1-7 days.

Two hundred and thirteen (60.9%) of the respondents used their mosquito nets whenever they wanted to go to bed, 32(9.6%) when it was dark while 90(26.9%) put the nets down from around 5pm. However, 291(90.1%) of the respondents said that nets are treated to kill mosquitoes, 27(8.4%) said it is to repel mosquitoes and 5(1.5%) said it is to make the nets stronger. When asked about the length of time to retreat a long lasting insecticide net, 46(13.1%) answered 2-3years, 84(24.0%) said every year, 77(22%) said every month, 31(8.9%) said every week while 70(20%) do not know when to retreat the net.

Majority of the respondents 221(65.4%) said the nets were washed whenever it was dirty, 62(18.4%) said nets were washed once a year, 47(13.9%) washed them weekly while 18(2.3%) felt nets should not be washed at all. One hundred and eighty-one (51.7%) respondents said that nets are washed with water and detergent, 13(38.3%) said soap and water, while 10(4.6%) said water only.

Two hundred and thirty-nine (68.3%) of the respondents sleep under ITNs every night, 59(3.2%) sleep under ITNs only when there are mosquitoes, 30(8.5%) sleep under ITNs only when a new baby is delivered while 11(3.1%) sleep under ITNs once a week. Respondents' reasons for not sleeping under ITNs regularly include heat and sweating; 123(49.2%), inconvenience; 52(20.8%), feeling of suffocation; 39(15.6%), absence of doors and windows; 18(7.2%), feeling they didn't have a mosquito problem; 16(6.4%) while 1(0.4%) said ITNs do not work.

A logistic regression was performed to determine the social factors that influenced the use of ITNs. Seven variables were used to define the social factors. Consequently, the test ascertained the effects of age, education, religion, occupation, marital status, and number of children on the likelihood of the study participants' use of ITNs. Table 2 shows that all the variables had a positive influence on the use of ITNs and the influence of five variables (age, education, ethnicity, marital status and number of children) were significant at $p<0.05$. The p-values in the table shows that Age ($p=0.003$); Education ($p=0.021$); Ethnicity ($p=0.009$); Marital status ($p= 0.039$) and number of children ($p= 0.001$) were determinants of the use of ITNs. The other two variables (Religion and Occupation) were not significant predictors in the model.

Table 3 depicts Spearman's Correlation showing association between knowledge and use of ITNs by the study participants. The correlation coefficient (rho=0.896; $p=.000$) shows that there is a strong positive association between respondents' knowledge and use of ITNs. The table also reveals that the association is statistically significant at $p<0.05$.

Figure 1. Level of knowledge of ITNs in the prevention and control of malaria by pregnant women in Enugu urban

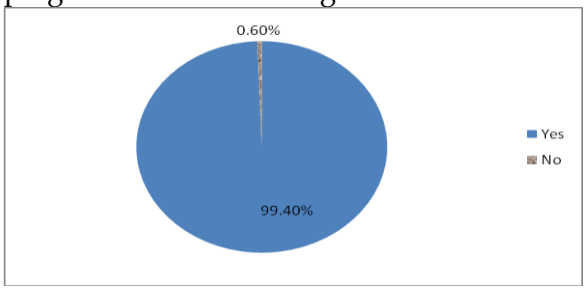
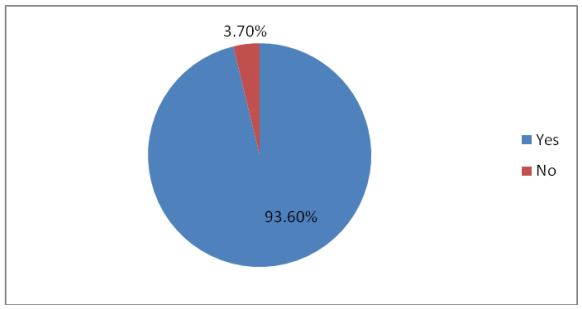


Figure 2. Response on whether respondents had ever suffered from malaria



DISCUSSION

The level of awareness of ITNs among female urban dwellers in Enugu is high with radio and television being the main sources of information. The predominant sources of these nets are health centres. Most women only put down the nets when they wish to sleep at night and the nets were only washed when dirty.

Consistent use of nets was low and usually when there was increased perceived risk of exposure to mosquitoes. Age, educational level, marital status and number of children were determinants of ITN use.

Table 2. Logistic regression result showing the influence of social factors on use of ITNs

Variables	B	S.E	Wald	df	Sig.	Exp(B)	95% C.I for EXP(B)	
							Lower	Upper
Age	.085	.028	9.225	1	**.003***	1.089	1.030	1.636
Education	.099	.117	.717	1	**.021***	1.067	.927	1.017
Religion	.714	.411	3.019	1	.061	1.006	.547	1.114
Ethnicity	.091	.121	.566	1	**.009***	8.471	1.178	1.611
Occupation	.617	.574	1.155	1	.055	4.508	1.348	16.625
Marital Status	.088	.842	0.011	1	**.039***	.906	.824	.995
Number of children	.978	.321	9.283	1	**.001***	4.702	1.791	1.994
Constant	2.224	1.698	1.715	1	.615	.187		

*Variable significant at $p<0.05$

Table 3. Spearman's Correlation showing association between knowledge and use of ITNs

			Average ITN Knowledge Scores	Average ITN Use Scores
Spearman's rho	Average ITN Knowledge Scores	Correlation Coefficient	1.000	.896(**)
		Sig. (2-tailed)	.	.000
		N	350	350
	Average ITN Use Scores	Correlation Coefficient	.896(**)	1.000
		Sig. (2-tailed)	.000	.
		N	350	350

The findings of the study revealed that majority of the pregnant women (316; 90.3%) in Enugu urban have adequate knowledge of ITNs as a preventive and control measure against Malaria. This figure falls within a similar range as reported in several earlier studies on the knowledge of ITNs among pregnant women in Nigeria [15, 17, 19,20]

The level of knowledge among the study participants is significantly higher when compared to reports of 77.1% and 37.9% from other studies assessing the adequacy of knowledge of ITNs in the prevention and control of Malaria.

The results show that majority of the pregnant women (333; 95.1%) in Enugu urban had used Mosquito nets before. This is an improvement on earlier findings of related studies[15,17]which revealed use rates of 68.9% and 73%, respectively.[19,20]

However, when compared to findings in related studies in Nigeria, there is a marked improvement in the use of ITNs, as earlier studies revealed use rates of 45.4% and 44% respectively.[15, 20] The increase in the use rate observed in this study may be indicative of increased periodic mass campaigns through media platforms and routine delivery channels like antenatal services and child health days/weeks as observed. The findings of Barbara *et al.* in 2012 corroborate the effectiveness of increased campaigns in improving outcomes in the use of ITNs.

Some reasons adduced for non-use of ITNs by some respondent included lack of interest in use of ITN, cost of acquiring ITN and lack of information on where to buy ITNs. An assessment of the pattern of use of ITNs in the prevention and control of malaria by pregnant women in Enugu Urban revealed that most respondents (60.9%) used ITNs at bedtime, while 26.9% made use of their ITNs from evening, when mosquitoes were expected to become a threat, till the next morning. In the same vein, 68.3% on the study participants slept under ITNs every night, while 16.9% used ITNs when mosquitoes were visibly present. This implies that most pregnant women will use the nets during periods when the threat of mosquitoes are evident and when they are ready to retire for the night. This means that there are still periods when these women do not enjoy the protection ITNs provide. This makes them vulnerable to mosquito bites despite perceived "consistent ITN use". These lapses need to be addressed in order to strengthen malaria prevention programs.

The perception of respondents on the length of time to treat ITNs varied and also influenced their pattern of use. A fifth (20%) of the women had no clue as to the length of time required for treatment of ITNs. Given the CDC standard of washing ITNs at most five times a year, responses on the frequency of washing of ITNs (a key factor in its use) revealed a lack of proper usage of ITNs. About sixty-five percent of the respondents washed the ITNs whenever it was dirty, while 18% did not wash them at all. Again, only 38.3% of the study participants washed their ITNs in the prescribed manner with the right materials (Soap and Water). This is likely to reduce the effectiveness of ITNs and the duration of action as well and may result in women using nets when their chemical potency has been lost.

Some reasons given for the infrequent use of ITNs included heat and excessive sweating (49.2%), inconvenience (20.8%) and the feeling of suffocation (15.6%). Efforts must be made to address these barriers to consistent ITN use. Unless this happens, use of this very useful tool in malaria control will remain poor among women living in developing in developing communities

Age, education, religion, ethnicity, occupation, marital status and number of children were the independent variables (Social factors) used to predict the outcomes of use of ITNs. The findings revealed that all seven had influences on the use of ITNs.

However, age, education, ethnicity, marital status and number of children have positive significant influences. This finding is consistent with a part of the results of Dhiman in 2012 who found that education, employment, family type and residential areas significantly influenced ITN usage. Unlike their finding, occupation did not have a significant influence on ITN use in this study. Malaria control programs must therefore focus ITN related behavioral change strategies on older women and those with many children.

The strong positive significant association (rhp=.896; p=.000) between respondents' knowledge and use of ITNs is consistent with an Ethiopian study by Devessa in 2011 which discovered that women with better knowledge of ITNs used them more. This provides evidence of the need for sustained education of women on the use of ITNs in efforts to halt and reverse the spread of malaria.

CONCLUSION

Most study participants had good knowledge of the use of ITNs in the prevention and control of Malaria. This knowledge translated to a good level of utilization. Some of the study participants did not practice proper maintenance of their ITNs. Infrequent washing and use of wrong washing materials were reported amongst the respondents. Socio demographic characteristics influenced respondents' use of ITNs in prevention and control of Malaria. There was a strong statistically significant association between respondents' knowledge and use of ITNs.

There is a need for emphasis to be placed on improving and sustaining ITN maintenance practices through the avenues of the mass media and health facilities. Improved access of women to ITNs should be the focus for all stakeholders in the malaria campaign. Also, interventions to improve ITN should focus on older women with lower levels of education and large number of children.

Limitations of the Study

The role of recall bias in affecting responses given by respondents is recognized as well as the assumption that women of reproductive age who access antenatal clinics are truly representative of all women living the same area. This study also assumes that all women who access the health facilities live in urban settlements.

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