

Knowledge of Malaria and Preventive Measures among Pregnant Women Attending Antenatal Clinics in a Rural Local Government Area in Southwestern Nigeria

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Abstract

Objective: This study determined the level of knowledge of malaria and preventive measures among pregnant women and its influence on the uptake of preventive measures.

Methods: A cross-sectional survey was carried out among 209 participants selected from pregnant women attending antenatal clinics in primary healthcare centres in Irepodun/Ifelodun, a local government area in Ekiti state, Nigeria.

Results: Knowledge of malaria was found to be very good, average and poor among two (1.0%), 165 (78.9%) and 42 (20.1%) respondents, respectively. Of the 109 (52.2%) respondents who had heard about intermittent preventive treatment, eight (7.3%) scored "very good" on knowledge, while 53 (48.6%) and 48 (44.1%) scored "average" and "poor," respectively. Of the 144 (68.9%) respondents

who had heard about insecticide-treated nets, 95 (66.0%) scored "good" on knowledge, while 49 (34.0%) scored "poor." Factors that significantly influenced knowledge about malaria were occupation, level of education, months at first appearance at antenatal clinic and transportation cost. Knowledge significantly influenced uptake of insecticide-treated nets and intermittent preventive treatment in pregnancy ($p < .05$).

Conclusion: There is a need to intensify efforts to provide health education on malaria and preventive measures as well as to encourage preventive practices among pregnant women.

Background

In highly endemic countries, malaria poses a serious threat to the health of pregnant women and their unborn children, with resulting high maternal and neonatal mortality (Adefioye et al. 2007; Bishwaranjan and Mahapatra 2009; Federal Ministry of Health [FMOH] 2007; Miaffo et al. 2004).

In Nigeria, the maternal mortality rate is currently 704 per 100,000 (FMOH 2005), and malaria contributes a large proportion of deaths, with a disease-specific prevalence rate of 1858 per 100,000. The annual financial burden of malaria is estimated at about 132 billion Naira (approximately \$8.7 million dollars [US]), representing the cost of treatment, prevention and loss of work hours (FMOH 2008).

Since the early 2000s, the approach to malaria prevention in pregnancy in Nigeria has changed from a weekly or bimonthly chemoprophylaxis to intermittent preventive treatment (IPTp) using sulphadoxine–pyrimethamine (SP) and insecticide-treated nets (ITNs) (FMOH 2004). This switch was informed by evidence from past studies that showed that morbidity and mortality associated with malaria in pregnancy can be significantly reduced by widespread use of ITNs (Miaffo et al. 2004; Montgomery et al. 2006) and that use of IPT with SP is equally an effective and practicable strategy to decrease the risk of anemia in pregnant women in malaria-endemic areas (Asa et al. 2008; Falade et al. 2007).

Statistics have shown an insignificant reduction in malaria incidence, poor management of malaria at home, low uptake of IPTp by pregnant women at the antenatal clinic (ANC), and low and/or inappropriate use of ITNs. Coverage of malaria control interventions in Nigeria is currently below national targets (FMOH 2008). Studies conducted in many developing countries, such as Bangladesh, Ethiopia, India, Uganda and Nigeria, have shown that pregnant women have only superficial knowledge of malaria transmission, prevention and treatment (Adeneye et al. 2007; Ahmed et al. 2009; Erhun et al. 2005; Karunamoorthi et al 2010; Nganda et al. 2004; Okwa 2003; Sabin et al. 2010).

Knowledge about malaria has also been shown to influence malaria treatment choices and the success in implementing preventive interventions among pregnant women (Nganda et al. 2004). Nganda et al. (2004) found that knowledge about malaria influences the use of preventive measures such as ITNs but not IPTp among pregnant women. Probable predictors of malaria knowledge in a study conducted in India were age, sex, education, place of residence and geographical region (Sharma et al. 2007). Tongo et al. 2009 found that poor knowledge of the burden of malaria was significantly associated with low educational attainment and the site of the ANC. Although several studies have been conducted on knowledge about malaria, very few had investigated factors or predictors of knowledge on preventive measures. This study is part of a larger one on IPTp uptake by pregnant women (Akinleye et al. 2009). It set out to determine the knowledge and predictors of knowledge on malaria and on preventive measures such as IPT-SP and ITNs among pregnant women, as well as the influence of knowledge on the uptake of such preventive measures.

Materials and Methods

Study Area and Population

The study was conducted in Irepodun/Ifelodun local government area (LGA), Ekiti State. The area, which has previously been described by Akinleye et al. (2009), has a population of approximately

124,088 people who are predominantly Yoruba, according to the 1991 census (Fasuan 2002). Malaria is hyper-endemic in this LGA, with perennial transmission. The LGA is rural and is divided into six health districts. All but one of the 13 primary health centres (PHCs) in the LGA offer antenatal care services. These services are conducted on Mondays in the three PHCs at the local government headquarters, while the other health centres conduct antenatal clinics every Tuesday. Other activities at each PHC include distribution of free ITNs supplied by the Federal Ministry of Health and Immunization.

The study population comprised all consenting pregnant women attending antenatal clinics at all the PHCs rendering antenatal services in the study LGA between July and August 2007. Both newly registered pregnant women and those on follow-up routine visits were included in the study; pregnant women presenting as emergencies were excluded.

Study Design and Sampling

A cross-sectional design was used. The sample size for the survey was calculated using an estimate of reported IPTp use among pregnant women (16%) (Mubyazi et al. 2005). The study required a minimum of 207 pregnant women. They were selected from ANC attendees at the 12 PHCs rendering antenatal services in the LGA, using systematic sampling technique. The sample size was distributed among PHCs based on proportionate-to-size allocation. The total ANC attendants for the previous year in each facility were used for the allocation. Using the estimate of the average clinic attendance from the month prior to the study, a sampling interval was determined for each PHC and systematic sampling was used to select the study subjects. The first pregnant woman to be interviewed was picked by balloting from the ANC appointment cards submitted to the record clerks.

Data Collection Methods

A semi-structured questionnaire was designed and written in both English and Yoruba. It was tested prior to use and administered with the help of two trained local interviewers and the investigator. The questionnaire comprised questions on socio-demographic characteristics, obstetric history, knowledge of malaria and its prevention, and attitudes of pregnant women to malaria prevention including ITN and IPTp use (see Appendix 1).

Ethical Considerations

Verbal informed consent was obtained from each respondent before the interview. Permission and approval to carry out the study was granted by the Director of the primary healthcare unit of the LGA. Confidentiality was maintained.

Data Analysis

Data entry and analysis were performed using Statistical Package for Social Sciences (SPSS) version 13.0 (SPSS Inc., Chicago, IL, USA). Data were summarized using frequency tables, graphs, means and standard deviations. Bivariate analysis was done with chi-square test or Fisher's exact test to compare proportions for categorical variables. The variables found to have association with outcome variables were further analyzed using binary logistic regression to determine which were most strongly associated. Results were considered significant when the 2-sided *p*-value was < .05. An overall knowledge score was computed for respondents' knowledge of malaria, ITNs and IPTp.

To assess respondents' knowledge of IPTp, responses to questions on the definition of IPTp were rated as 1 (very good) if they defined IPTp as treatment for prevention of malaria during pregnancy and recognized SP as the drug of choice and the correct interval for IPTp treatment. Respondents were rated 2 (average) if they knew that IPTp is given to prevent malaria during pregnancy or that IPTp is the use of SP during pregnancy. They were rated 3 (poor) if they could not define IPTp at all.

Responses to questions on malaria were rated 1, 2 and 3. Respondents were rated 1 – very good if they were able to attribute mosquito bites as the cause of malaria without being prompted and if they also correctly attributed symptoms such as fever, cold and body aches. They were rated

2 – average if they associated only fever, cold, pain and headaches to malaria; and 3 – poor if unable to define malaria at all.

Responses to questions on the difference between ITNs and other mosquito nets were also rated. Respondents scored 1 – very good if they were able to differentiate between the two by mentioning that ITNs are treated by insecticide and kill mosquitoes that perch on them, thereby preventing entry. Respondents were rated 2 – average if they mentioned that ITNs are treated while other nets are not, and 3 – poor if they could not differentiate at all.

Knowledge Score

Three knowledge scores were calculated in this study: a malaria score, an IPTp score and an ITNs score. Scores were computed and assigned to respondents based on their responses to questions pertaining to malaria, IPTp and ITNs in the questionnaire.

Malaria knowledge scores were rated as very good (scores below 20), average (from 21 to 30) or poor (above 30); IPTp scores were rated as very good (scores below or equal to 19), average (from 20 to 29) or poor (above 30); and ITNs scores were rated as good (from 1 to 5) or poor (from 6 to 9).

Results

Socio-demographic Characteristics

Two hundred and nine pregnant women were studied. Their mean \pm SD age was 25.1 \pm 1.1 years, with a range of 16 to 42 years. The majority (161, or 77.0%) were Yoruba, 47 (22.5%) had achieved a post-secondary education, and a high percentage (175, or 83.7%) were Christians. One hundred and sixty-seven (79.9%) respondents were married, 73 (34.9%) were traders or farmers, and the majority (161, or 77%) had no regular source of income.

History of Malaria Episodes among Respondents

About half (119/209, or 56.9%) of the respondents reported having had malaria at one time or another in pregnancy. Of these, 109 (91.6%) said they reported at the hospital for their first treatment, 41 (34.5%) mentioned having used herbs as treatment, and 27 (22.7%) had treated themselves at home with drugs bought over the counter from the chemist. The majority (111, or 93.3%) were cured after their first treatment.

Health Talks at the ANC

A hundred and sixteen (55.5%) respondents indicated that ANC staff had given malaria talks. When asked what they were taught during these visits, 67 respondents mentioned hygiene (personal and environmental), 18 mentioned malaria prevention and seven mentioned malaria transmission.

Knowledge of Malaria

The frequency of distribution of responses on the cause of malaria and its effect on pregnancy is shown on Table 1. Only 38 respondents (18.2%) provided a good definition of malaria. They attributed the occurrence of the disease to mosquito bites and associated it with the symptoms of fever, headaches and body aches. A little more than half (116, or 55.5%) of respondents were able to list the symptoms but did not report the cause and 55 (26.0%) gave no response or did not know. One hundred and ninety-three (92.3%) respondents agreed that mosquitoes transmit malaria, 194 (92.8%) mentioned a dirty environment and 147 (70.3%) attributed malaria to ill-ventilated and ill-lit houses.

Multiple responses were given on other aspects of malaria knowledge. A large percentage of respondents (179, or 85.6%), knew that malaria affects everyone, either young and old, 140 (67%) knew that malaria can affect pregnant women, while 63 (30.1%) believed otherwise. When respondents were asked about the effects of malaria on pregnancy, the most well known were low birth weight, mentioned by 140 (67.0%), and maternal death, mentioned by 130 (62.2) (Table 1).

Table 1. Respondents' knowledge about malaria (N = 209)

Variables	Frequency	Percentage
Ability to say what malaria is		
1 = very good	38	18.2
2 = average	116	55.5
3 = poor	55	26.3
Causes of malariaa		
Dirty environment	194	92.8
Mosquito bites	193	92.3
Dirty houses	176	84.2
Lakes, pits around environment	173	82.8
Ill-ventilated and ill-lighted house	147	70.3
Effects of malaria in pregnancy^a		
Yes	179	85.6
No	25	12.0
Don't Know	5	2.4
Pregnant women don't have malaria		
Yes	140	67.0
No	63	30.1
Don't know	6	2.9
Effects of malaria in pregnancy^a		
Low birth weight	140	67.0
Maternal death	130	62.2
Maternal anemia	127	60.8
Still birth	91	43.5
Abortion	78	37.3
Placental parasitemia	65	31.1
HIV	35	16.7
Tuberculosis	29	13.9

ITN = insecticide-treated net.

^a Multiple responses

When the malaria knowledge score was calculated, two respondents (1.0%) were rated as very good, 165 (78.9) as average and 42 (20.1%) as poor. The higher the level of respondents' education, the better was their score ($p < .05$; $X^2 = 23.719$) and their ability to describe malaria correctly. Probable predictors significantly associated with respondents' score included level of education

($p < .05$; $X^2 = 23.719$), occupation ($p < .05$; $X^2 = 13.798$), cost of transportation to the ANC ($p < .05$; $X^2 = 24.305$) and first ANC visit ($p < .05$, $X^2 = 24.305$).

Knowledge of ITNs

A majority of respondents (144/209, or 68.9%) knew about ITNs, and 66 (45.8%) of those mentioned that ITNs can be used for treating malaria. However, 133/144 (92.4%) said ITNs can prevent mosquito bites, and 130 (90.3%) said ITNs can prevent malaria. Rating respondents' knowledge on the difference between ITNs and other nets, 84 (58.3%) knew and were rated as very good, 15 (10.4%) were rated as average and 45 (31.3%) could not differentiate and were rated as poor (Table 2).

Table 2. Knowledge of ITNs by respondents who had heard of ITNs (n = 144)

Knowledge	Frequency	Percentage
An ITN is used for:		
a. Treating malaria		
Yes	66	45.8
No	71	49.3
Don't know	7	4.9
b. Preventing mosquito bites		
Yes	133	92.4
No	6	4.2
Don't know	5	3.5
c. Preventing malaria		
Yes	130	90.3
No	7	4.9
Don't know	7	4.9
Difference between ITNs and other nets		
1 = very good	84	58.3
2 = average	15	10.4
3 = poor	45	31.3

ITN = insecticide-treated net.

Calculating the ITNs knowledge score for those who knew about ITNs, 95 (66.0%) were rated as good and 49 (34%) as poor. The mean \pm SD for the score was 5.12 ± 1.27 ; range = 8.00. Respondents' knowledge score on malaria was significantly associated with their score on ITNs. The higher the respondents' knowledge score on ITNs, the higher their malaria knowledge score ($p < 0.05$; $X^2 = 7.087$). Probable factors showing association with respondents' ITN knowledge score included a history of malaria in the index pregnancy ($p < .05$; $X^2 = 12.702$), health talks on malaria from health nurses during ANC visits ($p < .05$; $X^2 = 7.880$) and respondents' number of deliveries

($p < .05$; $X^2 = 6.279$). Ninety two (67.2%) of 137 respondents with a previous delivery had an ITNs knowledge score of good.

Knowledge of IPTp

About half (109/209, or 52.2%) of respondents said they had heard about IPTp; 52/109 (47.7%) reported having heard about it at the ANC. Other sources included posters in the clinic, mentioned by 24 (22%); media, mentioned by 21 (19.3%); friends, 10 (9.2%); and spouses, three (2.8%). Twenty-six of the 109 (23.9%) were able to give a good definition of IPTp, and 63 (57.8%) said that IPTp can be given to pregnant women. When asked when IPTp drugs can be given during pregnancy, 67 (61.5%) mentioned between the fourth and sixth months of pregnancy, 12 (11.0%) mentioned the seventh to ninth, and one (0.09%) mentioned the first to second. About two thirds (73/109, or 67.0%) knew that SP is the recommended drug for IPTp. Asked about the different brand names of SP on the market, 13 (17.8%) identified Fansidar, 18 (24.7%) identified Amalar, and 42 (57.5%) identified Malareich, the major brand for IPTp used in the ANC at the time of the study. Of those who mentioned SP, 49 (67.1%) knew the correct dose for IPTp. The knowledge score calculated for IPTp showed that 8 (7.3%) respondents' scores were very good, 53 (48.6%) were average and 48 (44.1%) poor. The mean \pm SD of the IPTp knowledge score was 28.50 ± 7.44 ; range = 24. Respondents' malaria knowledge score was not a determinant of their IPTp score ($p > .05$; $X^2 = 6.332$). Factors likely to be associated with the IPTp knowledge score included religion ($p < .05$; $X^2 = 16.024$), monthly income ($p < .05$, $X^2 = 40.159$), cost of transportation ($p < .05$; $X^2 = 20.465$), history of malaria in pregnancy ($p < .05$; $X^2 = 10.859$), supervision of IPTp use by ANC staff ($p < .05$; $X^2 = 14.314$) and number of pregnancies ($p < .059$; $X^2 = 7.526$). Fourteen (60.9%) of 23 respondents supervised during IPTp use by ANC staff had a poor IPTp knowledge score.

Influence of Knowledge of Malaria and Preventive Measures on the Use of Preventive Measures

Of the 144 respondents who knew about ITNs, 97 (67.4%) had used them in the index pregnancy. Eighty-one (56.3%) had got their ITNs from the ANC, 4 (2.8%) from friends and relations, and 82 (56.9%) said they had got theirs free. Reasons given for not using ITNs included "not having one and it is very expensive," mentioned by 25 (22%). Two (1.7%) complained that their bed size was different from the ITNs size, and 3 (2.7%) said they already had window nets in their houses. Knowledge score on ITNs was a determinant of respondents' use of ITNs ($p < .05$; $X^2 = 21.586$). These results were further analyzed using binary logistic regression. Respondents' knowledge score on ITNs was found to be a determinant of their ITNs use ($p \leq .05$; OR = 0.880; 95% CI = 1.009–5.759). Malaria knowledge score had no significant influence on ITN use ($p > .05$; $X^2 = 4.527$).

A little more than half (57/109, or 52.3%) of respondents who knew about IPTp had used it in the index pregnancy, and 23 (40.4%) had been supervised by a health nurse. Knowledge of IPTp was significantly associated with IPTp uptake ($p < .05$; $X^2 = 66.355$). The result was further analyzed by binary logistic regression, which showed that knowledge of IPTp among respondents is a determinant of their uptake of IPTp ($p \leq .05$; OR 2.155; 95% CI = 2.973–25.014). Knowledge of malaria was not a determinant of respondents' IPTp uptake ($p > .05$; $X^2 = 3.896$).

Discussion

Findings from this study showed that a high percentage of respondents identified mosquito bites as a major source of malaria infection, while none mentioned the parasite as the cause. This corroborates a study by Ahmed et al. (2009: 7-8), who reported "the awareness that malaria is caused and transmitted by mosquito bite is a common knowledge in malaria endemic countries; however, only a tiny fraction could actually state the correct transmission route." The majority of respondents from the current study identified factors that encourage malaria transmission, such as a dirty environment, pools, and lakes around dwelling places. Despite this, the study revealed a superficial knowledge on malaria transmission and cause among respondents. This finding is in line with previous studies

conducted in several endemic countries (Ahmed et al. 2009; Karunamoorthi et al. 2010; Mabogunje et al. 2002; Nganda et al. 2004; Sabin et al. 2010). They reported a wide gulf in respondents' knowledge about the cause, transmission and symptoms of malaria. This shows the need for improving the awareness of malaria, its causes, mode of transmission and consequences. Our study reveals commendable performance regarding respondents' knowledge of the consequences of malaria during pregnancy; this is encouraging as respondents are likely to report early for treatment whenever they suspect malaria, thus reducing morbidity and mortality.

Malaria prevention-related activities in ANCs were suboptimal. Few respondents mentioned they received health talks on malaria, its prevention and treatment in the clinic, and 60.9% of respondents who received IPTp still had little knowledge about it. Adherence of health workers to IPTp administration protocol was discouraging and has implications for morbidity and mortality from malaria in pregnant woman and the unborn child. In addition, poor compliance with antimalarial drugs poses a risk for the development of resistance to SP, a drug that is still used for combination therapy in the treatment of malaria. Monitoring of activities in the clinics and adherence to guidelines among health workers should be enforced. Continuing training on malaria and its preventive measures as well as reorientation programs for health workers should be conducted at all levels of the healthcare system. Guidelines for malaria control and prevention should be revised to further emphasize health education on prevention for everyone, but especially for women, who are at high risk of morbidity when pregnant.

In this study, the higher the level of respondents' education, the better their malaria knowledge score ($p = 0.001$) and ability to describe malaria correctly. This is similar to findings of studies that reported the level of respondents' education was a major determinant of knowledge on the cause of malaria; these studies also stressed the importance of education in malaria control programs (Mabogunje et al. 2002; Nganda et al. 2004).

Our study shows that respondents' knowledge of malaria, its cause and effect during pregnancy has an association with their knowledge of preventive measures such as ITNs, but it was not a determinant of their knowledge of IPTp. This could be because IPTp was newly introduced at the time the study was conducted, and information about it was inadequate even among health workers. In our study, two thirds of respondents (68.9%) knew about ITNs, many demonstrated impressive knowledge of ITNs, and three quarters had a good ITNs knowledge score. This finding corroborates the results of several studies conducted in Bangladesh, Ghana and Nepal, which reported a high level of knowledge on the use of bed nets as preventive measures against mosquito bites among respondents (Ahmed et al. 2009). Respondents' knowledge on IPTp among those who were aware of it was really poor, as shown in their knowledge score; only a few respondents were rated as having high-level knowledge. Efforts on public enlightenment about IPTp should be intensified.

According to Nganda et al. (2004), knowledge of malaria in pregnancy was strongly associated with use of a combination of IPTp and an ITNs, and could independently predict use of an ITNs. However, malaria knowledge score in this study was not a determinant of ITNs use or IPTp uptake. Contrarily, respondents' knowledge scores on IPTp influenced IPTp uptake, and their knowledge score on ITNs determined their ITNs use. This finding suggests a weak link between knowledge of malaria and knowledge of preventive measures. It is similar to a finding in some past studies whereby there was no concordance between method of prevention and perceived causes of malaria mentioned by mothers (Ajayi et al. 2008; Brieger et al. 1996; Hamel et al. 2001). Our study was conducted in only one of the 774 LGAs in Nigeria, and is thus not generalizable. However, it provides useful information on how preventive measures could be effectively employed. Further research is needed on the probable predictors or factors affecting knowledge of malaria and its preventive measures at a micro level. Health workers should be encouraged to take up the challenge of providing comprehensive health education and training in the community to complement whatever health education activities are offered in the clinic, as many pregnant women have been shown to not attend clinics for antenatal care.

Conclusion

This study shows that despite concerted efforts at improving malaria control in endemic countries, there is still a wide knowledge gap that continues to impact negatively on the preventive practices and uptake of intervention. Results of this study provide insight on the importance and effectiveness of knowledge on the use of preventive measures such as IPTp and ITNs. It is therefore recommended that policies and guidelines on malaria prevention and control be modified to empower the healthcare workers and provide proper and comprehensive education to people living in endemic countries. Emphasis should be placed on re-orientation and training of trainers, as well as intensified monitoring of activities at ANCs. Predictors of knowledge of malaria and preventive measures at a micro level should be explored to help improve knowledge and uptake of malaria preventive measures as well as to foster behavioural changes. Provision of information, education and communication materials and prevention activities, especially in the ANCs, should be improved.

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