

# Malaria in pregnancy: A community-based study on the knowledge, perception, and prevention among Nigerian women

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## ABSTRACT

**Background:** Malaria accounts for approximately 1 million deaths annually and about 300,000 deaths in Nigeria alone. Pregnant women and their unborn babies are particularly vulnerable to the adverse consequences of malaria. This study assessed the knowledge, perception, and preventive practices for malaria in pregnancy (MiP) among women in Lagos, Nigeria. **Materials and Methods:** A cross-sectional, descriptive study design was adopted. A total of 422 respondents were selected using multistage sampling technique. Data were collected using a structured, interviewer-administered questionnaire in the first quarter of 2016. Analysis was done with Epi Info™ 7 software with level of significance set at  $P < 0.05$ . **Results:** All respondents were aware of MiP, and almost all the respondents (96.2%) were aware that malaria is caused by infected mosquito bite. Majority (89.3%) of the respondents registered for antenatal care in their last pregnancy, but 56.6% did so in the second trimester. A little over half (55.5%) had good knowledge of MiP. There was poor knowledge of the complications of MiP in mothers, with 27% unaware of any complications. Majority (51.6%) of them did not know the complications of malaria in the fetus. Better educated respondents had statistically significant better knowledge of MiP ( $P = 0.001$ ). Only two-fifths of the respondents (39.8%) agreed that MiP can lead to death of the fetus. Most (41.9%) used insecticide spray and coils in the prevention of MiP, whereas only 36.9% used intermittent preventive treatment. Only 24.1% used insecticide-treated nets and almost 20% used no form of prevention. **Conclusion:** Respondents' knowledge, perception, and preventive practices for MiP were not satisfactory. Public health education on MiP should be intensified at the community level in order to improve knowledge and prevention and also to correct misconceptions.

**Keywords:** Malaria in pregnancy, knowledge, perception, preventive practices, Nigeria

## Introduction

Malaria is a major public health burden in sub-Saharan Africa, especially Nigeria, causing 300–500 million illnesses and 1–2 million deaths every year.<sup>[1]</sup> It is a preventable and treatable mosquito-borne illness and one of the world's most common and serious tropical diseases.<sup>[2,3]</sup> Following the huge investment in its prevention, there was a significant decline in incidence globally between 2000 and 2016.<sup>[4]</sup>

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Economists have shown that malaria costs Africa about \$12 billion per annum, with considerable economic burden including direct loss to government's productive work or education.<sup>[5-7]</sup> Malaria constitutes a major public health issue due to its severity and potential fatality, being one of the greatest causes of mortality in tropical regions and can be devastating for both mother and fetus. Pregnant women are particularly vulnerable to malarial infection as the infection poses a lot of threats to them and the fetus. Malaria in pregnancy (MiP) is one of the major causes of mortality and morbidity in tropical regions, causing maternal anemia, intrauterine growth retardation, preterm birth, and low

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birth weight (LBW).<sup>[8-10]</sup> It is a major public health problem which requires to be overcome in malaria endemic regions such as the Sub Saharan Africa.<sup>[11]</sup>

Measures recommended by the WHO to curb morbidity and mortality among pregnant women include use of insecticide-treated bed nets (ITNs), intermittent preventive treatment (IPT) with sulfadoxine-pyrimethamine (SP), and prompt diagnosis and treatment of infection. Such measures have led to preventive efforts, though with continued rise in the cost of malarial treatment in pregnancy to the individual and the nation.<sup>[8,12]</sup> IPT in pregnancy (IPTp) reduces maternal malarial episodes, maternal and fetal anemia, placental parasitemia, LBW, and neonatal mortality.<sup>[13]</sup>

The symptoms and complications of MiP vary according to malarial transmission intensity in the given geographical area and the individual's level of acquired immunity. Each year, 25–30 million women become pregnant in malaria-endemic areas in Africa. Malaria-associated maternal illness and LBW are mostly the result of *Plasmodium falciparum* infection and occur predominantly in Africa.<sup>[14-16]</sup>

Nigeria accounts for a quarter of all malarial cases in the 45 endemic countries in Africa, and approximately 150 million people live in areas of high malarial transmission.<sup>[17]</sup>

The WHO Global Technical Strategy for Malaria provides a technical framework for all malaria-endemic countries working towards malaria control and elimination. It sets ambitious but attainable global targets for 2030, including reducing malarial case incidence by at least 90%, reducing malarial mortality rates by at least 90% in at least 35 countries, and preventing a resurgence of malaria in all countries that are malaria free. The timeline of 2016–2030 is aligned with the 2030 Agenda for Sustainable Development, endorsed in 2015 by all United Nations' member states.<sup>[18]</sup>

MiP is a common and serious public health problem in Nigeria as a large proportion of the asymptomatic pregnant women have malaria parasitemia with its attendant anemia. Maternal mortality is twice higher in pregnant women with malaria than among nonpregnant patients with severe malaria. Anemia is the most common symptom of MiP and usually develops during the second trimester. Cerebral malaria is rare in adults except during pregnancy and is responsible for many maternal malarial deaths. Severe falciparum malaria may cause deformities in the genital tract to make conception impossible or may prevent normal implantation and development of the placenta.<sup>[19]</sup>

Furthermore, malaria increases susceptibility to other infections and retard growth and development in children. The Nigerian Demographic and Health Survey 2013 revealed that the use of ITNs is still low despite the evidence that its use decreases malaria-related mortality and morbidity, and the survey showed that only 30% of pregnant women in households with ITN

slept under one, the night preceding the interview.<sup>[20]</sup> Malaria prevention during pregnancy using IPT and ITN is highly cost-effective. IPT with SP is estimated to cost \$12 to \$21 per disability-adjusted life year prevented, which is a very favorable cost compared to the benefits.<sup>[17]</sup>

Good knowledge of malaria and adequate preventive practices among women most likely will aid in the control of MiP. The aim of this study, therefore, was to assess the knowledge, perception, and preventive practices for MiP among women in Lagos, Nigeria. Information from the study will aid control efforts, especially where gaps are detected.

## Materials and Methods

### Study area

Lagos State is the most populous city in Nigeria, the second fastest growing city in Africa and the seventh in the world. It is located in the southwestern part of Nigeria with a projected population estimate of about 20 million, of which almost 30% are females of reproductive age. Lagos State comprises twenty local government areas (LGAs), and each is further divided into political wards. The study was conducted in Oshodi-Isolo LGA, which is a densely populated urban area.

### Ethics

The study proposal was approved by the Health Research Ethics Committee of Lagos University Teaching Hospital. Written informed consent was obtained from the respondents prior to interview. Confidentiality was maintained as the names of participants were not required.

### Study design

A descriptive, cross-sectional design was used for this study. The minimum sample size of 422 was determined using the Cochran formula based on the standard normal deviate at 95% confidence level (1.96), prevalence of 50% from a similar study, 5% precision level, and a 10% nonresponse rate.

### Selection and description of participants

The study was conducted among women between the ages of 21 and 49 years in Oshodi-Isolo LGA who have been pregnant at least once in the 2 years prior to the study lasting up to the 2<sup>nd</sup> trimester or pregnant at the time of the study up to the 2<sup>nd</sup> trimester. They would have been residing in the study area for at least 6 months.

Multistage sampling technique was used to select the respondents. A list of seven wards in Oshodi-Isolo constituted the sampling frame in Stage 1. Three wards were selected by simple random sampling by balloting procedure. In the second stage, five streets were selected in each of the three selected wards using simple random sampling. The third stage was the selection of houses where forty houses on each street were selected by systematic sampling method using the calculated sampling interval (K). Stage four involved the selection of one eligible woman from

each house using simple random sampling. Equal proportions of respondents were interviewed in each of the three wards.

### Statistical analysis

Quantitative data collection was carried out using a structured, pretested, interviewer-administered questionnaire. Analysis was done with Epi Info™ 7 software (Centers for Disease Control and Prevention, Atlanta, Georgia) with level of significance set at  $P < 0.05$ . Respondents' knowledge on MiP and prevention was assessed with 22 questions. For a summary measure of knowledge, these questions were scored and graded. Each correct response was awarded a score of 1, whereas wrong or "don't know" responses attracted a score of 0. The maximum knowledge score was 22 and the minimum was 0. A score of 0–11 was regarded as poor and 12–22 was graded good knowledge. Each respondent's total scores were converted to percentage and graded as good ( $\geq 50\%$ ) or poor ( $< 50\%$ ). Seven Likert statements were used to assess respondents' perception of MiP on a 3-point scale. Respondents could agree, disagree, or be indifferent to the statements. Three marks were given for agree, 2 marks for indifferent, and 1 mark for disagree. The maximum score was 21 and the minimum was 7. The midpoint between the two scores (14) was used as a cutoff to grade the respondents into two categories ( $< 14$  – wrong perception and  $\geq 14$  – right perception). Respondents were also interviewed on their preventive practices against MiP.

## Results

### Sociodemographic characteristics and pregnancy history

The modal age group of the respondents (182 [43.1%]) was 30–39 years. Almost all of the respondents (387 [91.7%]) were married. Almost a quarter (97 [23.8%]) had no formal education. Majority (377 [89.3%]) registered for antenatal care (ANC) in the last/current pregnancy, mostly in the second trimester (239 [56.6%]) [Table 1].

### Knowledge of complications of malaria in pregnancy in the mother and fetus

As much as 114 (27%) respondents were unaware of any complications of MiP in the mother, but 123 (29%) mentioned maternal death. There was poor knowledge of the complications of malaria in the fetus. Majority (218 [51.6%]) of the respondents were unaware of any complications, but 148 (35%) mentioned intrauterine death [Table 2].

### Knowledge about prevention of malaria in pregnancy

Preventive measures commonly mentioned were insecticide spray, 377 (89.3%); long-lasting insecticidal nets (LLIN), 234 (55.4%); IPTp, 212 (50.2%); and prompt and adequate treatment 174 (41.2%) [Table 3].

### Perception of malaria in pregnancy

A large proportion (321 [76.0%] and 288 [68.2%]) of the respondents agreed that MiP is a serious health risk to the

**Table 1: Socio-demographic characteristics**

Variable (n=422)	Frequency	Percentage (%)
Age (years)		
21-29	135	32.0
30 - 39	182	43.1
40 - 49	105	24.9
Marital status		
Married	387	91.7
Not married	35	8.3
Religion		
Christianity	197	46.7
Islam	225	53.3
Highest level of formal education		
No formal education	97	23.0
Primary	53	12.5
Secondary	171	40.5
Above secondary	101	24.0
Registered for antenatal care		
Yes	377	89.3
No	45	10.7
Time of booking		
1 <sup>st</sup> trimester	115	27.2
2 <sup>nd</sup> trimester	239	56.6
3 <sup>rd</sup> trimester	68	16.2

**Table 2: Knowledge on malaria in pregnancy**

	Frequency	Percentage (%)
*Complications of malaria in the mother (n=422)		
Anaemia	81	19.1
Cerebral malaria	55	13.0
Threatened/inevitable abortion	82	19.4
Premature labour	35	8.2
Dehydration	44	10.4
Maternal death	123	29.1
Others	23	5.4
Don't know	114	27.0
*Complications of MiP in the foetus		
Foetal distress	15	3.5
Intra-uterine death	148	35.0
Intra-uterine growth retardation	22	5.2
Others	19	4.5
Don't know	218	51.6
*Prevention of malaria in pregnancy		
IPTp	212	50.2
LLIN	234	55.4
Prompt and adequate treatment	174	41.2
Insecticide spray	377	89.3
Mosquito coil	134	31.7
Insect repellent cream	105	24.8
Others	12	2.8

\*Multiple responses allowed

mother and the unborn child, respectively. While more than half (217 [51.4%]) of the participants agreed that MiP can lead to the death of the mother, only two-fifth of the respondents (168 [39.8%]) agreed that MiP can lead to death of the fetus.

**Table 3: Perception of malaria in pregnancy**

Statement (n=422)	Agree	Indifferent	Disagree
Malaria in pregnancy is a serious health risk in pregnant women	321 (76.0%)	64 (15.1%)	37 (8.7%)
Malaria in pregnancy is a serious health risk to the unborn child	288 (68.2%)	102 (24.1%)	32 (7.5%)
Malaria in pregnancy can lead to death of the mother	217 (51.4%)	140 (33.1%)	65 (15.4%)
Malaria in pregnancy can lead to death of the foetus	168 (39.8%)	132 (31.2%)	122 (28.9%)
Malaria is a leading cause of death among pregnant women	54 (12.7%)	289 (68.4%)	79 (18.7%)
Malaria in pregnancy is a preventable disease	384 (90.9%)	29 (6.8%)	9 (2.1%)
Use of LLIN can be harmful to the pregnant woman	46 (10.9%)	109 (25.8%)	267 (63.2%)

Majority of the respondents (90.9%) agreed that MiP is a preventable disease. One in 11 (10.9%) respondents perceived LLIN as harmful to pregnant women [Table 4].

### Preventive practices against malaria in pregnancy

Preventive measures commonly used by the respondents were insecticide spray/coil, 177 (41.9%); IPTp, 156 (36.9%); and LLIN, 102 (24.1%). About one-fifth (82 [19.4%]) of the respondents did nothing to prevent MiP.

More than half (237 [56.2%]) of the respondents had never used LLIN as majority (34 [27.6%]) believed that it does not really prevent malaria. Respondents gave other reasons such as not affordable, discomfort, not durable, difficult to set up, not available in their locality, or that they did not know about it. Many (148 [62.4%]) had no reasons [Table 4].

### Factors influencing knowledge of malaria in pregnancy

Statistically significant association was found between respondents' level of education, marital status, and knowledge of MiP. Respondents with at least secondary education had better knowledge than those who were less educated ( $P < 0.001$ ), while those who were married were found to have better knowledge ( $P < 0.044$ ) [Table 5].

## Discussion

Majority of the respondents were married, which was expected, as pregnancy is usually an outcome of marriage, and many (40.5%) of them had secondary school education. This tallies with reports from the National Demographic and Health Survey 2013.<sup>[20]</sup> In this study, all the respondents were aware of malaria. This result is expected considering the high prevalence of malaria in Nigeria.

A higher level of knowledge about MiP was expected from the respondents, considering that most of them had formal education and received ANC in health facilities. Majority of the respondents identified headaches, fever, and shivering as symptoms of malaria; it is a known fact that malaria is generally associated with these symptoms. Similarly, respondents in northern region of Nigeria reported the same.<sup>[21]</sup> On the other hand, respondents exhibited poor knowledge of complications of MiP both on mother and fetus with as much as 27% and 55.6%, respectively, not knowing any of the complications, thus

**Table 4: Prevention of malaria in pregnancy among respondents**

	Frequency	Percentage (%)
*Preventive practices (n=422)		
Long lasting insecticidal nets (LLIN)	102	24.1
Intermittent prophylaxis treatment (IPTp)	156	36.9
Insecticide spray/coil	177	41.9
Nothing	82	19.4
Others	17	2.9
Ever used long lasting insecticidal nets		
Yes	185	43.8
No	237	56.2
Reason for non-use of LLIN (n=237)		
I don't believe it prevents malaria	34	14.3
I don't consider it affordable	10	4.2
It is uncomfortable	2	1.0
Others	43	18.1
No reasons	148	62.4

\*multiple response

**Table 5: Socio-demographic factors associated with knowledge of malaria in pregnancy**

Socio-demographic characteristics	Knowledge grade Freq. (%)			$\chi^2$	P
	Good (%)	Poor (%)	Total (%)		
Age group					
21 - 35	135 (57.70)	99 (42.30)	234 (100)	1.59	0.207
36 - 49	96 (51.06)	92 (48.94)	188 (100)		
Total	231 (55.00)	191 (45.00)	422 (100)		
Marital status					
Married	218 (56.33)	169 (43.67)	387 (100)	4.02	0.044
Never married	13 (37.15)	22 (62.85)	35 (100)		
Total	231 (55.00)	191 (45.00)	422 (100)		
Education level					
Secondary & above	190 (69.85)	82 (30.15)	272 (100)	68.84	0.001
Below secondary	41 (27.33)	109 (72.67)	150 (100)		
Total	231 (55.00)	191 (45.00)	422 (100)		

exposing knowledge gaps. Similar observations were made in Sudan among pregnant women.<sup>[22]</sup>

As regards respondents' knowledge on the prevention of MiP, the knowledge of the use of indoor aerosol insecticide sprays was higher than that of LLIN and IPTp as methods of prevention, which is similar to the report of studies from Malawi and

South-West Nigeria where it was shown that the majority of the people used screens and sprays to protect against malaria.<sup>[23,24]</sup> The use of aerosol insecticide sprays is very common in Nigeria, probably to curtail the noise nuisance from the mosquitoes. However, the increasing resistance of mosquito populations is threatening the efficacy of the insecticides.<sup>[25]</sup> More than half of the women in this study used antimalarial prophylaxis. This is in consonance with previous studies where chemoprophylaxis and/or antivevector measures for the prevention of malaria during pregnancy were used, with a large proportion combining both methods.<sup>[26,27]</sup>

Large proportions of the respondents agreed that malaria in progress is a serious health risk in pregnant women (76.0%) and to the unborn child (68.2%). Majority (90.9%) perceived MiP as preventable, whereas half (50%) agreed that MiP can lead to the death of the mother. The preventability of MiP was also attested to in another similar study where majority (95.5%) of the respondents knew that malaria was preventable.<sup>[21]</sup>

While majority of the respondents perceived MiP as a serious health risk which is preventable, their perception of the real threat to the life of the mother and fetus was poor. This was reflected in their practices as many of them did not imbibe the prescribed preventive measures, and as much as one in five of the women did nothing to prevent MiP. In addition, they hardly used LLINs. This has serious implications for the control of malaria and the eventual reduction of maternal and newborn deaths. Low LLIN use rates in the prevention of MiP were also reported in the northern and southeastern parts of the country.<sup>[28,29]</sup> A study in Southwestern Uganda also reported that about 84.0% of the respondents possessed ITNs, but many were not consistently using them.<sup>[30]</sup> Similarly, another survey in Bamenda Health District of Cameroon found a negative association between bed net ownership and utilization as bed net ownership was high, but utilization was low.<sup>[31]</sup>

The positive influence of higher educational level on the respondents' knowledge which was also reported by other studies in Nigeria and Kenya<sup>[21,32]</sup> highlights the importance of female education. Similarly, a study conducted in Malawi found that educated women were more likely to prevent malaria with IPTp compared to women with no education.<sup>[33]</sup> A survey on the use of IPT among pregnant women in sub-Saharan Africa reported a low prevalence of IPTp-SP and a significant association with the level of respondents' education.<sup>[34]</sup>

The female literacy level in Nigeria still stands at 58%,<sup>[35]</sup> and the prolonged security challenges in the country will likely prevent more girls from obtaining formal education.

### Strengths and limitations of the study

This study fills the gap in data regarding an important contributor to maternal and newborn deaths in Nigeria. Information gathered from the respondents show that they downplay the extent of the health effects of MiP on both mother and fetus, and this

wrong perception needs to be corrected. Moreover, using robust scientific methods at the grassroots level is a better reflection of the population as against the facility-based nature of the study. Though the generalizability is limited, it still serves as a re-awakening for stakeholders as there are recent calls globally for renewed attention on MiP as part of efforts to achieve the Sustainable Development Goal 3.

## Conclusion

The result of this study highlights a high level of awareness of malaria among the respondents, but their knowledge, perception, and preventive practices for MiP were not satisfactory. Many also had no reasons for not using LLINs. However, a significant association between the knowledge and level of education was found which highlights the importance of female education. Public health education on MiP should be intensified at the community level in order to improve knowledge and prevention and to correct misconceptions about MiP among women of reproductive age in Nigeria. More emphasis should be laid on the complications of MiP.

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### Conflicts of interest

There are no conflicts of interest.

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