

## Utilization of malaria preventive strategies among pregnant women at Adeoyo Maternity Teaching Hospital, Ibadan, Nigeria

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### ABSTRACT

**INTRODUCTION:** Malaria in pregnancy is associated with a high rate of maternal and perinatal morbidity and mortality. Utilization of preventive strategies during pregnancy is an integral part of controlling the burden of malaria in pregnancy. This study evaluated the malaria preventive strategies utilized and the prevalence of asymptomatic malaria among pregnant women at Adeoyo Maternity Teaching Hospital (AMTH), Ibadan, Nigeria.

**METHODS:** A facility-based descriptive cross-sectional study among 223 pregnant women in Adeoyo Maternity Teaching Hospital, Ibadan, Nigeria. Information on socio-demographic and obstetric characteristics, malaria symptoms, and the preventive strategies utilized were obtained using a structured questionnaire. Descriptive and bivariate analysis using chi-square test and multivariate analysis at 95% interval and  $p < 0.05$  was used to determine the predictors of asymptomatic malaria infection in relation to socio-demographic characteristics and malaria preventive strategies utilized.

**RESULTS:** The mean age was  $30 \pm 5$  years. More than half (53.4%) of them used insecticide-treated nets consistently, 49.3% sprayed the room regularly with insecticides, while the majority (88.3%) reported they maintained a clean environment. However, 11.7% tested positive for the malaria parasite. Consistency in the use of insecticide-treated net (ITN) and participants age were factors associated with malaria occurrence ( $p=0.01$ ). The use of ITN and being  $>30$  years of age are protective factors against having malaria infection among pregnant women (AOR= 0.34; 95% CI=0.14-0.84) and (AOR=0.31; 95% CI=0.13-0.76) respectively.

**CONCLUSION:** Irrespective of all other malaria preventive strategies adopted by pregnant women, consistent use of ITN was independently a protective factor against developing malaria in pregnancy.

**Keywords:** Ibadan, Malaria, Pregnant Women, Preventive, Strategies

### INTRODUCTION

Malaria is a preventable and treatable mosquito-

borne illness carried by infected female anopheles mosquitoes and one of the world's most common and serious tropical diseases [1]. Malaria remains

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a serious health challenge in Sub-Saharan Africa, particularly among pregnant women [2]. Malaria prevalence in Nigeria varied from less than 20% to over 70% based on the part of the country [3]. In South-West Nigeria, previous studies reported malaria parasitaemia prevalence of 60-72% among pregnant women though the incidence of clinical malaria is lower [3-5]. A large proportion of pregnant women having malaria parasitemia could be asymptomatic but not without its attendant complications [6]. These include anaemia, preterm labour, intrauterine growth restriction, fetal death, congenital malaria, and maternal death. Maternal mortality is twice as high in pregnant women with severe malaria than among non-pregnant women [7-10]. Adverse effects of malaria infections are better prevented, and therefore, emphasis is on control strategy centered on prevention of malaria infections [11]. The principal recommended prevention strategies for malaria complications in pregnancy include intermittent preventive treatment with three or more doses of sulphadoxine-pyrimethamine (IPTp-SP) and effective management of clinical malaria [12]. The other preventive strategies against malaria in pregnancy include regular use of insecticide-treated nets, regular room spraying with insecticides, use of mosquito coil, maintenance of a clean environment, prevention of stagnant waters, and maintenance of good drainage systems at home [13-14]. There is evidence that utilizing these preventive strategies with the use of three or more doses of IPTp-SP decreases malaria-related mortality and morbidity. However, their utilization is still below expectations, with only 30% of pregnant women in households sleeping under ITN a night preceding the interview in a national survey [15]. ITNs and IPTp-SP are provided for pregnant women attending regular antenatal care in some government-own health facilities, and their utilization is emphasized in the routine health talks given to them and reiterated in many of the community's reproductive health programs. Evaluating the preventive strategies among pregnant women is critical to reducing the burden of malaria among this population. Therefore, this study was conducted to assess the malaria preventive strategies utilized and the malaria prevalence among the pregnant women attending the antenatal clinic of Adeoyo Maternity Teaching Hospital, Ibadan, Nigeria.

## METHODS

**Study design and setting:** A descriptive cross-sectional survey among 223 pregnant women receiving care at the antenatal clinic of the Adeoyo Maternity Teaching Hospital, Ibadan, in Oyo State, Nigeria, over 6 months. Adeoyo Maternity Teaching Hospital is a government-owned tertiary health care facility with an average of 13,000 and 4,200 pregnant women attending antenatal and booking clinics yearly, respectively.

**Participants:** The study included all consenting pregnant women who had never received malaria prophylaxis, treated malaria or any febrile illness prior to recruitment into the study in the index pregnancy. Participants were recruited at booking. Samples were taken for blood film for malaria parasite using the standard method for the diagnosis of malaria- microscopy of thick and thin stained blood smears. This involves the collection of a blood smear and staining with Giemsa stains and examination of the erythrocytes for intracellular malarial parasites [16]. The last normal menstrual period was used to determine the gestational age while an early ultrasound scan was used for those who were not sure of their last menstrual period.

**Data sources and management:** The questionnaire was pre-tested in another tertiary health facility. Data collected included socio-demographic characteristics and malaria preventive measures utilized by each of the participants. In this study, consistent use of ITN means the woman had used ITN in the last 14 nights, and regular spraying of insecticide means she sprayed where she slept at least 3 times a week in the last two weeks.

**Statistical analysis:** Data was entered, cleaned, and analyzed using SPSS version 23. Descriptive and bivariate analysis using chi-square test and multivariate analysis at 95% interval and  $p < 0.05$  was used to determine the predictors of asymptomatic malaria infection in relation to socio-demographic characteristics and malaria preventive strategies utilized.

The women recruited for this study were informed that participation is voluntary and guaranteed that their non-participating would not impact the quality of medical care they were to receive. Thereafter, written informed consent was obtained from every woman who participated in this study. The ethical approval for this study was obtained from the Oyo State Ethical Review Board, with ethical approval number AD 13/479/764. All

consenting pregnant women who met the inclusion criteria during the study period were interviewed using an interviewer-administered structured questionnaire designed by the investigators.

## RESULTS

The mean age of the participants was  $30 \pm 5$  years. Almost all the participants were married, about half (48.4%) had tertiary education, and

**Table 1: Socio-demographic characteristics**

Variables		Frequency n (%)
Age	Mean $\pm$ -SD	30 $\pm$ 5
Marital status	Married	215 (96.4)
Gestational age (weeks)	Mean	23 $\pm$ 4
Parity	None	2 (0.9)
	1-3	179 (80.3)
	$\geq$ 4	42 (18.8)
	Mean $\pm$ SD	2.48 $\pm$ 1.49
Educational status	No formal education	1 (0.4)
	Secondary	114 (51.1)
	Tertiary	108 (48.4)
Occupation	Professionals	15 (6.7)
	Skilled workers	29 (13.0)
	Semi-skilled workers	120 (53.8)
	Unemployed	59 (26.5)

*SD: Standard deviation*

**Table 2: Malaria preventive strategies**

Variables		Frequency n (%)
Consistent use of insecticide-treated nets	Yes	119 (53.4)
	No	104 (46.6)
Regular room spraying with insecticide	Yes	110 (49.3)
	No	113 (50.7)
Maintenance of a clean environment	Yes	197 (88.3)
	No	26 (11.7)
Use of mosquito coil	Yes	52 (23.3)
	No	171 (76.2)
Preventing stagnant water	Yes	119 (53.4)
	No	104 (46.6)

only one had no formal education. The mean gestational age of the participants was 23±4 weeks at booking. Only 2(0.9%) of the participants were primigravida. More than three-quarters (80.3%) of the participants have had one to three previous

pregnancies (Table 1).

Slightly above half (53.4%) of the participants used insecticide-treated nets consistently, while 49.3% of them sprayed the room regularly with insecticides. Most (88.3%) of the participants

**Table 3: Association between malaria prevention strategies, socio-demographic characteristics, and malaria infection**

Variables	Malaria infection		Chi-square	p-value
	Positive	Negative		
Consistent use of ITN				
Yes	8 (29.6)	111 (56.6)	6.95	0.01
No	19 (70.4)	85 (43.4)		
Regular room spraying with insecticide				
Yes	12 (44.4)	98 (50.0)	0.29	0.59
No	15 (55.6)	98 (50.0)		
Maintenance of a clean environment				
Yes	22 (81.5)	175 (89.3)	-	*0.24
No	5 (18.5)	21 (10.7)		
Use of mosquito coil				
Yes	9 (33.3)	43 (22.1)	1.68	0.20
No	18 (66.7)	152 (77.9)		
Preventing stagnant water				
Yes	13 (48.1)	106 (54.1)	0.34	0.56
No	14 (51.9)	90 (45.9)		
Age				
<30	19 (70.4)	83 (42.3)	7.51	0.01
≥30	8 (29.6)	113 (57.7)		
Educational status				
Below tertiary	16 (59.3)	9 (50.5)	0.73	0.39
Tertiary	11 (40.7)	97 (49.5)		
Occupation				
Professional	2 (7.7)	13 (6.6)	3.62	0.31
Skilled worker	1 (3.8)	28 (14.2)		
Semi-skilled worker	13 (50.0)	107 (54.3)		
Unemployed	10 (38.5)	49 (24.9)		

\*Fisher's exact; ITN: Insecticide-treated net

reported they maintained a clean environment, and only few (23.3%) used mosquito coils. Over half (53.4%) of the participants reported they ensure adequate drainage of used water in their environment (Table 2).

Among the participants with malaria parasitaemia, a significantly lower proportion (29.6%) consistently use insecticide-treated net ( $p=0.01$ ). Out of those participants who tested positive for malaria infection, 70.4% of the participants were significantly younger than 30 years of age ( $p=0.01$ ) (Table 3).

**Table 4: Multivariate analysis of socio-demographic factors and occurrence of malaria infection in pregnant women**

Variable	AOR	95%CI	p-value
<b>Consistent use of ITN</b>			
Yes	0.34	0.14-0.84	0.02
No (Ref)	-	-	-
<b>Age</b>			
<30	0.31	0.13-0.76	0.01
≥30 (Ref)	-	-	-
<b>Educational status</b>			
Below tertiary	0.70	0.30-1.63	0.40
Tertiary (Ref)	-	-	-

TN: Insecticide-treated net; AOR: Adjusted Odds ratio; CI: Confidence interval

After adjusting for possible confounders, the use of an insecticide-treated net (AOR= 0.34; 95%CI=0.14-0.84) remained a protective factor in the risk of malaria infection among pregnant women. Also, being greater than 30 years of age was a protective factor to having the risk of malaria infection among pregnant women (AOR=0.31; 95%CI=0.13-0.76) (Table 4).

## DISCUSSION

The age distribution of the participants showed that most participants were below 35 years of age, with a mean age of  $30\pm 5$  years. This finding is similar to a cross-sectional study conducted

on malaria preventive practices among pregnant women in Ibadan, Nigeria, with a mean age of 29+6 years [17]. In this study, maternal age was associated with malaria prevalence, indicating that older pregnant women were at a lower risk of malaria infection. This finding corresponds with previous studies in Lagos, Nigeria, and Gabon, where malaria prevalence was observed to decrease as age increased [4,18]. This might be due to the fact that in younger age group, most women are primigravida or primipara with no or inadequate humoral immunity against malaria parasites compared to older participants who are most likely multigravidas and more experienced in the measures of preventing malaria infection in pregnancy [19].

The prevalence of malaria parasitaemia was 11.7% despite varying use of different malaria preventive strategies. The majority of the participants reported consistent use of insecticide-treated nets, regular room spraying with insecticide, maintenance of a clean environment, and prevention of stagnant water as protection against malaria infection. The observed prevalence of malaria parasitaemia was much lower than 20.8% reported by Accrombessi et al. in 2018 among pregnant women in Cotonou, Benin, who were in their first trimester [20]. The prevalence was, however, higher than that reported by Agomo et al. at the antenatal clinic of two hospitals in semi-urban areas of Lagos, Nigeria [4]. The difference in malaria prevalence in this study compared to other studies in Nigeria could be due to the study period (November to April), which was in a dry season. Malaria occurrence and related morbidity have been shown to have seasonal trends, with peaks in the wet season and a low level in the dry season [21]. Other factors that could affect the prevalence include the parity because the majority of the participants are multiparous women and might have developed some humoral immunity against malaria [22]. The difference could also be attributed to the skill and experience of laboratory personnel involved in blood film preparation and reading of the slides. However, in this study, various measures were in place to ensure quality control, like ensuring preparation of slides, reading and interpretations were done by two independent medical laboratory personnel to avoid intra-observer errors. We also ensured the training of the research assistants (nurses) in the collection of samples and data collections [11,15].

As regards the preventive measures for malaria in pregnancy, the most common preventive measure for malaria reported by the participants was the maintenance of a clean environment, followed by consistent use of insecticide and ensuring good drainage of water at home. This may have accounted for the low prevalence of malaria infection reported in this study. This could also suggest pregnant women, especially multiparous women, were knowledgeable about malaria, especially its causes, effects, and prevention, as midwives often discussed while giving health talks in the hospital's antenatal clinic. This finding is in line with the suggestion of Inah et al., that malaria intervention programs should be redesigned or remodeled to include the core components of environmental sanitation to prevent mosquito breeding and mitigate malaria transmission in rural areas [23]. Insecticide-treated nets (ITN) coverage in this study population was in tandem with the 60% target of pregnant women sleeping under an ITN that African Heads of State set at the Roll Back Malaria Summit held in Abuja in 2000 [24]. This study further revealed that those who reported consistently using ITN were less likely to develop malaria. Similarly, the use of long-lasting insecticidal nets significantly decreased the risk of occurrence of the first malaria infection in early pregnancy in a study that assessed the use and effectiveness of long-lasting insecticidal nets in early pregnancy in Benin and its impact on malaria infection risk [25]. This finding supports reports that the use of ITNs substantially reduced the risk of malaria in pregnancy and, therefore, was a protective factor against developing malaria in pregnancy [26-29]. This study revealed that consistent use of ITN will minimize the risk of malaria in pregnancy.

This study is not without some limitations. The study was a hospital-based study; thus, it cannot be generalized to the general population of pregnant women. Women with a history of malaria in previous pregnancy(ies) might have utilized prophylaxis differently. Though, we did not collect data on malaria in prior pregnancy. Therefore, we recommend further studies to explore the association between a prior history of malaria in a previous pregnancy and the utilization of preventive strategies. We also suggest future studies to compare infants' outcomes of case and control of women who use malaria prophylaxis and other preventive measures and those who do

not use multiple healthcare facilities with a larger sample size.

## CONCLUSION

Majority of the participants reported consistent use of insecticide treated net, regular room spraying with insecticide, and maintenance of clean environment as their strategies of preventing malaria infection. Association between malaria preventive strategies and malaria infection showed that consistent use of ITN independently or in combination with other measures and older age were protective factors against developing malaria in pregnancy.

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