Nigerian Journal of Health Promotion
ISSN: 0995-3895
Vol 15, 2022

Knowledge and Attitude of Pregnant Mothers Towards Malaria Management in Nsukka Local Government Area. Enugu State Nigeria

[*1]Tochi Emmanuel Iwuagwu, [1]Patience Chikodili Ezema, [1]Amaka Harry Ononuju, [1] Vivianmary Amarachi Ifemegbulem, [1]Binfat Nandang Adi, [1]Osmond Chukwuemeka Ene, [2]Veronica O. Charles-Unadike

[1]Department of Human Kinetics and Health Education, University of Nigeria, Nsukka
[2]Fred N. Binka School of Public Health, University of Health and Allied Sciences PMB 31 Ho, Ghana

*Corresponding author: tochi.iwuagwu@unn.edu.ng; 08063290746

Abstract

Malaria infection during pregnancy is a major public health problem in Nigeria. This study assessed the Knowledge and attitude of pregnant mothers towards malaria management in Nsukka Local Government Area, Enugu State Nigeria. A cross-sectional study was conducted between December 2021 and March 2022, from the functional health facilities in Nsukka Local Government Area. A total number of 350 pregnant mothers participated. Data collection was done using self-structured pregnant mothers knowledge and Attitude Towards Malaria Management Scale. Descriptive statistics of frequency, percentage, and multivariable logistic regression were used for analyses. The findings reveal that overall, pregnant mothers in the study had good knowledge of causes (91.7%) and control (93.1%) of malaria in Nsukka Enugu State South-East Nigeria. Pregnant mothers had positive attitudes towards: causes of malaria (62.7%), effects of malaria (70.8%), and control of malaria (76.6%). Place of residence, age, and level of education (p<.05) were statistically significantly associated with knowledge of malaria management among pregnant mothers. Place of residence and level of education (p<.05) were statistically significantly associated with attitude towards malaria management among pregnant mothers. This research proves that good knowledge and positive attitudes towards malaria management can help to reduce and control the incidence of the disease. However, provision of affordable healthcare facilities by government and improved patronage coupled with sound integration of health information and education policy would enhance and promote change of attitude, behaviour and practices that would help in combating malaria in the rural endemic settings.

Keywords: Knowledge, Attitude, Management of malaria, Pregnant mothers

Introduction

Malaria infection during pregnancy is a major public health problem in Nigeria and the major cause of death worldwide. Despite being preventable and treatable, malaria continues to have a devastating impact on people´s health and livelihood around the world (World Health Organization [WHO], 2015). Globally, approximately about 216 millions of cases of malaria occur annually (WHO, 2017).

Malaria persists to be the most illustrious cause of morbidity and mortality in many tropical regions of the world. The WHO (2015) disclosed that about 3.4 billion people are at risk of

malaria, 1.2 billion are at high risk worldwide. In 2020, nearly half of the world's population was at risk of malaria. Some population groups are at considerably higher risk of contracting malaria, and developing severe disease, which include the infants, children under 5 years of age, pregnant women, and patients with HIV/AIDS, as well as people with low immunity moving to areas with intense malaria transmission, such as migrant workers, mobile populations, and travellers (WHO, 2022). In sub-Saharan Africa, malaria is accounted to be one of the most dangerous diseases which affect humanity badly, and it has become a serious health problem mainly among pregnant women (WHO, 2017). In addition, WHO (2022) disclosed that there were 241 million cases of malaria in 2020 compared to 227 million cases in 2019. The estimated number of malaria deaths stood at 627,000 in 2020, resulting to an increase of 69,000 deaths over the previous year. The WHO (2022) revealed that four African countries accounted for just over half of all malaria deaths worldwide: the Democratic Republic of the Congo (13.2%), United Republic of Tanzania (4.1%), Mozambique (3.8%), and Nigeria (31.9%).

Pregnant women still suffer from malaria disease in Nigeria, which is known to be an endemic disease throughout Nigeria with a seasonal transmission, the peak transmission of which is during the rainy season (April - October) followed by the dry season (November - March) (Yakubu et al., 2019). The parasitic disease disproportionately affects children and pregnant women compared to the rest of the population groups (Center for Disease Control and Prevention [CDC], 2016). In addition, the disease is transmitted throughout Nigeria with 97 per cent of the population at risk of the infection (Dawaki et al., 2016). Hence, there is need for the management of malaria during pregnancy, as it helps to promote the health of the mother and the foetus.

In malaria endemic areas, pregnant women are the highest risk group for malaria infection. Pregnant women need proper management of malaria in order to control its effects to their health and that of their foetuses. Management of malaria as described by Jakubowski et al. (2017) is the use of insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), intermittent preventive treatment for pregnant women (IPTp), seasonal malaria chemoprevention (SMC), and diagnosis by malaria microscopy or rapid diagnostic test (RDT), together with effective treatment for confirmed malaria cases with artemisinin-based combination therapies (ACTs) for pregnant women. However, pregnant women need to have good knowledge and develop positive attitude towards the management of malaria.

The knowledge and attitude of pregnant women toward management of malaria is paramount in curbing its health threat. In a study conducted by Fuge et al. (2015), more than half of the pregnant women's population showed positive attitude towards severity of malaria and its prevention methods, such as: sleeping under bed nets as well as its threat on under five children and pregnant women. A study done in Nigeria showed that the overall knowledge of malaria prevention practices among majority of the pregnant women and caregivers was found to be poor (Adebayo et al., 2015). In contrast, Studies done in: Nigeria (Omaka-Omari & Nwimo, 2015) BurkinFaso (Yaya et al., 2017), and Sudan (Tayseir et al., 2015) revealed that 64.9 per cent, 56.1 per cent, and 55.9 per cent of participants had good knowledge on malaria control respectively.

Malaria infection is higher in pregnant women because of their decreased immunity. According to CDC (2017), pregnant women lose some of their immunity and are prone to malaria infection because of the changes in women's immune systems during pregnancy, and the presence of placenta with new places for parasites to bind. Pregnant women living in areas of low or unstable malaria transmission have little or no immunity to malaria, and are at higher risk of developing the severe disease as a result of malaria infection than non-pregnant adults living in the same

area (Tegegne et al., 2019). Despite the targets to reduce by 90 per cent of malaria prevalence rates in 2030, which stresses the need for entire coverage of main malaria control interventions, including behaviour change for populations at risk of malaria disease, especially pregnant women (WHO, 2015) malaria still remains a great burden, thus slowing down the targets of sustainable development goals attainment (Fuge et al., 2015). Although, not only in the developing countries, even in all the malaria-endemic regions of the world. Notwithstanding the increase of malaria in Nigeria, many pregnant women in Nsukka Local Government Area (LGA) who are highly at risk seem not to express positive attitude towards the disease itself, and those who are aware of the disease appear not to have the knowledge on the management of the disease.

Limited research has been conducted on the knowledge and attitude of pregnant mothers towards malaria management. This study addresses this gap in the literature. In view of these facts, the study investigated the knowledge and attitude of pregnant mothers towards malaria management in Nsukka Local Government Area, Enugu State. Specifically, the study determined: the level of knowledge possessed by pregnant women on causes and control of malaria; the attitude of pregnant mother's towards causes, effects, and control of malaria. It was hypothesized that knowledge and attitude of pregnant mothers toward malaria management is not significantly associated with their socio-demographic factors of place of residence, age, and education.

The study findings would help to inform a more effective response from health education programme planners and policy makers in designing policies that emphasize management of malaria, and reduction of incidence of the disease among pregnant mothers. Also, the results would help health agencies to identify the areas with high risk of malaria during pregnancy to pay more attention. Also, the findings would inspire the government, health institutions and health professionals in planning health care interventions on management of malaria during pregnancy.

Methods and Material

Study Design and Setting

A cross-sectional study was conducted between December 2021 and March 2022, from the 15 functional health facilities in Nsukka Local Government Area (LGA), Enugu State Nigeria. Nsukka LGA is one of the LGAs in Enugu State South East, Nigeria. Geographically, Nsukka LGA is bounded on the North by Igbo-Eze South LGA, on the North-East by Udenu LGA, on the South-West by Uzo-Uwani LGA, on the South-East by Igbo-Etiti LGA, and on the West by Odoru/Igalamala LGA of Kogi State. The area was chosen for the study due to the observed behaviours of pregnant mothers with regard to malaria management.

Participants

The study participants consisted of 4,557 pregnant mothers who registered for antenatal care in the fifteen registered health facilities in Nsukka LGA. Only pregnant mothers who are in good health and had no terminal health challenges were included in the study population.

Sampling Procedures

A sample size of 350 pregnant mothers was used for the study. The sample size was determined using Cohen et al. (2011) Standardized Table for Random Samples. Simple random sampling

technique of balloting without replacement was adopted to select 10 out of the 15 functional health facilities in the study area. Non-proportional stratified random sampling technique was adopted to draw 35 pregnant mothers from each of the 10 selected health facilities used for the study.

Material and Measures

Data collection was done using self-structured Pregnant Mothers Knowledge and Attitude Towards Malaria Management Scale (PMKAMS). The Scale consisted of three parts: Part I consisted of three socio-demographic variables (place of residence, age, and level of education). Part II consisted of 14 questions with dichotomous response options covering knowledge of causes and control of malaria, while Part III consisted of 15 questions with dichotomous response options covering attitude of pregnant mothers towards causes, effects, and control of malaria.

Questions assessing causes of malaria were prepared by the researchers according to literature review and had eight dichotomous response options (yes and no): thus: Do you know that: the bite of a female Anopheles mosquito causes malaria?, stagnant water/empty receptacles could lead to the breed of the mosquito?, taking dirty water could not cause malaria?, infected mother could not transmit malaria to the foetus?, malaria causes low-birth weight?, malaria does not cause premature delivery?, and malaria does not cause jaundice in newly born children? Questions assessing control of malaria was prepared by the researchers according to literature review and had six dichotomous response options (yes and no): thus: Do you know that: preventing myself from mosquito bite cannot help reduce malaria?, sleeping under insecticide-treated mosquito nets (ITNs) cannot help prevent malaria?, use of anti-malaria medicines can help prevent malaria?, use of intermittent preventive treatment can help prevent malaria?, allowing stagnant waters increases the presence of mosquitoes?, and dirty environment breeds more mosquitoes?

Questions ascertaining attitude of pregnant mothers towards causes, effects, and control of malaria were prepared by the researchers according to literature review and had non dichotomous response options (strongly agree, agree, disagree, and strongly disagree), but were later dichotomized to ‘Agree’ and ‘Disagree’ thus: Attitude Towards the Causes of Malaria (seeing stagnant water and empty receptacles around my house makes me feel unsafe, drinking dirty water may not cause malaria, and malaria infection may not be transmitted to the foetus); Attitude Towards the Effects of Malaria (experiencing malaria is the best way to know its effect, orientations help expose the effects of malaria, laboratory experiment is the best way to ascertain the effects of malaria, and peer group discussions expose the effects of malaria in a better way); and Attitude Towards the Control of Malaria (taking IPTP-SP at the second trimester of pregnancy is health compromising, sleeping under insecticide treated mosquito net during pregnancy is necessary, cutting the bushes around my surrounding to avoid mosquito breeding is health wise, ensuring that taking of malaria drugs any time I feel I am about having malaria is good, preventing myself from mosquito bite may not prevent me from having malaria, use of anti-malaria drugs can help prevent malaria, avoiding contact with infected persons can protect me against malaria, and personal hygiene and environmental sanitation can help in controlling malaria

Face and content validity of the questionnaire was evaluated by a professional board of seven specialists in medical and health sciences, public health education, and as well was tested for internal consistency.

Data Collection Procedure

The current research was developed in accordance with the Ethical Principles of the World Medical Association Declaration of Helsinki for medical research involving human subjects (World Medical Association, 2013). The research was approved by Research Ethics Committee of the Faculty of Education, University of Nigeria, Nsukka (UNN/FE/REC21/116).
After obtaining permission from the various directors of the selected health facilities for data collection, pregnant mothers who gave consent for participation were knowledge-tested on attitude and management of malaria by the researchers as soon as possible before leaving the selected registered health facilities. The researchers explained the objectives of research for the participants, and they were reassured that their responses are confidential and no personal identifiers will be disclosed. The knowledge test was administered with the aid of well-trained interviewers. A total number of 350 questionnaires were filled out in the process. The 350 copies were all returned, duly filled out, and used for analyses.

Data Analysis

The IBM Statistical Package for Social Sciences (SPSS) version 23.0 was used for all the statistical analyses. The standard descriptive statistics were applied to describe data pattern. Frequency counts and percentages were generated to compute the knowledge of causes and control of malaria. Knowledge score was calculated out of the 14 knowledge specific questions. Each correct response earned one point, whereas any wrong response attracted no point. Good knowledge of causes and control of malaria was given to the respondents who scored 5-8 and 4-6 points respectively, and poor knowledge of causes and control of malaria was given to the respondents who scored <4 and <3 points respectively. The level of knowledge and attitude of pregnant mothers were determined by the category of respondents (good/poor/positive/negative) who had the greatest percentage score. This procedure was followed by Upashe et al. (2015) in a knowledge-based study. The internal consistency of the questionnaire was determined using split half (Spearman-Brown Coefficient) with an index of .761. The null hypotheses were tested using multivariable logistic regression at.05 alpha level.

Results

Table 1: Frequency Table of Demographic Characteristics of Pregnant Mothers (*n*=350)

Demographic characteristics	Frequency	Per cent
Place of Residence		
Rural	131	37.4
Urban	219	62.6
Age		
15-30years	132	37.7
31-45years	108	30.9
46 years and above	110	31.4
Education Level		
No Formal Education	39	11.1
Primary Education	94	26.9
Secondary Education	84	24.0

Tertiary Education	133	38.0

Table 1 shows the distribution of respondents. A total of 350 pregnant mothers were studied. Most respondents 219(62.6%) reside in the urban setting. Most respondents 132 (37.7%) were aged between 15 and 30 years. Majority of the respondents 311(88.9%) had attained at least primary education.

Table 2: Knowledge of Pregnant Mothers, Overall Malaria Causes and Control Measures

Variable	Overall
n(%)	350 (100.0)
Malaria Causes Knowledge	
Poor knowledge (<4)	29 (8.3)
Good knowledge (5-8)	321 (91.7)
Malaria Control Knowledge	
Poor knowledge (<3)	24 (6.9)
Good knowledge (4-6)	326 (93.1)

Table 2 shows that overall, pregnant mothers in the study had good knowledge of causes (91.7%) and control (93.1%) of malaria in Nsukka LGA, Enugu State Nigeria.

Table 3: Attitude of Pregnant Mothers, Overall Malaria Causes, Effects and Control

Variable	Overall
n(%)	350 (100.0)
Attitude Towards Causes of Malaria	
Positive attitude	219 (62.7)
Negative attitude	131 (37.3)
Attitude Towards Effects of Malaria	
Positive attitude	248 (70.8)
Negative attitude	102 (29.2)
Attitude Towards Control of Malaria	
Positive attitude	268 (76.6)
Negative attitude	82 (24.4)

Table 3 shows that overall, pregnant mothers in the study had positive attitudes towards: causes of malaria (62.7%), effects of malaria (70.8%), and control of malaria (76.6%).

Table 4: Multivariate Logistic Regression of Covariates Adjusted for Knowledge of Malaria Management

Factors	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp(B)	
							Lower	Upper
Place of Residence								
Rural[a]	-	-	-	-	-	-	-	-
Urban	-.882	.338	6.815	1	.009**	.414	.213	.803
Age Category			7.004	2	.030*			
15-30years[b]	-	-	-	-	-	-	-	-
31-45years	.867	.401	4.680	1		2.379	1.085	5.217

46+years	.939	.452	4.309	1	.031* .038*	2.557	1.054	6.203
Education Level			6.021	3	.111			
No Formal Educ[c].	-	-	-	-	-	-	-	-
Primary Educ.	1.337	.571	5.483	1	.019*	3.809	1.244	11.667
Secondary Educ.	.848	.500	2.882	1	.090	2.336	.877	6.220
Tertiary Educ.	.769	.467	2.713	1	.100	2.158	.864	5.389
Constant	1.012	.435	5.417	1	.020	2.750		

***p < 0.05; **p < 0.01; ***p < 0.001**
Ref Groups: Place of Residence = Rural[a] ; Age =18 -30yrs[b] ; Level of Education = No Formal Education[c]
Exp (B) = Odd Ratio (OR)

Table 4 shows that place of residence, age, and education level (p < .05) were statistically significantly associated with knowledge of malaria management among pregnant mothers. In a multivariate analysis, pregnant mothers residing in the urban settings were 58.6% less likely knowledgeable about malaria management than those residing in the rural settings (OR = .414, 95% CI [.213-.803], p< .01). Pregnant mothers aged 31-45 years (OR = .2.379, 95% CI [1.085-5.217], p< .05) and those aged 46+ years (OR = 2.557, 95% CI [1.054-6.203], p< .05) were 2 times and 2.6 times more likely respectively knowledgeable about malaria management than those aged 15-30 years. Pregnant mothers with primary education (OR = 3.809, 95% CI [1.244-11.667], p< .05) were 3.8 times more likely knowledgeable about malaria management than those with no formal education.

Table 5: Multivariate Logistic Regression of Covariates Adjusted for Attitude Towards Malaria Management

Factors	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95% C.I. for Exp(B)**	
							Lower	**Upper**
Place of Residence								
Rural[a]	-	-	-	-	-	-	-	-
Urban	-.696	.237	8.619	1	.003**	.499	.313	.794
Age Category			.984	2	.611			
15-30years[b]	-	-	-	-	-	-	-	-
31-45years	.011	.271	.002	1	.967	1.011	.595	1.720
46+years	.274	.295	.861	1	.353	1.315	.737	2.347
Education Level			5.161	3	.160			
No Formal Educ[c].	-	-	-	-	-	-	-	-
Primary Educ.	.418	.420	.990	1	.320	1.519	.667	3.460
Secondary Educ.	.914	.421	4.719	1	.030*	2.495	1.094	5.693
Tertiary Educ.	.565	.404	1.957	1	.162	1.759	.797	3.881
Constant	-.618	.385	12.348	1	.108	.539		

***p < 0.05; **p < 0.01; ***p < 0.001**

Ref Groups: Place of Residence = Rural[a] ; Age =18 -30yrs[b] ; Level of Education = No Formal Education[c]
Exp (B) = Odd Ratio (OR)

Table 5 shows that place of residence and education level ($p < .05$) were statistically significantly associated with attitude towards malaria management among pregnant mothers. In a multivariate analysis, pregnant mothers residing in the urban settings were 50.1% less likely knowledgeable about malaria management than those residing in the rural settings (OR = .499, 95% CI [.313-.794], $p< .01$). Pregnant mothers with secondary education (OR = 2.495, 95% CI [1.094-5.693], $p< .05$) were 2 times more likely knowledgeable about malaria management than those with no formal education.

Discussion

The finding revealed that pregnant mothers in the study had good knowledge on causes and control of malaria (Table 2). The result was expected and therefore, not surprising given the fact that malaria is endemic throughout the country and more than 90 per cent of the population lives in area with stable malaria. The finding on level of knowledge on causes of malaria was consistent with the findings of (Ejike et al., 2016; Mbong et al., 2020) who reported that majority of the pregnant women had good knowledge on the causes and common symptoms associated with malaria, and they recognized it as an important health risk during pregnancy in Nigeria. Also, the findings were in line with the finding of (Gemuhay et al., 2021) that majority of the pregnant mothers had an understanding on the meaning and transmission of malaria in Tanzania. However, the high knowledge of the correct cause of malaria will have a positive implication on the malaria control programme that is targeted on pregnant women (Ejike et al., 2016). The finding is not consistent with the findings of Oluwasogo et al. (2016); Sielinou et al. (2020) that many of the caregivers of children under five years and pregnant women in the studies do not have adequate knowledge on the causes or transmission of malaria in Nigeria and in Cameron. The inconsistent of this study may be because of the misconceptions on malaria etiology and causes. However, the finding on level of knowledge on control of malaria was consistent with the findings of Awoyesuku et al. (2020); Munisi et al. (2019); and Fuge et al. (2015) who reported good knowledge of malaria and its preventive measures in Nigeria, Tanzania, and Ethiopia. The finding disagrees with the finding of Adebayo et al. (2015); Kio et al. (2016); and Oluwasogo et al. (2016) who in their various related studies reported poor overall knowledge about malaria prevention in Nigeria. The similarities in the finding could be because of the adoption of similar research designs by the researchers. However, the disparity in the findings of the study may be due to variations in the geographical context.

The finding shows that pregnant women in the study had positive attitude towards the causes, effects, and control of malaria (Table 3). The result was expected and hence, not surprising. This is because studies have shown an encouraging good attitude towards the control and prevention of malaria in Tanzania (Munisi et al., 2019) and Nigeria (Kio et al., 2016). However the finding is not in agreement with the finding of Adebayo et al. (2015) and Adibe et al. (2017) who revealed poor attitudes and misconceptions about the use of ITNs and control of malaria among pregnant women in Nigeria. The findings is not consistent with the finding of Ejike et al. (2016) who found that the knowledge of the consequences of malaria during pregnancy was poor especially the risk posed on the foetus. The disparity in the findings may be because of the population of the study.

The findings in Table 4 shows that place of residence, age, and education level were statistically significantly associated with knowledge of malaria management among pregnant mothers. Also, pregnant mothers residing in the urban settings were less likely knowledgeable about malaria management than those residing in the rural settings. Pregnant mothers aged 31-45 years and those aged 46+ years were 2 times and 2.6 times more likely respectively knowledgeable about malaria management than those aged 15-30 years. Pregnant mothers with primary education were 3.8 times more likely knowledgeable about malaria management than those with no formal education. The finding on place of residence was expected and hence, not surprising because pregnant mothers residing in urban settings have a higher likelihood of utilising health services or better access to health care facilities than those in rural settings. The finding is in line with the finding of Omaka-Omari and Nwimo (2015) that pregnant women living in the urban area demonstrates better knowledge than those in the rural area in Nigeria. The authors further disclosed that most of the misconceptions about the cause of malaria were observed more among the rural women, indicating strong influence of cultural beliefs and myths. The findings is also consistent with the finding of Goshu and Yitayew (2019) who found that women who were from urban areas were 2.4 times more likely knowledgeable than women who were from rural areas in Ethiopia. The association may be explained that women who are from urban may be more exposed for information, such as mass media and other health-related meeting than rural. The finding on age of pregnant mothers was surprising and hence, expected. This is because studies have shown that age is significantly associated with the level of knowledge of pregnant women on causes and control of malaria in Tanzania and in Nigeria (Adebayo et al., 2015; Gemuhay et al., 2021). Hence, results that level of age had a significant association with the causes and control of malaria are surprisingly not expected to be inconsistent. For instance, the finding is not consistent with the finding of Awoyesuku et al. (2020) who found that that there is no significant relationship between malaria management and age in Nigeria. The differences in the study may be because of the type of instrument used. The finding on level of education was surprising and not expected. This is because studies have shown that education had a difference on causes and control of malaria in Nigeria (Adebayo et al., 2015; Mbong et al., 2020). Also, the finding is in line with the findings of Goshu and Yitayew (2019) who found that educated women were more knowledgeable than those who were not educated in Ethiopia. The finding of Goshu and Yitayew (2019) is similar to studies done by Omaka-Omari and Nwimo (2015) in Nigeria, Tayseir et al. (2017) in Sudan, and Beyene et al. (2015) in Ethiopia. However, the findings of this study are in agreement with the finding of Awoyesuku et al. (2020) who found that there is no significant relationship in the control of malaria among pregnant women in Nigeria. Association may be due to the fact that educated women may easily read and understand information regarding the management of malaria.

The findings in Table 5 shows that place of residence and education level were statistically significantly associated with attitude towards malaria management among pregnant mothers. Also, pregnant mothers residing in the urban settings were less likely knowledgeable about malaria management than those residing in the rural settings. Pregnant mothers with secondary education were 2 times more likely knowledgeable about malaria management than those with no formal education. The finding of age was surprising and therefore, expected. This is because pregnant mothers' age was found to be a determining factor for their attitude, younger age groups having better attitude than the older in Ethiopia (Fuge et al., 2015). However, the finding is consistent with the finding of Djoufounna et al. (2022) who found that good attitudes were adopted by public servants and students; mostly of secondary and higher levels of education in

Cameroon. Results that place of residence had a significant association with the attitude of pregnant mothers towards causes, effects, and control of malaria is expected to be consistent. This is because where one resides has great influence on certain behaviours.

The study findings have a positive implication on their educational institutions in organizing in-service training for pregnant mothers as a way of increasing the mothers' knowledge and disposing good attitude towards malaria management. The findings have implication for ministry of health and health agencies in organizing health measures aimed at promoting specific knowledge levels and attitude towards malaria during pregnancy. Also, it has implications for assisting health educators/professionals and health agencies in carrying out malaria management education-based programmes at different locations where pregnant mothers can be reached, to optimize their level of knowledge and attitude through the use of counseling, seminars, sensitization, and how to control it through adopting management measures. The study findings have implications for adoption by ministry of health, health agencies/institutions, and policy makers in designing policies that emphasize on management of malaria during pregnancy. Also, it demonstrates the impact of health educators in sensitizing pregnant mothers about the management of malaria. In addition, the findings would assist health educators in organizing awareness campaigns on management of malaria among pregnant mothers in Nigeria.

Conclusion

Our findings have shown that pregnant women had good knowledge on causes and control of malaria, and positive attitude towards the causes, effects, and control of malaria. Place of residence, age, and education level were highly associated with pregnant mothers' knowledge of causes and control of malaria, while place of residence and education level were highly associated with the attitudes of pregnant mothers toward the causes, effects, and control of malaria. However, consistent and timely distribution of malaria control resources by the government and other funding agencies is promptly needed. There is a need for concerted health education intervention to improve the knowledge of rural dwellers regarding malaria prevention, including the use of ITN, in order to accommodate the less educated members of this group as well as address misconceptions and develop positive attitudes towards the causes, control, and effects of malaria. Provision of affordable healthcare facilities by government and improved patronage coupled with sound integration of health information and education policy would enhance and promote change of attitude, behaviour and practices that would help in combating malaria in the rural endemic settings. Continuous efforts at providing necessary information by relevant health organizations are needed to control and reduce incidence of malaria in the general public, through the use of health education. However, there is a need to improve education on malaria with active participation of women and improve malaria surveillance that will lead to malaria eradication through the use of mass media, seminars, and conferences. Deployment of more resources and trained health professionals in the persons of public health physicians, registered nurses and mid-wives, environmental health officers, community health officers, and community health extension workers into rural communities should holistically enhance better malaria control and health care delivery.

References

Adebayo, A. M., Akinyemi, O. O., & Cadmus, E. O. (2015). Knowledge of malaria prevention among pregnant women and female caregivers of under-five children in rural Southwest Nigeria. *Peer Journal, 3*, e792; doi: 10.7717/peerj.792

Adibe, M. O., Ayogu, E. E., & Igboeli, N. (2017). Attitudes and self practices of Pregnant Women towards malaria prevention and control in Nigeria. *Journal of Applied Pharmaceutical Science, 7*, 136-141.

Awoyesuku, P. A., Ohaka, C., & Ngeri, B. (2020). Knowledge of malaria and utilization of its preventive measures among Pregnant Women attending antenatal care at a Tertiary Hospital in Port-Harcourt, Nigeria. *International Journal of Tropical Disease and Health, 41*(19), 34-46. NLM ID: 101632866

Beyene, B. H., Telele, F. N., & Mekuria, H. A. U. (2015). Knowledge, attitude and practice on malaria and associated factors among residents in Pawe District, North West Ethiopia: A Cross-Sectional Study. Science. *Journal of Public Health, 3*(3), 303–309. https://doi.org/10.11648/j.sjph.20150303.11

Center for Disease Control and Prevention (CDC). (2016). *Impact of malaria*. Accessed from https://www.cdc.gov/malaria/malaria_worldwide/impact.html

Centre for Disease Prevention and Control. (CDC). (2017). *Malaria program*. Centre for Disease Prevention and Control.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed.). New York: Routledge Taylor & Francis Group.

Dawaki, S., Al-Mekhlafi, H., Ithoi, I., Ibrahim, J., Atroosh, W., & Abdulsalam, A. (2016). Is Nigeria winning the battle against malaria? Prevalence, risk factors and KAP assessment among Hausa communities in Kano State. *Malaria Journal*, *15*, 351.

Djoufounna, J., Bamou, R., Mayi, M. P. A., Chouakeu, N. A. K., Tabue, R., Ambene, P. A., Fosah, D. A., Nkondjio, C. A., & Tchuinkam, T. (2022). Population knowledge, attitudes and practices towards malaria prevention in the locality of Makenene, Centre-Cameroon. *Malaria Journal, 21*, 234. https://do.org/10.1186/s1293602204253z

Ejike, B. U., Ohaeri C. C., Amaechi, E. C., Ejike, E. N., Oleka, G., Role-eze, O. P., & Belonwu, A. C. (2016). Knowledge, attitudes and practices of malaria amongst pregnant women in Aba South Local Government Area, Abia State, Nigeria. *Animal Research International, 13*(2), 2463 – 2469

Fuge, T. G., Ayanto, S. Y., & Gurmamo, F. L. (2015). Assessment of knowledge, attitude and practice about malaria and ITNs utilization among pregnant women in Shashogo District, Southern Ethiopia. *Malaria Journal, 14*, 235. doi:10.1186/s12936-015-0755-7

Gemuhay, H. M., Kadeso, A. P., Mlundi, S., Sungwa, E., Kibona, S., Malale, K., & Kavana, N. (2021). Knowledge, Attitudes, and Practice on Malaria Prevention and Treatment among Pregnant Women in Karatu District, Arusha Region, Tanzania. *Nur Primary Care, 5*(6), 1-5.

Goshu, Y. A., & Yitayew, A. E. (2019). Malaria knowledge and its associated factors among pregnant women attending antenatal clinic of Adis Zemen Hospital, North-western Ethiopia, 2018. *PLoS ONE, 14(*1), e0210221. https://doi.org/10.1371/journal.pone.0210221

Jakubowski, A., Stearns, S. C., Kruk, M. E., Angeles, G., & Tirumurthy, H. (2017). The US President's Malaria Initiative and under-5 child mortality in sub-Saharan Africa: A difference-indifferences analysis. *PLoS Medicine, 14*(6), e1002319.

Kio, J. O., Agbede, C. O., Olayinka, F. E., Omeonu, P. E., & Dire-Arimoyo, Y. (2016). Knowledge, attitudes and practices of mothers of under-five regarding prevention of malaria in Children: Evidence from Ogun State, Nigeria. *IOSR Journal of Humanities and Social Science (IOSR-JHSS), 21*(8), 01-07.doi: 10.9790/0837-2108080107

Mbong, O. E., Edem, E. N., & Hussain, S. (2020). Awareness and measures utilized by Pregnant Women in the prevention of malaria in sub-urban Communities in Eket Local Government Area. *Journal of Environmental Science and Public Health, 4,* 175-183.

Munisi, D. Z., Nyundo, A. A., & Mpondo, B. C. (2019). Knowledge, attitude and practice towards malaria among symptomatic patients attending Tumbi Referral Hospital: A cross-sectional study. *PLoS ONE, 14*(8), e0220501. https://doi.org/10.1371/journal.pone.0220501

Oluwasogo, A. O., Henry, O. S., Abdulrasheed, A. A., Olawumi, T. A., & Olabisi, E. Y. (2016). Assessment of mother's knowledge and attitude towards malaria management among under five children in Okemesi–Ekiti, Ekiti–West Local Government, Ekiti State Estrjkl. *Malaria Contr Elimination, 5*, 142. doi:10.4172/2470-6965/1000142

Omaka-Omari, L. N., & Nwimo, I, G. (2015). Pregnant Women's malaria knowledge in Ebonyi State, South-East Nigeria. *Research on Humanities and Social Sciences, 5*, 10.

Sielinou, C. B. K , Anong, D., Cumber, S. N., Cumber, R. Y., & Nkuo-Akenji, T. (2020). Knowledge, attitudes and perceptions regarding malaria: a cross sectional study in pregnant women attending antenatal care in the New-Bell district hospital, Douala, Cameroon. *Pan African Medical Journal, 36*(207). doi:10.11604/pamj.2020.36.207.16180

Tayseir, T. M. M., Yousif, M. E., Mohammed, A. E. E., Ahmed, E. E., Mahmoud, J., & Mustafa, M. M. (2017). Knowledge, Attitude and Practices Among Mothers Towards Insecticide-Treated Nets in Abuharira Village–Um Remta Locality- The White Nile State -2015. *Science Journal of Clinical Medicine, 6*(2), 24–31. https://doi.org/10.11648/j.sjcm.20170602.11

Tegegne, Y., Asmelash, D., Ambachew, S., Eshetie, S., Addisu, A., & Zeleke, A. J. (2019). The prevalence of malaria among Pregnant Women in Ethiopia: A Systematic Review and Meta-Analysis. *Hindawi Journal of Parasitology Research.* https://doi.org/10.1155/2019/8396091

Upashe, S. P., Tekelab, T., & Mekonnen, J. (2015). Assessment of knowledge and practice of menstrual hygiene among high school girls in Western Ethiopia. *BMC Women's Health, 15*, 84. doi: 10.1186/s12905-015-0245-7

World Health Organization. (2015). *Global Technical Strategy for Malaria 2016-2030; 2015*. Accessed from https://www.who.int/ malaria/publications/atoz/9789241564991/en

World Health Organization. (2017). *Malaria report 2017*. Retrieved from http://apps.who.int/iris/bitstream/10665/259492/1/9789241565523eng.pdf%3Fua%3D1

World Health Organization. (2022). *Malaria*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/malaria

World Medical Association. (2013). World Medical Association Declaration of Helsinki; Ethical principles for medical research involving human subjects. *Journal of American Medical Association, 310*, 2191-2194. [CrossRef].

Yakubu, B., Longdet, I., Tony, H., Davou, D., & Obishakin, E., (2019). High-complexity Plasmodium falciparum infections, North Central Nigeria, 2015-2018. *Emerg. Infect. Dis, 25*(7), 1330–1338.

Yaya, S., Bishwajit, G., Ekholuenetale, M., Shah, V., Kadio, B., & Udenigwe, O. (2017). Knowledge of prevention, cause, symptom and practices of malaria among women in BurkinaFaso. *PLoS ONE, 12*(7), e0180508. https://doi.org/10.1371/journal.pone.0180508 PMID: 2867198720