

Original Article

Determinants of Knowledge of Malaria Prevention Among Women of Reproductive Age 15-49 Years in Nigeria

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Abstract

Background: Despite ongoing malaria control efforts in Nigeria, malaria prevalence remains high. Knowledge of malaria prevention among women of reproductive age is critical for national elimination strategies. This study examined determinants of knowledge of malaria prevention methods among Nigerian women aged 15–49 years.

Methodology: Data from 14,476 women in the 2021 Nigeria Malaria Indicator Survey (NMIS) were analysed using SPSS version 29. Bivariate and multivariable logistic regression analyses were conducted to identify determinants of malaria prevention knowledge. Variables with $p \leq 0.05$ were considered statistically significant.

Results: Most women (80.2%) had knowledge of at least one malaria prevention method; 19.8% had none. Knowledge increased with education: primary (AOR=1.27, 95% CI:1.12–1.45), secondary (AOR=1.97, 95% CI:1.71–2.26), and tertiary (AOR=4.42, 95% CI:3.48–5.61). Women exposed to mass media (AOR=2.41, 95% CI:2.22–2.62) and from wealthier households (average AOR=1.25, 95% CI:1.11–1.41; rich AOR=1.90, 95% CI:1.63–2.22) were more likely to have knowledge than those without exposure and from poor households. Women of Islamic (AOR = 0.78, 95% CI: 0.63–0.97) and those of traditionalist religion were less likely to have knowledge than Catholics. Knowledge of malaria prevention also varied by age and geopolitical zone but did not differ by urban-rural residence (AOR = 0.98; 95% CI: 0.87-1.09).

Conclusion: Malaria prevention programmes should target education-based, age-specific, wealth-sensitive, and regionally tailored interventions, leveraging mass media and community platforms. The 19.8% of women lacking any knowledge should be given attention to ensure equitable awareness and support national malaria elimination efforts.

Keywords: Women of Reproductive Age; Determinant; Knowledge of Malaria Prevention Methods.

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Introduction

Malaria remains a major public health challenge globally and continues to pose significant risks to women of reproductive age in Nigeria.[1] Despite ongoing control efforts, the country accounts for approximately 27% of global malaria cases and 31% of malaria deaths.[2] Globally, 263 million malaria cases were reported in 2023, compared to 252 million cases reported in 2022, with an estimated 597,000 and 600,000 deaths in 2023 and 2022, respectively.[3] Africa has the largest burden of malaria, with 94%, while 95% of the reported deaths also occur in this region, with children under five accounting for 76% of these deaths that occur in the sub-Saharan African countries of Nigeria (30.9%), the Democratic Republic of the Congo (11.3%), Niger (5.9%) and the United Republic of Tanzania (4.3%).[3]

Malaria is a leading cause of morbidity and mortality in Nigeria, disproportionately affecting women of reproductive age.[4] Pregnant women are particularly vulnerable, as malaria infection during pregnancy can result in severe maternal anaemia, miscarriage, stillbirth, preterm delivery, and low birth weight.[5,6] Children under five, many of whom are born to women in malaria-endemic regions, also face high mortality risks, highlighting the intergenerational impact of malaria on families and communities.[7] According to the National Malaria Elimination Programme (NMEP) programme data, malaria accounts for 30% of childhood deaths, 11% of maternal deaths, 25% of deaths of children under one year, and 60% of health facility visits by outpatients in Nigeria.[8] Knowledge of malaria prevention methods among individuals is key to effective prevention of malaria. A study conducted in Indonesia reported awareness of nine malaria prevention methods among community members. These methods included sleeping under long-lasting insecticide-treated nets, sleeping under non-long-lasting insecticide-treated nets, using mosquito coils, maintaining clean household environments, wearing protective clothing outdoors at night, indoor residual spraying, covering ventilation points with anti-mosquito nets, and taking preventive malaria medication when residing in endemic areas. Overall, the study found that participants had low levels of comprehensive knowledge regarding malaria prevention practices.[9] In Ghana, socio-demographic characteristics were found to significantly influence knowledge of malaria prevention. Factors such as age, educational attainment, household wealth, religious affiliation, and place of residence were reported to be associated with variations in knowledge of malaria prevention. Women from households with higher wealth indices, those residing in rural areas, belonging to non-Islamic religious groups, and those with lower levels of education demonstrated higher odds of having greater knowledge of malaria prevention methods compared to their respective reference groups.[10]

Despite Nigeria's high malaria burden, nationally representative studies of the determinants of women's knowledge of malaria prevention remain few, among women with no knowledge of any malaria prevention method. Most previous studies have relied on older datasets or localised samples and have not incorporated the most recent nationally collected information. The 2021 Nigeria Malaria Indicator Survey provides the most up-to-date, high-quality, nationally representative data on malaria-related knowledge and household characteristics. Leveraging this dataset enables a comprehensive assessment of socio-demographic, economic, religious, and regional factors associated with malaria prevention knowledge among women aged 15–49 years, while addressing critical gaps left by earlier, outdated studies. Many studies have identified sociodemographic variables, including place of residence, age categories, religion, educational level, and wealth quintile, that impact women's knowledge of malaria prevention and control.[10–18] The effect of these variables on the knowledge of malaria prevention methods among women of reproductive age will be explored in this study to determine their relationships and inform the development of policies that guide informed decision-making and interventions.

Materials and Methods

Data Source

This study used the 2021 Nigeria Malaria Indicator Survey (NMIS) dataset of women of reproductive age. The 2021 NMIS is a cross-sectional study designed to provide survey indicators for urban and rural

areas, the country's six geopolitical zones, and the nation as a whole. The study is nationally representative, and a two-stage sampling technique was used to select the participants. The women's questionnaire was used to collect data on the variables of interest. The details of the methodology used for the survey have been described elsewhere.[19]

Variables Measures

The dependent variable for this study is Knowledge of Malaria Prevention Methods, which was created by the study participants' responses to questions on Malaria prevention Methods in the 2021 MIS. Women who cannot mention a malaria prevention method were graded as No Knowledge = 0, and those who can mention a malaria prevention method were graded as Have Knowledge = 1. Sociodemographic variables, whose data were collected in the primary survey and have been identified in the literature as affecting women's knowledge of malaria prevention methods, were included in the study as independent variables. They include age categories of the women, place of residence, educational level, religion, household wealth index, exposure to mass media and geopolitical zone. These variables were measured on the nominal scale. The coding of the variables is shown in the Appendix.

Data Management and Analysis

Data was analysed using Statistical Package for Social Sciences (SPSS) version 29. A total of 14,476 women aged 15–49 years were included, with no missing data. Sample weights from the Malaria Indicator Survey were applied to ensure national representativeness.[19] Multicollinearity was assessed using Variance Inflation Factors (VIF), and all predictors had values < 5 , indicating no serious multicollinearity concerns. Logistic regression analyses were used to examine associations between knowledge of malaria prevention and explanatory variables. Variables not significant at $p < 0.05$ in bivariable analyses were excluded from the multivariable model. Crude and adjusted odds ratios, along with 95% confidence intervals, are reported. Statistical significance was set at $\alpha = 0.05$. The large sample size provided adequate statistical power and precision of estimates.[18]

Ethical Procedures

The authors requested permission to use the dataset, which the DHS Programme granted to us to download the data for the study from https://dhsprogram.com/data/dataset/Nigeria_MIS_2021.cfm?flag=1. The approved procedure by the Institutional Review Board for DHS public-use datasets does not permit the identification of respondents, households, or sample communities. The data files do not contain personal identifiers of individuals or households.

Results

The sociodemographic characteristics of the study participants are shown in Table 1. A total of 14,476 women of reproductive age were included in the analysis. The study sample reflected a broad distribution across educational levels, age groups, and geopolitical zones. Most participants resided in rural areas, and a substantial proportion reported exposure to mass media. Educational attainment was generally low, with relatively few women having completed tertiary education. Younger women were more represented in the sample than older women. The “Other” category for religion was excluded due to insufficient sample size to support reliable estimates. Overall, the majority of women demonstrated knowledge of malaria prevention methods.

Table 1. Weighted Distribution of Sociodemographic Characteristics and Knowledge of Malaria Prevention Among Women Aged 15–49 Years in Nigeria

Predictors	Weighted Frequency (n)	Weighted Per cent (%)
Educational Level		
No Education	5156	35.6
Primary Education	2089	14.4
Secondary	5364	37.1
Tertiary	1867	12.9
Age Categories (Years)		
15-19	2793	19.3
20 – 24	2464	17.0
25 – 29	2660	18.4
30 – 34	2362	16.3
35 – 39	1964	13.6
40 – 44	1420	9.8
45 - 49	814	5.6
Place of Residence		
Urban	4641	32.1
Rural	9835	67.9
Household Wealth Index		
Poor Household Wealth Index	7721	29.4
Average Household Wealth Index	5557	21.2
Rich Household Wealth Index	12955	49.4
Religion		
Catholic	1057	7.3
Other Christian	4892	33.8
Islam	8470	58.5
Traditionalist	54	0.4
Other	3	0.0
Geopolitical Zone		
North-Central	2377	16.4

North-East	2399	16.6
North-West	4832	33.4
South-East	1111	7.7
South-South	1734	12.0
South-West	2023	14.0
Exposure to Mass Media		
No Exposure to Mass Media	6270	43.3
Exposed to Mass Media	8206	56.7
Knowledge of Malaria Prevention Methods		
No Knowledge	2862	19.8
Have Knowledge	11614	80.2

Fig 1. Distribution of knowledge of malaria prevention methods among reproductive-age women. The majority of women (80.2%, n = 11,614) demonstrated knowledge of malaria prevention methods, while 19.8% (n = 2,862) had no knowledge.

Table 2. Logistic Regression Results for Determinants of Malaria Prevention Knowledge in Nigerian Women

Predictors	COR (95% C.I.), p-value	AOR (95% C.I.), p-value
Educational Level	<i>p</i> < .001	<i>p</i> < .001
No Education	<i>Ref</i>	<i>Ref</i>
Primary Education	1.32 (1.17, 1.49); <i>p</i> < .001	1.27 (1.12, 1.45); <i>p</i> < .001
Secondary	2.15 (1.95, 2.63); <i>p</i> < .001	1.97 (1.71, 2.26); <i>p</i> < .001
Tertiary	6.18 (5.06, 7.56); <i>p</i> < .001	4.42 (3.48, 5.61); <i>p</i> < .001
Age Categories (Years)	<i>p</i> < .001	<i>p</i> < .001
15-19	<i>Ref</i>	<i>Ref</i>
20 – 24	1.08 (.94, 1.23); <i>p</i> = .28	1.15 (1.00, 1.32), <i>p</i> = .05
25 – 29	1.04 (.92, 1.19); <i>p</i> = .52	1.13 (.98, 1.30), <i>p</i> = .08
30 – 34	1.17 (1.02, 1.34); <i>p</i> = .02	1.33 (1.15, 1.54), <i>p</i> < .001
35 – 39	1.35 (1.17, 1.57); <i>p</i> < .001	1.52 (1.30, 1.78), <i>p</i> < .001
40 – 44	1.20 (1.02, 1.41); <i>p</i> = .03	1.39 (1.17, 1.65), <i>p</i> < .001
45 - 49	1.26 (1.04, 1.55) <i>p</i> = .02	1.48 (1.19, 1.84), <i>p</i> < .001

Place of Residence		
Urban	Ref	Ref
Rural	.54 (.49, .59); $p < .001$.98 (.87, 1.09) $p = .66$
Household Wealth Index	$p < .001$	
Poor Household Wealth Index	Ref	Ref
Average Household Wealth Index	1.33 (1.19, 1.48); $p = < .001$	1.25 (1.11, 1.41); $p < .001$
Rich Household Wealth Index	2.95 (2.68, 3.25); $p < .001$	1.90 (1.63, 2.22); $p < .001$
Geopolitical Zone	$p < .001$	
North-Central	Ref:	<i>Ref</i>
North-East	1.23 (1.07, 1.41); $p = .004$	2.16 (1.85, 2.52); $p < .001$
North-West	1.28 (1.14, 1.44); $p < .001$	2.11 (1.84, 2.42); $p < .001$
South-East	1.93 (1.59, 2.34); $p < .001$.96 (.77, 1.20); $p = .73$
South-South	.76 (.66, .87), $p < .001$.38 (.32, .45); $p < .001$
South-West	2.97 (2.49, 3.54); $p < .001$	1.52 (1.25, 1.84); $p < .001$
Religion	$p < .001$	$p = .004$
Catholic	Ref	Ref
Other Christian	1.87 (.73, 1.04), $p = .13$.96 (.78, 1.17), $p = .67$
Islam	.73 (.61, .86), $p < .001$.78 (.63, .97), $p = .02$
Traditionalist	.37 (.21, .67), $p < .001$.45 (.24, .84), $p = .01$
Exposure to Mass Media		
No Exposure to Mass Media	Ref	Ref
Exposed to Mass Media	2.41 (2.22, 2.62), $p < .001$	1.52 (1.35, 1.69), $p < .001$

Table 2 shows the crude and adjusted odds ratios from the bivariable and multivariable logistic regression analyses. Women with higher levels of education, primary education (AOR =1.27: 95% CI;1.12, 1.45), secondary education (AOR =1.97: 95% CI;1.71, 2.26), and tertiary education (AOR =4.42: 95% CI;3.48, 5.61) were more statistically significantly likely to have knowledge of malaria prevention methods than those with no education. Apart from women who are in the age categories of 20-24 and 25-29 who did not show any difference in their knowledge of malaria prevention methods compared to those in the age category of 15-19 years, others in the age categories between 30 to 49 were statistically significantly more likely to have knowledge of malaria prevention methods than those in the age category of 15-19 years at Alpha = .05. There was no statistically significant difference in the knowledge of malaria prevention methods between women living in urban and rural areas (AOR = .98: 95% CI; .87, 1.09). Women exposed to mass media (AOR = 2.41; 95% CI, 2.22, 2.62) were statistically significantly

more likely to have knowledge of Malaria prevention methods than those without exposure to mass media.

There was no difference in the knowledge of malaria prevention methods between women of Catholic religion and other Christian religions (AOR = .96: 95% CI; .78, 1.17), while women of Islamic (AOR = .78: 95% CI; .63, .97) and traditionalist religions (AOR = .45: 95% CI; .24, .84) were statistically significantly less likely to have knowledge of malariaprevention methods than women of Catholic faith.

Women from households with average wealth index (AOR = 1.25: 95% CI; 1.11, 1.41) and rich wealth index (AOR = 1.90: 95% CI; 1.63, 2.22) were more statistically significantly likely to have knowledge of Malaria prevention methods than those from households with poor wealth index. Apart from women of reproductive age from the south-east region of Nigeria who did not show any difference in their knowledge of malaria prevention methods with those from the north-central region (AOR = .96: 95% CI; .77, 1.20), women from other geopolitical zones of the country showed a statistically significant difference in their knowledge of malaria prevention methods with those of women from the north-central region.

Discussion

Main Findings

This study examined the sociodemographic factors influencing women of reproductive age's knowledge of malaria prevention methods in Nigeria. The findings showed that all the included variables, except place of residence, were statistically significantly associated with knowledge of malaria prevention methods at an α level of 0.05. Higher levels of education, older age, higher household wealth index, exposure to mass media, and religious affiliation were all positively associated with greater knowledge of malaria prevention. These findings highlight the uneven distribution of malaria knowledge across different population subgroups, suggesting the need for context-specific health education strategies.

Comparison with Previous Studies

Women with higher educational attainment had significantly greater knowledge of malaria prevention methods than those with no formal education. This finding is supported by previous studies conducted in Nigeria by Anene-Okeke et al. and Oladimeji et al., which showed that increased educational status enhances understanding of disease prevention strategies.[14,15] This may be attributed to women with higher educational status having more knowledge and information about their health status.[20] Age was also significantly associated with knowledge of malaria prevention methods. Older women demonstrated greater knowledge than their younger counterparts, a finding consistent with studies conducted in Malawi, Mozambique, and Nigeria.[14,18,21] This finding may be related to older people being more experienced caregivers and having more previous exposures to malaria than the younger ones.[10,21]

This study also found that women from higher wealth index households demonstrated greater knowledge of malaria prevention methods than those from lower wealth index households. Cross-country findings by Afai et al. in Mozambique and Ayanore et al. in Ghana supported this finding.][10,18] In contrast, poorer households may face structural barriers, including limited access to radio, television, and mobile internet services, as well as fewer interactions with health workers.[22,23] Exposure to mass media emerged as a strong determinant of knowledge of malaria prevention methods. Women who reported being exposed to mass media had significantly higher knowledge levels than those who were not exposed. Previous studies have similarly noted the role of media campaigns in improving knowledge of malaria prevention methods.[17,21,24] In Nigeria, radio and television remain critical channels for disseminating malaria-related messages, especially during national malaria control campaigns.

Religion was another significant factor influencing knowledge of malaria prevention methods. Catholic women were found to differ significantly in knowledge from women affiliated with Islamic and Traditionalist religions. A similar pattern was reported in a study in Ghana.[10] These variations may be shaped by underlying sociocultural and regional differences, including disparities in education, healthcare access, and community health outreach efforts between Southern and Northern Nigeria.[25] The lack of difference reported between the Other Christians and the Catholic religion may be attributed to both being sub-groups of the Christian Religion

Implications for Policy and Practice

These findings have important public health implications. First, they underscore the need for targeted health education interventions aimed at women who are younger, possess lower formal education, and belong to lower-wealth households. Such groups are at higher risk of limited knowledge of malaria prevention methods, which may translate into poor prevention practices and increased vulnerability to infection.

Second, mass media campaigns should continue to be prioritised as part of malaria prevention strategies. However, messaging must be tailored to reach underserved groups, particularly women in rural or low-income settings where access to media may be limited. Expanding use of mobile phone messaging, community radio, and social media platforms may improve reach and engagement.

Third, culturally sensitive approaches are needed to address observed religious and regional disparities. Collaboration with religious leaders, community gatekeepers, Islamic organisations, and traditional institutions may help improve the acceptability and uptake of malaria prevention messages. Community-based outreach workers and peer educators can also play a crucial role in bridging knowledge gaps.

Finally, malaria prevention programmes should incorporate considerations of educational status and socioeconomic context in designing communication and intervention strategies. Policies that promote female education and reduce income inequality may indirectly contribute to improved malaria awareness and prevention practices.

Limitations of the Study

The cross-sectional design of the primary survey data prevents the establishment of causal relationships between sociodemographic characteristics and malaria knowledge. Additionally, the use of self-reported data from the National Malaria Indicator Survey introduces the possibility of recall and social desirability bias. The analysis was also limited to variables collected in the primary dataset; therefore, unmeasured confounders such as cultural beliefs, health system exposure, and frequency of malaria episodes may have influenced the findings. Residual confounders may have impacted the study's findings.

Conclusion

Educational level, age, household wealth, religion, geopolitical zone, and exposure to mass media significantly influenced Nigerian women's knowledge of malaria prevention methods, while place of residence did not. Women who were more educated, older, wealthier, exposed to mass media, or from certain religious groups were more likely to be knowledgeable. These findings highlight sociodemographic and religious disparities that should guide targeted health education and malaria prevention interventions. Malaria prevention programmes should prioritise vulnerable subgroups and leverage mass media and community-based communication channels to improve nationwide knowledge of malaria prevention methods.

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Appendix

S/N	Variable	Coding
1	Knowledge of Malaria Prevention Method	Women who cannot mention a malaria prevention method were graded as No Knowledge = 0, and those who can mention a malaria prevention method were graded as Have Knowledge = 1.
2	Age Categories of Women	The age of the women was categorised in ascending order into five-year interval groups (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49).
3	Place of Residence	Place of Residence was coded as (Urban = 1; Rural = 2)
4	Educational Level	Educational Level was coded as (No Education = 0, Primary Education = 1, Secondary Education = 2 and Higher Education = 3);
5	Religion	Religion coded as (Catholic = 1, Other Christian = 2, Islam = 3, Traditionalist = 4, and Other = 96)
6	Household wealth index	Household wealth index coded as (poor household wealth index = 0 (combining poorest and poorer), average household wealth index coded = 1, rich household wealth index = 2 (combining richer and richest)
7	Exposure to Mass Media	Exposure to Mass Media variable was created by combining the frequency of reading newspaper or magazine, listening to radio and watching television. No Exposure to Mass Media was coded as 0 if the respondent was not exposed to any of the media mentioned, and 1 if the participant was exposed to at least one of these media.
8	Geopolitical Zones	Coded as North-Central = 1, North-East = 2, North-West = 3, South-East = 4, South-South = 5 and South-West = 6