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Malaria knowledge and preventive practices among caregivers of under-five children in Southwest Nigeria

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The knowledge and practice of malaria prevention and treatment among caregivers of children under the age of five is critical to reducing the morbidity and mortality caused by malaria in the under-five population. This study, therefore, assessed the knowledge and practices of caregivers of children under five years in Southwestern Nigeria towards malaria prevention. A hospital-based, cross-sectional study was conducted using a pretested, semi-structured, interviewer-administered questionnaire. Data were analyzed using multiple logistic regression analysis. Out of the 797 caregivers surveyed, 689 (86.4%) demonstrated good knowledge of malaria. Caregivers from Ondo and Ogun States had significantly higher odds of good malaria knowledge compared to those from Osun State. Good knowledge was significantly associated with better malaria prevention practices ($OR = 2.347$, $95\% CI = 1.251$ – 4.406 , $p = 0.008$). The study found that over half of caregivers possessed good knowledge of malaria, which was significantly associated with better prevention practices in children under five. These findings offer valuable insights for targeted public health interventions aimed at malaria control in Nigeria.

Keywords Knowledge, Practice, Malaria prevention, Caregivers, Under 5 children, Nigeria

Malaria is a major preventable cause of death for children worldwide, especially in tropical and sub-tropical areas, even though there are numerous intervention efforts to control and eradicate malaria^{1,2}. Globally, there are 263 million cases of malaria, with an incidence of 60.4 cases per 1000 at-risk individuals, according to a recent World Health Organization estimate³. In 2023, Nigeria accounted for 26% of all malaria cases worldwide, placing it among the top five nations with the highest estimated malaria burden³. With a mortality rate of 13.7 per 100,000, malaria is expected to have killed 597,000 people in 2023 alone³. Global efforts to control, eradicate, and eradicate malaria are seriously hampered by the concerning statistics. One such goal is the third Sustainable Development Goal of the United Nations, which aims to reduce malaria incidence and mortality by 90% and eradicate malaria in at least 35 endemic countries by 2030⁴. The World Health Organisation (WHO) estimates that a child in sub-Saharan Africa dies from malaria every two minutes⁵. According to the Malaria Indicator Survey (MIS) 2021 in Nigeria, the percentage of children with fever who had blood diagnostic testing in the South West Zone, reached its zenith in 2015 at 29%, subsequently decreased to 26% in 2018, and stayed constant in 2021⁶.

Poor caregivers' knowledge or incorrect practices can result in delayed treatment, increased morbidity, and preventable deaths⁷. Therefore, caregivers' knowledge and implementation of malaria preventive and treatment strategies could have significant impact in reducing morbidity and mortality rates from malaria among children under five.

According to a previous study conducted in Ethiopia, parents can play a critical role in the control of malaria by being aware of the disease, taking preventive measures like using mosquito nets treated with insecticide, helping the community eradicate mosquito breeding grounds, and promptly seeking treatment for their

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children⁸. In reality, a number of factors have been identified as contributing to the poor outcomes of malaria, such as the absence of maternal information regarding preventive measures and the women's lack of self-efficacy in administering the necessary medication⁹. Ineffective malaria control efforts may be hampered by parents who are reluctant to take preventive action and disseminate correct information, which could result in their children inheriting false beliefs¹⁰. To effectively direct targeted public health promotion programs, it is necessary to examine parents' knowledge and practices about malaria control.

Malaria control programs should ultimately focus on understanding the knowledge, attitudes, and practices (KAP) of the community and the adherence to malaria control and preventative measures by caregivers of children under five¹¹. This can be achieved through health education. Among Nigerian caregivers of children under five, a recent study on their knowledge of the new malaria vaccine assessed the effectiveness of these preventive measures as low¹². Understanding the knowledge and practices of malaria control among parents and guardians in endemic countries such as Nigeria is essential for the successful implementation of malaria preventive methods¹³. Therefore, the purpose of this study was to evaluate the knowledge and practices of caregivers of children under five in Southwestern Nigeria about the prevention and treatment of malaria.

Materials and methods

Study design

This study adopted a hospital-based, cross-sectional design to assess the knowledge and practices of caregivers regarding the prevention and treatment of malaria among children under five years old in South West Nigeria.

Study setting

The study was carried out in a mixed urban, peri-urban, and rural area in Southwestern Nigeria from November 20, 2023 to February 29, 2024. This region is one of Nigeria's six geopolitical zones and includes the states of Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo. The Yoruba ethnic group mostly inhabits the area, and their cultural legacy influences much of the region's social fabric. The climate is tropical, with a dry season from November to March and a rainy season from March to October—characterized by high humidity and stagnant water bodies. This offers optimal conditions for malaria transmission.

As of 2018, the South West was home to over 50.4 million people, accounting for roughly 22% of Nigeria's population¹⁴, with estimates showing continued expansion in the following years. Households are frequently made up of extended families, with a large number of children under the age of 5. Literacy levels vary and are lower in rural locations, influencing health information uptake. The majority of residents engage in farming, petty trading, or informal labour, with low income and extreme poverty restricting access to healthcare and insecticide-treated nets. Health information is primarily accessed by radio, television, and mobile phones.

The region also has a dense network of healthcare institutions, which supports a wide range of malaria prevention and treatment programs in its various communities. Primary healthcare facilities do exist, but they are underfunded, therefore carers frequently rely on patent medicine dealers, community health workers, and traditional healers. The region has a high malaria burden, with national surveys indicating a high frequency among children under the age of five. Many homes lack protective window screens or constant net use, and proximity to aquatic bodies further heightens malaria exposure risk. Previous malaria control programs, such as ITN distribution, have been carried out, although with varying success^{15,16}. Therefore, Southwest Nigeria was chosen for its high malaria burden, urban-rural mix, and diverse socioeconomic characteristics, all of which provided representative insights. This is to provide an evidence framework for region-specific malaria control plans, which will guide focused health education, ITN distribution, and better care-seeking activities to minimize child morbidity and mortality.

Study population

Eligible respondents were caregivers of children under five years of age who attended the selected hospitals within the study period. Within each hospital, participants were recruited through a balloting process, which provided each eligible caregiver an equal chance of selection.

Inclusion criteria: caregivers of children under five years of age who provided written informed consent to participate, who were permanent residents of one of the states in South West Nigeria and at least 18 years old at the time of enrollment to ensure legal capacity for consent. **Exclusion criteria:** caregivers who declined to provide consent were excluded from the study, who were critically ill and unable to participate and those who are not residing in any of the states in South West Nigeria or those below 18 years of age were also excluded.

Sampling technique

A multistage sampling technique was employed to ensure the study's participants were representative of caregivers of children under five years old across the South West geopolitical zone of Nigeria. The sampling process include:

Four states were randomly selected from the six states in the South West region using a simple random sampling technique. This initial step ensured broad geographical coverage and diversity within the study population.

For each of the selected states, a comprehensive list of all Local Government Areas (LGA) was obtained. One LGA was then chosen from each state using a simple random sampling method, further enhancing the representativeness of the sample.

Within each selected LGA, two hospitals were purposefully chosen—one government-owned and one non-government (private) hospital. This dual selection ensured that the study captured perspectives from both public and private healthcare settings, reflecting the full spectrum of care available to caregivers and their children.

Within each hospital, eligible caregivers of children under five years old were identified. To minimize selection bias and ensure fairness, participants were recruited using a balloting system. This approach gave every eligible caregiver an equal opportunity to participate in the study.

Sample size determination

The sample size for this study was calculated using the Leslie Kish formula ($n = Z^2 p(1-p)/e^2$ ¹⁷) for a single proportion, which is widely used for health research surveys. The following assumptions were made: a 95% confidence level ($Z = 1.96$), an estimated proportion (p) of 0.5 to ensure the maximum sample size, and a precision (margin of error) of 5% ($e = 0.05$). To account for potential non-response, a 10% adjustment was included. A minimum sample size of 422 was determined for each group (government and non-government hospitals), resulting in a total required sample size of 844. Of these, 797 questionnaires were completed and analyzed, yielding a response rate of 94.4%.

Study instrument

The study employed a pretested, semi-structured, interviewer-administered questionnaire. The questionnaire consisted of 27 items designed to comprehensively assess the knowledge and practices of caregivers regarding malaria prevention and treatment among children under five years of age. The questionnaire was divided into 2 sections namely; (i) participants sociodemographic characteristics and (ii) knowledge and practice of caregivers towards malaria prevention and treatment.

For both knowledge and practice of malaria, correct response was scored as 1 while wrong response was scored 0. Knowledge of malaria was assessed based on the ability to identify the major cause of malaria, transmission of malaria as well as their ability to identify the right drug for treatment. For the practice of malaria, it was assessed based on their practice of malaria treatment, possession of ITN and use of ITN. The total obtainable score on both scales was 3 and a score from 2 and above was classified as good knowledge or good practice of malaria while a score below 2 was classified as poor knowledge or practice. This aligned with established KAP frameworks¹⁸.

To ensure validity, the questionnaire was developed based on a thorough review of relevant literature and expert consultation, aligning its content with established tools and guidelines for similar studies. Face and content validity were further confirmed by a panel of experts in public health and malaria research. Additionally, the questionnaire which was prepared in English language was translated into the local language and back-translated to English to ensure linguistic accuracy and cultural appropriateness.

For the validity purpose, the instrument was pretested on a group of 10 respondents who are part of the population, feed backs on unclear or sensitive questions were collected and the questionnaire was revised to address any gap identified. For the reliability of the instrument, the instrument was also pretested in 30 respondents who do not necessarily part in the main study but are part of the population. Data obtained were subjected to Kuder- Richardson Formula 20 (KR-20) and the result yielded reliability coefficient of 0.76 indicating a reliable instrument.

Data quality was assured through several strategies: real-time review of completed questionnaires by field supervisors to identify and address omissions or inconsistencies, double data entry by independent personnel to reduce input errors, and regular team meetings to resolve operational challenges. These measures collectively enhanced the reliability and accuracy of the data collected.

Method of data collection

Data for this study were collected using a pretested, semi-structured, interviewer-administered questionnaire. At each study site, trained research assistants explained the study's objectives, inclusion and exclusion criteria, and the voluntary nature of participation to all potential participants. Written informed consent was obtained from each caregiver before enrollment. The questionnaire was administered face-to-face by the research assistants, who received standardized training.

Statistical analysis

All completed questionnaires were carefully coded and entered into a computer database to ensure data integrity. Data analysis was performed using IBM SPSS Statistics version 20.0. Statistical significance was assessed at the 5% level, with p-values less than 0.05 considered statistically significant.

Descriptive statistics were used to summarize the data: frequencies and percentages were calculated for categorical variables, while means were computed for quantitative variables. To identify factors associated with caregivers' knowledge and practice of malaria prevention and treatment, multiple binary logistic regression analyses were conducted. The results were reported as odds ratios (OR) with corresponding 95% confidence intervals.

Ethical consideration

The study was done in adherence to the tenet of Helsinki Declaration for conducting study among human participants. Formal ethical protocol was rigorously reviewed and received ethical clearance from the National Health Research Ethics Committee of Nigeria (NHREC) under the approval number NHREC/01/01/2007-12/11/20,233. This approval ensures that the research conforms to the Nigerian National Code for Health Research Ethics and upholds the highest standards for participant protection. Prior to enrollment, written informed consent was obtained from all parents or legal guardians of the children involved in the study.

Results

Demographics of the respondents

The demographics of the respondents is presented in Table 1. Result shows that the majority of the respondents were female, 703 respondents (88.2%). The average age of the respondents was computed to be 32.12 ± 6.39 years. The state distribution of the respondents indicates that most of the respondents were recruited from Ogun state. More than half of the respondents were Christians, 597(74.9%) and the majority have tertiary education, 470(59.0%) while in terms of their income distribution, the majority earned less than 50,000 monthly.

Knowledge and practice of malaria among caregivers of under 5-children in South West Nigeria

Result presented in Table 2 shows their level of knowledge and practice of malaria among the under 5 years caregivers in the study area. The study found that only 463 respondents (58.1%) of the 797 caregivers were able to identify the major cause of malaria though 90.0% correctly identified Mosquito particularly female anopheles' mosquito as the agent of transmission of malaria. In terms of their practice, less than half of the respondents' visits hospital to treat malaria, 391 (49.1) with only 45.7% of the caregiver were able to identify the use of insecticides, 45.7% followed by the use of Mosquito net (28.9%) as the ways to prevent getting malaria. The result also established that of the 797 respondents, only 350(43.9%) sleep under insecticides treated net while more than of the respondents, 447(56.1%) did not sleep under insecticide treated net the night prior to the interview.

Factors associated with knowledge of malaria among caregivers of under 5 years in South West Nigeria

Result in Table 3 reveals that out of the 797 caregivers of under 5 that participated in the study, 689(86.4%) had good knowledge of malaria while 108(13.6%) had poor knowledge of malaria. The distribution of their knowledge of malaria based on their demographics characteristics is presented in Table 3. The result shows that states ($p=0.038$), education ($p<0.001$), religion ($p<0.001$) were found to be significantly associated with the knowledge of malaria among the caregiver of under 5 years in south west Nigeria. The prevalence of good knowledge of malaria among caregivers of under 5 years in Ondo state (90.0%) was higher than that of Ogun state (87.4%), Oyo state (85.1%) and Osun state (78.6%). Result also shows that caregiver that have tertiary education reported better knowledge of malaria than their counterparts with no formal education, primary, secondary or have other educational qualifications (Table 3).

Factors associated with practice of malaria among caregivers of under 5 years in South West Nigeria

In terms of practice of malaria, result reveals that 716 caregivers representing 89.8% have good practice of malaria while 81 respondents (10.2%) have poor practice of malaria. Result showed that their practice of malaria was significantly associated with their knowledge of malaria ($p=0.006$), the state ($p<0.001$), religion ($p=0.031$) and

Demographics variables	Number of Respondents ($n=797$)	Percentage (%)
Gender		
Male	94	11.8
Female	703	88.2
State		
Osun State	103	12.9
Oyo State	194	24.3
Ondo State	239	30.0
Ogun State	261	32.7
Religion		
Christianity	597	74.9
Islam	189	23.7
Others	11	1.4
Education		
No formal education	16	2.0
Primary	33	4.1
Secondary	239	30.0
Tertiary	470	59.0
Others	39	4.9
Income (Naira)		
Less than 50,000	232	29.1
50,000–100,000	314	39.4
More than 100,000	105	13.2
Unwilling to disclose	146	18.3

Table 1. Demographics of the respondents.

Variables	Number of Respondents	Percentage (%)
What causes Malaria		
Plasmodium	463	58.1
Mosquito	43	5.4
Dirt	1	0.1
Stress	134	16.8
Sunlight	58	7.3
Filaria parasite	52	6.5
Don't know	1	0.1
Others	45	5.6
How is malaria transmitted		
Mosquito	717	90.0
Stress	1	0.1
High temperature	58	7.3
Others	21	2.6
How do you treat malaria		
Buy drug from Pharmacy	182	22.8
Buy drug from Chemist	40	5.0
Go for test and buy drugs	97	12.2
Visit the hospitals	391	49.1
Use herbs	3	0.4
Home Nurse	1	0.1
Others	83	10.4
How do you prevent getting malaria		
Close windows	3	0.4
Environmental control	1	0.1
Mosquito coil and local repellants	75	9.4
Herbs	1	0.1
Other chemicals	19	2.4
Nothing	20	2.5
Protecting clothing	1	0.1
Mosquito net	230	28.9
Insecticides	364	45.7
Others	83	10.4
Did you sleep under insecticides treated net previous night		
Yes	350	43.9
No	447	56.1

Table 2. Knowledge and practice of malaria among caregivers of under 5-children in South West Nigeria.

education ($p=0.013$). The percentage of caregiver that have good knowledge of malaria and also good practice about malaria were significantly higher (91.0%) than their counterparts in other categories (Table 5) (Table 4).

Multiple logistic regression results of factors associated with knowledge and practice of malaria

The multiple logistic regression results in Table 5 provides the analysis of the multiple factors that are significantly associated with knowledge of malaria and practice of malaria. Result shows that both state, religion and education were significantly associated with knowledge of malaria. There was a significant higher odd of good knowledge of malaria in Ondo state ($OR = 3.366$, $C.I = 1.535-7.379$) and Ogun state ($OR = 3.074$, $C.I = 1.444-6.543$) compared to that of Osun and Ekiti states. For practice of malaria, state and knowledge was found to be significantly associated with the practice of malaria ($p < 0.05$). The odds of good practice of malaria was significantly higher among caregivers with good knowledge of malaria than those that have poor knowledge of malaria ($OR = 2.347$, $C.I = 1.251-4.406$, $p = 0.008$).

Discussion

This cross-sectional study offers valuable insights on the knowledge and practices of malaria preventive and treatment measures among caregivers of under 5-children in South West Nigeria. In this study, we assessed the knowledge level of the respondents on the causative agent of malaria and determined their understanding of the role of mosquito in malaria transmission. Notably, our study determined the respondents' understanding of optimal health-seeking behavior, particularly their knowledge of the necessity for quick medical attention at

Demographics variables	Poor	Good	Total	χ^2 -cal.	p-value
Gender					
Male	12(12.8)	82(87.2)	94	0.056	0.813
Female	96(13.7)	607(86.3)	703		
State					
Osun State	22(21.4)	81(78.6)	103		
Oyo State	29(14.9)	165(85.1)	194	8.38	0.038*
Ondo State	24(10.0)	215(90.0)	239		
Ogun State	33(12.6)	228(87.4)	261		
Religion					
Christianity	63(10.6)	534(89.4)	597	23.49	0.000**
Islam	40(21.2)	149(78.8)	189		
Others	5(45.5)	6(54.5)	11		
Education					
No formal education	5(31.2)	11(68.8)	16	49.946	0.000**
Primary	10(30.3)	23(69.7)	33		
Secondary	47(19.7)	192(80.3)	239		
Tertiary	33(7.0)	437(93.0)	470		
Others	13(33.3)	26(66.7)	39		
Income (Naira)					
Less than 50,000	41(17.7)	191(82.3)	232		
50,000–100,000	37(11.8)	277(88.2)	314	5.085	0.166
More than 100,000	11(10.5)	94(89.5)	105		
Unwilling to disclose	19(13.0)	127(87.0)	146		

Table 3. Factors associated with knowledge of malaria among caregivers of children under 5 years in South West Nigeria.

a hospital for their children's malaria treatment. It is quite delightful that the majority of our respondents had good practice of malaria. The study also assessed level of utilization of insecticide treated nets (ITN). This is very important for malaria control in highly endemic countries like Nigeria.

Remarkably, this study showed that over half of the population studied had good knowledge of the causative agent of malaria as Plasmodium with nine out of ten of the respondents also stating that mosquito plays a key role in the transmission of malaria among children. A study by Oreagba et al., in Ogun state found the majority, 65% of population studied attributing malaria to mosquito bite¹⁹. Also, the finding in this present study is similar to that of Prince Adum et al. from Ghana who found that about 97% of the population attributed the causative factor of malaria to mosquito bite²⁰. On the contrary, a study from an urban slum in Jos, northern Nigeria by Daboa et al., found only 24.9% attributing malaria to mosquito bite²¹. The difference in these findings may be related to the lower level of education among the population studied in Jos, with the majority of the population having primary level of education. Similarly, Orimadegun et al. in a rural settlement found only 14.2% ascribed malaria to mosquito bite²².

Furthermore, this present study found that nearly half of the population knew that the child with malaria should be taken to the hospital for treatment. However, a good number would rather buy drugs from the pharmacy; a poor practice that could contribute to the high burden of malaria and also promote resistance to antimalarial drugs. This is in contrast with the findings of a study by Oreagba where the majority of the population both in the rural and urban settlement would rather visit the health centre or hospital for treatment¹⁹. This indeed is a good practice that reduces the burden of malaria among under five children. Also, a higher percentage of population 65% in the northern Nigeria study by Dabober took their wards to the hospital for treatment of malaria while 23% and 10% treated their wards at home and with the help of herbalists respectively²¹. A similar trend was documented by Adum in Ghana where the majority of the population studied sought treatment from the hospital²⁰. The general population must be oriented towards a good health-seeking behaviour in the treatment of malaria to effectively reduce the overall burden of malaria.

Our study also assessed the knowledge of the parents on the prevention of malaria. It was found that while a large number of the respondents [45.7%] believed in the use of insecticides to prevent malaria, only 28.9% of them knew about the use of mosquito net, a cost-effective means of prevention. Similarly, majority of the population do not sleep under insecticide treated nets. On the contrary, Orimadegun documented that 70% of population believed in the use of insecticide treated nets (ITN) as the sole means of prevention²². A study from Sokoto, Nigeria by Yunusa et al., reported a higher usage of ITN in 87.6% of the population studied²³. It has been clearly documented by Bayode in a study done in Akure, Ondo State, Nigeria and Tsegaye in Ethiopia that the use of insecticide treated net is associated with low risk of malaria among under five children^{24,25}.

Underutilization of ITNs observed in this study has important policy implications, given the reported decline in the efficacy of intermittent preventive treatment (IPTi) reported in a recent study in Nigeria²⁶. Insecticide-

Factors	Practice of Malaria				
	Poor	Good	Total	χ^2 -cal.	p-value
Gender					
Male	10(10.6)	84(89.4)	94	0.026	0.871
Female	71(10.1)	632(89.9)	703		
State					
Osun State	4(3.9)	99(96.1)	103	32.155	0.000**
Oyo State	12(6.2)	182(93.8)	194		
Ondo State	16(6.7)	223(93.3)	239		
Ogun State	49(18.8)	212(81.2)	261		
Religion					
Christianity	51(8.5)	546(91.5)	597	6.971	0.031*
Islam	28(14.8)	161(85.2)	597		
Others	2(18.2)	9(81.8)	11		
Education					
No formal education	1(6.2)	15(93.8)	16	12.731	0.013*
Primary	6(18.2)	27(81.8)	33		
Secondary	34(14.2)	205(85.8)	239		
Tertiary	40(8.5)	430(91.5)	470		
Others	0(0.0)	39(100.0)	39		
Income (Naira)					
Less than 50,000	24(10.3)	208(89.7)	232	5.369	0.147
50,000–100,000	39(12.4)	275(87.6)	314		
More than 100,000	5(4.8)	100(95.2)	105		
Unwilling to disclose	13(8.9)	133(91.1)	146		
Knowledge of malaria					
Poor	19(17.6)	89(82.4)	108	7.553	0.006**
Good	62(9.0)	627(91.0)	689		

Table 4. Factors associated with the practice of malaria among caregivers of children under 5 years in South West Nigeria.

treated nets (ITNs) and intermittent preventive treatment in infancy (SP-IPTi) are two key recommended, evidence-based interventions that use complementary mechanisms to prevent malaria in early childhood^{27–29}. While ITNs minimize the likelihood of mosquito bites and, consequently, malaria transmission, SP-IPTi provides chemoprophylaxis, which reduces parasitemia during peak transmission seasons even if bitten. When applied jointly, these strategies provide both a physical barrier and pharmaceutical protection, resulting in a synergistic benefit in lowering malaria episodes and infant death²⁷.

Underutilization of ITNs and declining effectiveness of IPTI could jeopardize malaria control gains if not addressed promptly.

This present study demonstrated that majority (89.9%) of the population studied had good practice of malaria. The higher percentage was associated with the knowledge of the respondents on malaria, their level of education, the state of domicile and religion. The level of education, religion and place of domicile were important factors that contributed to the knowledge and practice of malaria among the study subjects in this study. This is in sharp contrast with the findings of a study in Yemen where malaria prevention practices were rated as poor³⁰. This discrepancy may be attributable to the difference in the culture and social structure of the respondents in the two settings. The level of education of the respondents could also be a possible reason for these observed differences.

The findings of this study highlight the necessity for sustainable, targeted, and state-specific malaria control efforts in Southwestern Nigeria. Although the majority of caregivers demonstrated strong knowledge and practice, considerable variations among states, combined with inadequate use of highly effective preventive interventions like insecticide-treated nets, suggest that a one-size-fits-all approach may be insufficient. State health ministries, in collaboration with the National Malaria Elimination Programme (NMEP), should create culturally relevant health education campaigns that address local knowledge gaps, encourage prompt health-seeking behaviour, and dispel myths about malaria prevention and treatment. Malaria education can be integrated into routine mother and child health services, particularly during antenatal and vaccination visits, to ensure caregivers receive repeated exposure to essential themes.

Addressing the impact of education and religious affiliation on knowledge and practices necessitates collaboration with educational institutions, faith-based organizations, and community leaders to promote appropriate malaria prevention behaviours. By synchronizing these strategies with Nigeria's malaria elimination targets, policymakers can expedite advancements in reducing morbidity and mortality among children under five, ultimately fulfilling national and global malaria control aspirations.

Factors	Knowledge of Malaria		Practice of Malaria	
	OR [C.I]	p-value	OR [C.I]	p-value
Gender				
Male	1.00[reference]			
Female	0.940[0.449–1.969.449.969]	0.869	0.811[0.377–1.742.377.742]	0.591
Age	0.975[0.942–1.009.942.009]	0.142	1.028[0.988–1.069.988.069]	0.177
State		0.010*		0.000**
Osun State	1.00[reference]			
Oyo State	2.002[0.927–4.325.927.325]	0.077	0.776[0.227–2.651.227.651]	0.685
Ondo State	3.366[1.535–7.379]	0.002	0.682[0.207–2.252.207.252]	0.530
Ogun State	3.074[1.444–6.543]	0.004	0.219[0.071–0.673.071.673]	0.008
Religion				
Christianity	1.00[reference]			
Islam	3.939[0.931–16.673.931.673]	0.063	2.434[0.381–15.539.381.539]	0.347
Others	1.946[0.458–8.267.458.267]	0.367	1.925[0.303–12.220.303.220]	0.488
Education		0.000**		0.624
No formal education	1.00[reference]			
Primary	0.688[0.177–2.675.177.675]	0.590	0.181[0.017–1.881.017.881]	0.152
Secondary	1.215[0.376–3.925.376.925]	0.745	0.271[0.030–2.436.030.436]	0.244
Tertiary	4.197[1.258–13.996]	0.020	0.318[0.035–2.909.035.909]	0.310
Others	0.704[0.172–2.875.172.875]	0.625	0.554[0.0342–1.823.0342.823]	0.998
Income (Naira)		0.402		0.234
Less than 50,000	1.00[reference]			
50,000–100,000	1.440[0.839–2.471.839.471]	0.186	0.922[0.514–1.654.514.654]	0.785
More than 100,000	1.405[0.649–3.043.649.043]	0.388	2.563[0.905–7.264.905.264]	0.076
Unwilling to disclose	1.701[0.852–3.395.852.395]	0.132	0.915[0.421–1.989.421.989]	0.822
Knowledge of malaria				
Poor	NA		1.00[reference]	
Good	NA		2.347[1.251–4.406]	0.008**

Table 5. Multiple logistic regression showing factors associated with knowledge and practice of malaria among caregivers of children under 5 years in South West Nigeria. NA- not applicable, **significant at 1% ($p < 0.01$), *significant at 5% ($p < 0.05$).

Strengths and limitations

The study utilized a validated and pretested instrument to attain a high response rate of 94.4% with 797 respondents, hence enhancing the representativeness and reliability of the findings. The substantial sample size increases the statistical power and generalizability of the findings in Southwestern Nigeria. The use of multistage sampling, which includes both public and private institutions in four randomly selected states, ensures wide geographic and institutional representation. This improves the external validity of the results. Therefore, this study provides important insights for targeted public health strategies on malaria control in Nigeria. However, the study's cross-sectional nature limits our ability to determine causality between variables. Specifically, the simultaneous assessment of exposure and outcome makes determining the temporal relationship between the two difficult, leaving it unclear whether the exposure came before the outcome or vice versa. Furthermore, the study's reliance on self-reported data may create biases, limiting the findings' accuracy. The lack of qualitative exploration also limits our comprehension of the various elements impacting the outcome. Given these limitations, additional longitudinal or mixed-methods research are required to better understand the causal linkages and behavioural variables that underpin the observed findings.

Conclusion

The majority of Southwestern Nigerian caregivers of children under five years old have good knowledge and exhibit good malaria preventive behaviors, according to this study. Significantly more effective malaria prevention behaviours were likely to be adopted by caregivers who possessed greater knowledge. However, disparities among states, inadequate utilization of insecticide-treated nets (ITNs), and ongoing self-medication underscore the necessity for targeted intervention. Evidence supports scaling up state-specific health education, incorporating malaria messages into maternal and child health care, encouraging early health-seeking behaviour, and expanding ITN access and use through free or subsidized distribution with follow-up. More research is needed to understand the impact of socio-cultural and religious factors on preventative behaviours, identify hurdles to ITN use despite their availability, and assess the role of supplemental strategies like insecticide spraying. Addressing these priorities will assist to strengthen malaria control measures, reduce morbidity and mortality among children under the age of five, and expedite progress toward eradication goals.

Data availability

The corresponding author can provide the datasets used and analyzed in this study upon reasonable request.

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Author contributions

Conceptualization and initial manuscript: T.OData curation: M.A., O.V and A.NMethodology: T.O and D.EStatistical analysis: T.KSupervision: Y.O and D.TAll authors reviewed the manuscript.

Declarations

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

The Nigerian National Health Research Ethics Committee (NHREC) granted ethical permission under authorization number NHREC/01/01/2007-12/11/2023. The procedures used in this study adhere to the standards outlined in the Declaration of Helsinki. To ensure anonymity, no personally identifiable information was included in the questionnaire.

Additional information

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