Tropical Journal of Natural Product Research

Available online at https://www.tjnpr.org

Original Research Article

Knowledge, Attitudes, and Practices toward Malaria Prevention and Treatment among Residents of Awka, Anambra State, Nigeria

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ARTICLE INFO

ABSTRACT

The World Health Organisation has consistently reported poor control strategies in most malaria-endemic countries, such as Nigeria. This cross-sectional study aimed to assess residents' knowledge, attitude, and practice (KAP) regarding malaria treatment, prevention, and control in Awka metropolis of Anambra State. The study was conducted between February and June 2021, with participants selected randomly. Using a well-structured questionnaire, we evaluated their KAP concerning malaria treatment and prevention. To assess the reliability of the data collection tool, a review by three field experts was followed by a reliability analysis. At the end of the study, 60.3% of the 350 respondents demonstrated a good understanding of malaria prevention methods. A Likert scale score of 3.97 indicated a positive attitude among respondents towards malaria treatment. Over 90% of participants agreed that malaria is preventable. While all preventive measures were more frequently practised by participants, the use of Insecticide-Treated Nets (ITNs) was poorly utilised as a preventive measure. In conclusion, the respondents showed a good understanding of malaria infection, treatment, and control. However, despite this awareness, they do not consistently follow the recommended prevention practices.
The study highlighted the need to train and retrain communities on the benefits of prevention and treatment practices as tools for effective malaria control and eradication.

Keywords: Malaria, Knowledge, Attitude, Practice, Prevention and Control, Treatment.

Introduction

Malaria is a significant health concern in developing nations, with Africa leading the pack. [1] Malaria infection is known and reported to be caused by the *Plasmodium* parasites: P. knowlesi, P. falciparum, P. malariae, P. ovale, and P. vivax,[2] and transmitted by the female Anopheles mosquito in the course of a blood meal and documented in literature to cause fever amongst other symptoms within one to three weeks post-infection. The 2024 WHO malaria report showed Africa as having the highest prevalence of malaria, with Nigeria accounting for 25.9% of the total burden worldwide, and a mortality rate of 30.9%. [1]
 According to the WHO report, 83 countries reported malaria cases, with 94% occurring in Sub-Saharan Africa. Notably, India accounted for a significant share of cases in the WHO South-East Asia Region. The African region is the most affected, with 34 malaria-endemic countries. Several factors, including drug misuse, drug abuse, and climatic changes, as well as those that support the growth, survival, and reproduction of mosquito vectors, have been linked to the increasing cases of malaria infection in endemic regions. [3,4] Primary tools reported by various researchers for the effective control and elimination of malaria include early detection, proper treatment, compliance with treatment, and accurate vector control. [6,8-10]

Recent research on malaria has concentrated on developing new treatment strategies, mainly from natural sources. It neglects the need for better community perceptions and adherence to treatment and control measures. This study was designed to emphasise the importance of KAP studies.

Materials and Methods

Study design, site and population
This study, a cross-sectional descriptive study conducted between February and June 2021, was designed to assess the KAP of community residents towards malaria treatment, prevention, and control. Data collection was conducted between January and June, with the study population consisting of individuals aged 18 years or older residing within the study area. All participants enrolled in the study had written or oral consent to participate willingly in the survey. A random sampling technique was employed to select the study population.
The population size was calculated using the formula for a single population proportion. Following the calculation, a proportion of 35% was obtained, in line with existing literature, with a 5% confidence interval, as described by Naing *et al*. (2006). [6] Study participants were sampled randomly and at convenience within the Awka capital city.

Data collection instrument
Study Instrument and Data Collection
A structured questionnaire was developed based on existing Knowledge, Attitudes, and Practices (KAP) literature on malaria prevention and control. [8,9] The instrument was divided into four main sections: Demographic characteristics of participants, Knowledge regarding malaria transmission and symptoms, Attitudes toward malaria prevention and treatment, and Practices related to malaria control.
The draft questionnaire was reviewed and critiqued by three independent researchers experienced in malaria epidemiology and

behavioural studies to ensure content validity, clarity, and relevance. To evaluate the internal consistency of the instrument, a reliability analysis using Cronbach's alpha (CA) was conducted. A CA value of ≥0.50 was considered acceptable for exploratory research. The reliability test was applied to the *attitude* and *practice* sections, as the *knowledge* component was assessed through grading rather than Likert-type items.

Data Collection Procedures
Data were collected through face-to-face interviews conducted by trained research assistants. Questionnaires were initially written in English and then translated into the local language for participants who were not fluent in English, ensuring understanding and inclusivity for all participants. Completed questionnaires were reviewed daily for completeness and accuracy, and any inconsistencies were clarified with the participants.

Data Management and Statistical Analysis
All data were entered and analysed using the Statistical Package for Social Sciences (SPSS), version 20 (IBM Corp., Armonk, NY, USA). Descriptive statistics such as frequencies and percentages were computed to summarise categorical variables. Mean Likert scores were calculated for attitude and practice variables relating to malaria prevention and treatment. The results were presented in tables for clarity. Continuous variables were summarised using means and standard deviations where appropriate.

Ethical Considerations
The study protocol received ethical approval from the Ethics Committee of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH), Awka (Ref: COOUTH/CMAC/ETH.C/VOL.1/FN:04/0104). The study adhered to the ethical principles outlined in the Declaration of Helsinki. The purpose and procedures of the study were explained to all eligible participants. Participation was voluntary, and informed consent was obtained either orally or in writing. Confidentiality of all collected data was maintained, and access to the information was restricted solely for research purposes.

Results and Discussion
We assessed participants' knowledge of the subject area by analysing their responses using variables related to transmission, mortality, breeding sites, and disease symptoms.

Reliability analysis
This was measured using Cronbach's Alpha (CA), which should not be below 0.50. However, this criterion did not apply to our knowledge assessment, as it was based on a grading system. Tables 1A and 1B display the reliability analysis results for participants' attitudes towards prevention and treatment.
For reliability analysis on attitudes towards prevention, removing any item had little to no effect on the CA value, so all items were retained. In the case of attitudes towards treatment, removing the first three questions, as shown in Table 1B, caused a slight change in the CA value. Removing the item showed a further improvement in CA; therefore, the item was discarded, resulting in a CA value of 0.672 for attitudes towards treatment.
The same analysis was conducted on treatment and prevention practices to determine if the CA values could be improved. After adjustments, the CA for both was 0.583 and 0.751, respectively. Item coding was reviewed following the negative CA value, which resulted from a negative average item covariance.

Table 1A: Reliability test for attitude to prevention of malaria

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
You are bothered by the presence of mosquitoes	11.87	.981	.592	.626
Do you think malaria is preventable	12.00	1.143	.776	.613
I think malaria is a serious and life-threatening disease	11.93	1.210	.394	.732
I believe in sleeping under a mosquito net to prevent mosquito bites	12.40	.686	.559	.708
I believe in sleeping under a mosquito net to prevent mosquito bites	12.40	.686	.559	.708

Table 1B: Reliability analysis on attitude toward the treatment of malaria

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Blood smear necessary for malaria diagnosis	11.13	2.124	.442	.323
I believe in visiting health centres when I feel sick	11.33	1.667	.546	.180
I think it's risky when malaria medicine is not taken properly and completely	10.53	2.552	.414	.369
Perceived cost is the deciding factor when choosing an anti-malarial	10.60	4.400	-.317	.672

Demographic characteristics of participants
A total of 350 comprehensive, well-filled questionnaires were analysed, with demographic information presented in Table 2. The male-to-female ratio was 147:203. The majority of respondents (42.6%) belonged to the 21–30-year age group, while 26.3%, 15.7%, and 12% were between ages 31-40, 41-50, and under 20 years, respectively. In

terms of education, 178 (50.9%) held tertiary qualifications, 128 (36.6%) had secondary education, and 33 (9.2%) had primary education, while 8 (2.3%) held higher degrees and 3 (0.9%) had no certificates. The results in Table 4 revealed possible shortcomings in the face-to-face community health education provided by health workers. A large proportion of respondents (23.9% and 24.3%) obtained information about malaria from television and friends or neighbours, respectively, indicating a reliance on informal and mass media sources rather than healthcare professionals. This finding emphasises the need for increased involvement of health workers in public health education for communities on malaria prevention and control. On antimalarials commonly used for treatment as shown in Table 3, 26.7% of respondents used artemether–lumefantrine, followed by chloroquine/primaquine (15.7%) and artesunate–amodiaquine (15.4%). The continued use of older antimalarial drugs indicates variability in treatment practices among respondents

Table 2: Demographic analysis of study participants

		MALE (%)	FEMALE (%)
AGE	<20 years	8 (5.4)	34 (16.7)
AGE	21-30 years	50 (34.0)	99 (48.8)
AGE	31-40 years	51 (34.7)	41 (20.2)
AGE	41-50 years	31 (21.1)	24 (11.8)
AGE	51-60 years	7 (4.8)	5 (2.5)
TOTAL		147 (42.0)	203 (58.0)
ETHNICITY	Igbo	139 (94.6)	182 (89.7)
ETHNICITY	Hausa	0 (0)	2 (1.0)
ETHNICITY	Yoruba	1 (0.7)	7 (3.4)
ETHNICITY	Others	7 (4.8)	12 (5.9)
RELIGION	Christianity	136 (92.5)	201 (99.0)
RELIGION	Muslim	0 (0)	1 (0.5)
RELIGION	Traditionalist	11 (7.5)	1 (0.5)
MARITAL STATUS	Married	63 (42.9)	75 (36.9)
MARITAL STATUS	Single	80 (54.4)	122 (60.1)
MARITAL STATUS	Divorced	4 (2.7)	6 (3.0)
EDUCATIONAL STATUS	Primary	22 (15.0)	11 (5.4)
EDUCATIONAL STATUS	Secondary	58 (39.5)	70 (34.5)
EDUCATIONAL STATUS	Tertiary	63 (42.9)	115 (56.7)
EDUCATIONAL STATUS	Post-graduate	2 (1.4)	6 (3.0)
EDUCATIONAL STATUS	No formal education	2 (1.4)	1 (0.5)
TOTAL		147 (42)	203 (58)

Table 3: Antimalarials frequently used by respondents

		Responses	
		N	Percent
Antimalarials used by respondents	Arthemether/Lumefantrine	206	27.6%
	Artesunate/Amodiaquine	115	15.4%
	Dihydroartemisinin/Piperaquine	92	12.3%
	Sulfadoxine/Pyrimethamine	76	10.2%
	Artesunate	88	11.8%
	Chloroquine/Primaquine	117	15.7%
	Arterolane/Piperaquine	25	3.4%
	Halofantrine	27	3.6%
Total		746	100.0%

Table 4: Source of information on malaria

		Responses	
		N	Percent
Source of information	TV	217	23.9%
	Friends/Neighbours	221	24.3%
	Newspaper	120	13.2%
	Hospital	171	18.8%
	Health workers	180	19.8%
Total		909	100.0%

Participants' malaria knowledge level
The level of knowledge was assessed using variables related to malaria transmission, mortality, breeding sites, and symptoms. The average knowledge among respondents was 60.3%. Comparison by gender in Table 5, revealed no significant difference between males and females (p = 0.968), with males scoring 60.3% and females scoring 60.2%. Age-related knowledge indicated that respondents aged 31-40 and 51-60 years had less knowledge about malaria than those under 20 years. Other variables, such as education, did not significantly influence knowledge levels. This high level of expertise aligns with earlier studies, [12-14], which reported widespread awareness of malaria transmission and prevention among residents in endemic regions. Over 90% of respondents were aware that malaria is preventable and that methods such as insecticide-treated nets (ITNs), indoor residual spraying (IRS), and proper sanitation are effective control measures for the disease. [14-17]

Attitudes to Treatment, Prevention, and Control
Respondents were asked to respond to eight statements regarding their attitudes towards malaria treatment, prevention, and control. A large proportion agreed that using mosquito nets, especially at night, was the most effective prevention method. Mean Likert scores (Table 6) above 3.5 indicated positive attitudes, with 3.97 for prevention and 3.70 for treatment. Regression analysis (Table 7) revealed that employment status, tertiary education, and religion had the most significant influence on attitudes towards prevention, accounting for 32.3% of the variation in respondents' attitudes (adjusted R²). These findings show that the community generally holds a positive attitude towards malaria control, consistent with previous studies.[11,14-16] However, positive attitudes did not always lead to corresponding preventive practices, highlighting a gap between awareness and behavioural implementation.
One hundred and twenty-seven study respondents (36.3%) frequently used insecticides indoors or outdoors as preventive measures, while 213 (60.9%) rarely did so, and 2.6% had never used insecticides. Despite widespread awareness, over 40% of respondents did not use ITNs or did not maintain them properly. Cost, reported by 344 participants, was a significant reason for non-adherence to preventive measures. Regarding healthcare-seeking behaviour, only 64 (18.3%) regularly visited health centres when sick, while 273 (78%) did so occasionally, and 12 (3.4%) had never visited a clinic for suspected malaria (Table 8). Self-medication was alarmingly high, with over 95% of respondents treating themselves without professional consultation. This poor treatment-seeking behaviour is concerning, as early diagnosis and treatment are essential in reducing malaria transmission. Similar to findings by Belay (2021)[11] and others, the mass media served as the primary source of information as reported in Table 4; however, this reliance limits direct engagement with healthcare professionals. The observed preference for self-medication contradicts earlier reports, [15,18,19] where over 90% of respondents sought medical attention at health facilities. Such differences highlight the need for better public education on the dangers of self-medication and the importance of prompt, professional treatment. The findings also revealed that although 80% acknowledged the importance of ITNs, only about half used them regularly. This aligns with reports by Animut (2014), Alelign (2018), and Yimer (2015), which found low compliance with ITN use despite high awareness [17, 20, 21]. Reported reasons for non-compliance included discomfort during hot weather, skin irritation, and limited accessibility.

Table 5: Malaria knowledge of participants in relation to gender

Gender				Statistic	Std. Error
Male	Knowledge of Respondents on Malaria	Mean		60.2969	1.24753
		95% Confidence Interval for Mean	Lower Bound	57.8313	
			Upper Bound	62.7624	
		5% Trimmed Mean		61.1180	
		Median		63.6364	
Female	Knowledge of Respondents on Malaria	Mean		60.2329	.99937
		95% Confidence Interval for Mean	Lower Bound	58.2624	
			Upper Bound	62.2034	
		5% Trimmed Mean		61.0066	
		Median		63.6364	

Table 6: Mean Likert value for attitudes

			Statistic	Std. Error
attitutude_Prevention	Mean		3.9663	.03475
	95% Confidence Interval for Mean	Lower Bound	3.8980	
		Upper Bound	4.0347	
	5% Trimmed Mean		3.9873	
	Median		4.0000	
Attitude to Treatment	Mean		3.7994	.03672
	95% Confidence Interval for Mean	Lower Bound	3.7272	
		Upper Bound	3.8717	
	5% Trimmed Mean		3.8132	
	Median		3.6667	

Table 7: Regression analysis for attitude to prevention

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.337	.164		20.407	.000
	Age=31-40 years	-.093	.080	-.063	-1.157	.248
	Age=51-60 years	-.047	.173	-.013	-.274	.785
	Age=21-30 years	-.046	.078	-.035	-.586	.558
	religion=Christianity	.347	.160	.101	2.174	.030
	marital_status=Single	.004	.080	.003	.055	.956
	education=Tertiary	.248	.079	.191	3.158	.002
	education=Post graduate	.533	.198	.123	2.697	.007
	employment=Student	.534	.088	.399	6.046	.000

a. Dependent Variable: attitude_Prevention

Table 8: Respondents' practices when sick

How do you describe your habit of visiting the health centre when you or any of your family members are sick?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	12	3.4	3.4	3.4
	Sometimes	273	78.0	78.2	81.7
	Always	64	18.3	18.3	100.0
	Total	349	99.7	100.0	
Missing	System	1	.3		
Total		350	100.0		

Therefore, there is an urgent need for targeted community health campaigns to reinforce the benefits of consistent ITN use and dispel misconceptions surrounding it. Furthermore, the study highlighted that although most respondents possessed ITNs and engaged in IRS, actual usage remained low. In contrast to European settings, where studies report that over 90% seek treatment at health facilities within 24 hours of symptom onset, in the present study, just over 70% practised self-medication. This further emphasises the need for ongoing education to promote timely treatment-seeking behaviour and proper malaria management.

The study by Ezejiegu et al. (2022), [5] on the effectiveness of ACT, although reporting the successful efficacy of the drugs tested, revealed certain limitations, such as early treatment failures and lower rates of adequate clinical and parasitological responses (ACPR). This suggests that, despite adherence to the correct treatment protocol, as observed in the study where participants were treated under close monitoring, the success of the treatment heavily depends on proper administration, timely dosing, and patient compliance. This highlights a behavioural challenge that may hinder the success of antimalarial strategies.

Strengths and Limitations
This study employed a pre-tested and reliable questionnaire administered through face-to-face interviews, which helped ensure accurate and inclusive data collection across different literacy levels. The involvement of diverse participants also strengthened the representativeness of the findings. Nonetheless, being a cross-sectional study, it only reflects participants' knowledge and behaviours at a single point in time and may not capture changes over longer periods. Additionally, reliance on self-reported responses may have introduced recall or social desirability bias. Despite these limitations, the study provides valuable baseline evidence for improving malaria prevention and treatment awareness, and highlights areas that require more sustained health education and behavioural interventions.

Conclusion
Although residents of Awka demonstrated adequate knowledge and positive attitudes towards malaria prevention, gaps persist in consistent preventive practices and proper treatment-seeking behaviour. Targeted health education and interventions are needed to improve practice.

Conflict of Interest
The authors declare no conflict of interest.

Authors' Declaration
The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

Acknowledgements

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