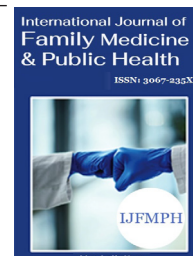


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Knowledge, Attitudes, and Practices of Parents Regarding Malaria Chemoprevention for Children in ILORIN, KWARA State.

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ABSTRACT

Introduction: Malaria chemoprevention has been adopted in Nigeria as one of the preventive strategies aimed at reducing the burden of malaria, but the effectiveness of these interventions is intrinsically linked to the knowledge, attitudes, and practices of parents and caregivers regarding this malaria prevention strategy. This study aims to comprehensively assess the knowledge, attitudes, and practices of parents concerning this preventive method, thereby informing targeted interventions to improve uptake and adherence to malaria prevention strategies.

Methods: A hospital-based, descriptive cross-sectional study design was employed using a convenient sampling technique to administer a pretested, semi-structured questionnaire to the sample population of caregivers of under 5 children at the outpatient department of the selected hospital.

Results: The results indicate that although 57.2% of caregivers had heard of SMC, only 28.4% reported their child had taken it, revealing a disparity between awareness and actual uptake. Key barriers to SMC adoption included poverty, difficult access to healthcare services, and concerns over drug side effects. The study also revealed a significant relationship between caregivers' knowledge of SMC and its uptake ($p = 0.005$). In addition, factors influencing caregivers' decision to allow SMC treatment included perceived effectiveness, trust in healthcare providers, and accessibility of healthcare. Despite a generally positive attitude toward malaria prevention, existing knowledge gaps continue to hinder the effective implementation of preventive measures.

Conclusion: The study concluded that enhancing health education and awareness, improving healthcare service accessibility, and addressing socioeconomic challenges are vital measures for increasing SMC uptake and effectively combating malaria among children in Ilorin.

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Background

Malaria remains a significant public health concern, particularly in regions with high transmission rates, such as Nigeria and Sub-Saharan Africa [1]. While preventive measures, such as chemoprevention for children, have been introduced, their effectiveness depends on parental knowledge, attitudes, and practices. Seasonal Malaria Chemoprevention (SMC) adopted in Nigeria in 2014 was being implemented in 18 states by 143000 community drug distributors (also known as CDDs) over a four-month period spanning June to October of 2021, with a target population of 23 million children [2]. There are plans to expand SMC even further, to 21 states with four or five monthly cycles. Though malaria vaccine,

RTS, S/AS01, has demonstrated modest efficacy against malaria and holds promises for children living in areas where malaria transmission is high, caregiver's awareness of the new malaria vaccine was inadequate [1].

In a study conducted by Ahluwalia *et al.* [3], on the adherence to chemoprophylaxis amongst travelers to malaria-endemic states, they found out that the adherence was low. In another study conducted in Nigeria, concerns regarding the quality and effectiveness of the tablets were raised, despite the fact that SMC was generally thought to be effective in preventing malaria and that malaria was widely recognized as a serious health issue [5]. These concerns included both general worries about potential side effects and reports of problems or symptoms that were linked to the medication [2]. A few caregivers were unsure of the treatments' intended outcome. Some found the CDDs' perceived lack of friendliness or politeness off-putting. Furthermore, regarding the supply

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side, caregivers and CDDs both mentioned shortages of SMC medications, stating insufficient stock to serve all eligible children [5]. In Ilorin, there was a 27.3% frequency of malaria parasitemia among blood donors and that blood receivers in Ilorin are at risk due to the high incidence of malaria parasites among blood donors and the lack of routine blood screening [6]. This study aim to assess the knowledge, attitude and practice of parents regarding malaria chemoprevention for children in Ilorin, Kwara state.

The high rate of pediatric malaria admissions in a study conducted in Ilorin highlights the morbidity burden among Nigerian children, particularly those under five, who are more likely to have severe forms of the disease [7]. The risk of HIV infection in children is further increased in Nigeria due to a high rate of anemia necessitating blood transfusions and inadequate organized control programs. As a result of this high morbidity, there have been promises to begin the roll out of seasonal malaria chemoprophylaxis in different parts of Kwara state, however, concerns are raised by caregivers and thus, this study intends to underscore the knowledge, attitude and practice of parents towards malaria chemoprophylaxis in Ilorin

Objectives

1. To evaluate the level of knowledge among parents regarding malaria chemoprevention in children.
2. To understand parents' attitudes towards malaria chemoprevention.
3. To assess the practices of parents in terms of adherence to malaria chemoprevention schedules and seeking healthcare for children with malaria symptoms.

Methodology

This study involved a hospital-based cross-sectional study. The research was conducted in Ilorin, located in Kwara State, a part of Nigeria's north-central region. Kwara State is one of the 36 states in the Federal Republic of Nigeria, which is the most populous country in Africa. It shares borders with the Republic of Benin to the west, the Niger River to the north, Kogi State to the east, and Ekiti, Osun, and Oyo States to the south. The University of Ilorin Teaching Hospital, situated on Old Jebba Road, Oke-Ose in the Oke-Oyin area of Ilorin East LGA, served as the primary research site. This tertiary care center functions as a referral facility for residents within the state and neighboring areas such as Kogi, Oyo, and Benue.

Population:

The study population included caregivers of under-five children visiting the outpatient department of selected hospitals.

The required sample size for this research was calculated using the Leslie Kish formula for a single proportion, with an assumed confidence level of 95% (Leslie, 1965):

$$n = \frac{(z\alpha)^2 p \times q}{(d)^2}$$

To investigate the knowledge, attitudes, and practices of caregivers regarding malaria chemoprevention for children in Ilorin, Kwara State, a convenience sampling method was employed. This method was chosen due to its practicality and accessibility, allowing for the inclusion of participants based on their availability and willingness to participate. The sampling process involved acquiring the sampling frame for selected departments in the hospital. The recruitment of respondents was conducted using a balloting method, selecting caregivers of under-five children from each of the chosen local government areas.

Questionnaire (Instrument and Method):

A pretested, semi-structured, interviewer-administered questionnaire consisting of forty items was used to collect data from respondents. The questionnaire was divided into four sections: (i) socio-demographic characteristics of the respondents, such as age, gender, occupation, and marital status; (ii) health-related characteristics of both caregivers and children, including past malaria occurrences; (iii) previous experiences

with childhood vaccination; and (iv) caregivers' awareness and acceptance of malaria vaccines.

Data Analysis:

Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were used to summarize the socio-demographic characteristics of the participants. The mean and standard deviation of respondents' knowledge and attitudes were calculated. Inferential techniques, including chi-square and logistic regression, were used to determine relationships between variables. A probability value of $P < 0.05$ was considered statistically significant.

Results

The majority of respondents were female (62.4%) and aged between 31–40 years (41.2%), followed by 20–30 years (35.2%). Most caregivers were married (92%) and resided in Ilorin East (89.6%), with smaller proportions in Ilorin South (6.8%) and Ilorin West (3.6%). Religious affiliation was predominantly Muslim (84.4%), followed by Christian (14.8%) and traditionalist (0.8%). Employment was high (90%), with most being self-employed (73.6%), while others were civil servants (6.8%), farmers (4%), traders (4.4%), and drivers (1.2%). Monogamous family structures were more common (78.8%) than polygamous (21.2%). Regarding household income, 48.4% earned below 50,000 naira, 34.4% between 51,000–100,000 naira, and 17.2% above 100,000 naira.

The majority of caregivers (57.2%) had heard about Seasonal Malaria Chemoprevention (SMC), and 56.8% had received information about it for their child. Knowledge of malaria and its prevention varied, with 28% rated as good, 25.2% as average, and 17.2% as poor. The most reported malaria prevention methods included insecticide-treated nets (82.8%), insecticides (60.4%), herbal concoctions (57.6%), and proper sewage disposal (37.2%). Awareness of the appropriate age group for SMC was low, with 84% unaware, while only 12.8% correctly identified the 1–5-year age range. Less than half (45.6%) had received SMC information for their child, primarily from health clinics (53.1%), followed by radio/TV (37.2%), pamphlets/brochures (33.6%), and community health workers (19.5%).

The majority of caregivers (43.2%) agreed that SMC is effective in preventing malaria in children under five, while 33.6% strongly agreed. Key factors influencing caregivers' decision to allow SMC treatment included perceived effectiveness (59.6%), trust in healthcare providers (59.2%), and accessibility of healthcare (32.8%). Ease of accessing SMC services varied, with 26.8% rating it as very difficult [1], while 23.2% rated it as very easy [5]. Major challenges reported were lack of awareness (78.8%), unavailability of SMC services (68.4%), limited healthcare accessibility (32%), and work or family commitments (10.4%).

The majority of caregivers (71.6%) reported that their child had not taken SMC, while 28.4% had. Only 4.8% completed one cycle, 8.8% completed two cycles, 6.8% completed three cycles, and 8% completed four cycles. Regarding consistency, 42.4% followed every cycle, 20.4% did so occasionally, and 37.2% rarely. Key barriers to SMC uptake included poverty or illiteracy (30.4%), inconvenient healthcare access (26.8%), concerns about side effects (17.6%), superstitions (15.2%), lack of parental permission (6.4%), child illness (6%), and lack of awareness or poor knowledge (2.4% each).

The chi-square analysis revealed a significant relationship between knowledge and the uptake of Seasonal Malaria Chemoprevention (SMC) among caregivers in Ilorin, Kwara State ($\chi^2 = 8.070$, $df = 1$, $p = 0.005$). With a p-value below the 0.05 threshold, the null hypothesis was rejected in favor of the alternative hypothesis. Cross-tabulation showed that 56.4% of caregivers had adequate knowledge of SMC, while 28.4% reported SMC uptake for children under five. The statistical analysis highlights the influence of socio-demographic factors on caregivers' knowledge of Seasonal Malaria Chemoprevention (SMC) in Ilorin, Kwara State. The regression model shows significance ($p = 0.044$), indicating that at least one socio-demographic factor affects SMC knowledge. However, the model's explanatory power is low ($R^2 = 0.063$), meaning only 6.3% of the variance in SMC knowledge is explained by these factors. Employment status is the only significant predictor ($p = 0.042$), with a weak negative coefficient (-0.223), suggesting that certain occupations may limit caregivers' knowledge of SMC.

Variables	Options	Frequency	Percentage
Gender	Male	94	37.6%
	Female	156	62.4%
Age	20-30 years	88	35.2%
	31-40 years	103	41.2%
	41-50 years	35	14%
	Above 50 years	24	9.6%
Marital Status	Single	9	3.6%
	Married	230	92%
	Divorced	1	0.4%
	Widowed	10	4%
Local Government Area	Ilorin East	224	89.6%
	Ilorin South	17	6.8%
	Ilorin West	9	3.6%
Religion	Muslim	211	84.4%
	Christian	37	14.8%
	Traditional	2	0.8%
Are you employed?	Yes	225	90%
	No	25	10%
If yes, what is your employment status	Self-employed	184	73.6%
	Civil Servant	17	6.8%
	Farmer	10	4%
	Driver	3	1.2%
	Trader	11	4.4%
Type of family	Monogamy	197	78.8%
	Polygamy	53	21.2%
Households monthly income	Below 50,000	121	48.4%
	51,000-100,000	86	34.4%
	Above 100,000	43	17.2%

Table 1: Demographic Information of Respondents.

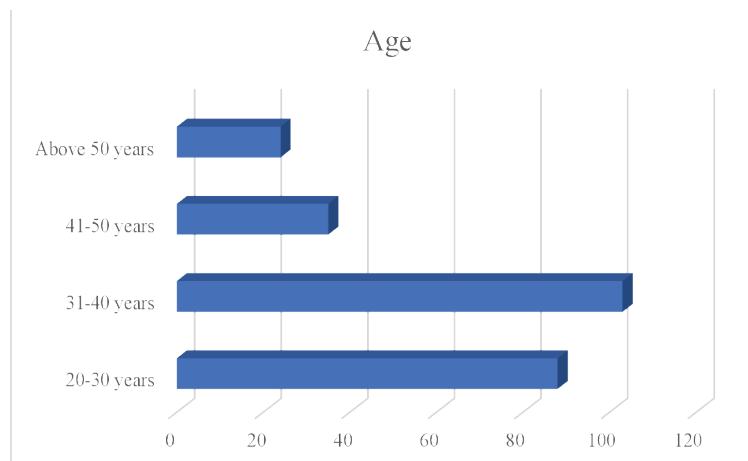


Figure 1: Age distribution of Respondents.

Variables	Options	Frequency	Percentage
Have you heard of SMC?	Yes	143	57.2%
	No	107	42.8%
Have you received information about SMC for your child?	Yes	142	56.8%
	No	108	43.2%
How would you rate your knowledge about malaria and its prevention methods?	Very Poor	34	13.6%
	Poor	43	17.2%
	Average	63	25.2%
	Good	70	28%
	Very Good	40	16%
What are the prevention methods for malaria you know?	Insecticide treated mosquito nets	207	82.8%
	SMC	30	12%
	Mosquito Repellant	59	23.6%
	Proper Sewage Disposal	93	37.2%
	Intermittent Preventive treatment	11	4.4%
	Taking herbal concoction	144	57.6%
	Use of insecticides	151	60.4%

Are you aware of the age groups to take SMC?	Yes	40	16%
	No	210	84%
if yes, what age group?	0-5 months	1	0.4%
	6 month- 1year	4	1.6%
	1-5 years	32	12.8%
Have you received information about Seasonal Malaria Chemoprevention (SMC) for your child?	Yes	114	45.6%
	No	136	54.4%
If yes, where did you receive information about SMC from?	Health clinics	60	53.1%
	Community Health Workers	22	19.5%
	Radio/Tv	42	37.2%
	Pamphlets/Brochures	38	33.6%

Table 2: Knowledge of Malaria Chemoprophylaxis.

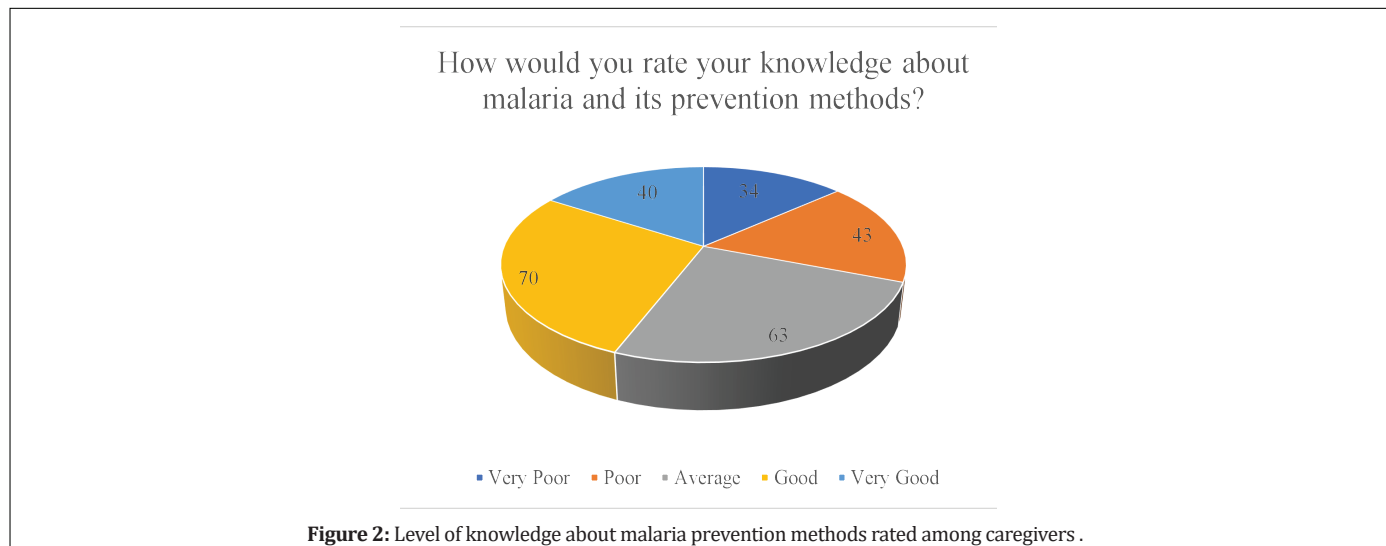


Figure 2: Level of knowledge about malaria prevention methods rated among caregivers .

Variables	Responses	Frequency	Percentage
Do you believe that SMC is effective in preventing malaria in children under five?	Strongly disagree	5	2%
	Disagree	7	2.8%
	Neutral	46	18.4%
	Agree	108	43.2%
	Strongly Agree	84	33.6%
What factors influence your decision to allow your child to receive SMC treatment?	Perceived effectiveness	149	59.6%
	Trust in healthcare provider	148	59.2%
	Previous experience with SMC	48	19.2%
	Accessibility of Healthcare	82	32.8%
	Previous knowledge of SMC	56	22.4%
	Previous history of SMC	38	15.2%
How easy or difficult is it for you to access SMC services for your child? 1 been easy and 5 difficult	1	67	26.8%
	2	34	13.6%
	3	52	20.8%
	4	39	15.6%
	5	58	23.2%
What challenges, if any, do you face in ensuring your child receives SMC consistently?	Unavailability of SMC services	171	68.4%
	Lack of Awareness	197	78.8%
	Work and family commitment	26	10.4%
	Accessibility of Healthcare services	80	32%

Table 3: Attitude and Perception towards SMC.

Variables	Responses	Frequency	Percentage
Have your child taken SMC?	Yes	71	28.4%
	No	179	71.6%
If yes, how many cycles have your children taken SMC?	1	12	4.8%
	2	22	8.8%
	3	17	6.8%
	4	20	8%
How consistently do you ensure your child receives SMC each cycle?	Every cycle	106	42.4%
	Occasionally	51	20.4%
	Rarely	93	37.2%

What are the main reasons for not allowing your child to receive SMC?	Parents did not give permission	16	6.4%
	It is expensive	14	5.6%
	Inconvenient access to healthcare service	67	26.8%
	Child was sick	15	6%
	Concerns for side effects	44	17.6%
	Superstitious believe	38	15.2%
	Poverty or illiteracy	76	30.4%
	Others	20	8%
	Lack awareness	6	2.4%
	Poor knowledge	6	2.4%

Table 4: SMC Uptake and Barriers.

Knowledge of SMC	Uptake of SMC			Chi-Square (X^2)	df	p-value
	Yes	No	Total			
Inadequate Knowledge	41(16.4%)	68(27.2%)	109(43.6%)	8.070	1	0.005
Adequate Knowledge	30(12%)	111(44.4%)	141(56.4%)			
Total	71(28.4%)	179(71.6%)	250(100%)			

Table 4.5.1: Chi-Square analysis to determine significant relationship between knowledge and uptake of seasonal malaria chemoprevention for under five children among caregivers in Ilorin, Kwara State.

Socio-demographic factors	Unstandardized Coefficients		p-value	R-squared Value	ANOVA significant value
	B	Standard error			
(Constant)	2.237	0.243	0.001	0.063	0.044
Gender	0.057	0.065	0.380		
Age	-0.042	0.037	0.249		
Marital Status	-0.034	0.055	0.539		
Local Government Area	-0.059	0.074	0.422		
Religion	-0.002	0.081	0.984		
Households monthly income	-0.083	0.042	0.051		
Type of Family	-0.096	0.076	0.212		
Are you employed	-0.223	0.109	0.042		

Independent Variable: Variables from socio-demographic characteristics of respondents**Dependent Variable:** Variable from knowledge of SMC among caregivers**Table 4.5.2:** Regression analysis to determine whether Socio-demographic factors affect level of knowledge about SMC among caregivers in Ilorin, Kwara State.

Socio-demographic factors	Unstandardized Coefficients		p-value	R-squared Value	ANOVA significant value
	B	Standard error			
(Constant)	1.249	0.242	0.001	0.058	0.067
Gender	0.146	0.065	0.026		
Age	0.062	0.037	0.092		
Marital Status	-0.002	0.054	0.976		
Local Government Area	-0.013	0.073	0.856		
Religion	0.027	0.081	0.743		
Households monthly income	-0.086	0.042	0.042		
Type of Family	-0.003	0.076	0.967		
Are you employed	-0.107	0.109	0.325		

Independent Variable: Variables from socio-demographic characteristics of respondents**Dependent Variable:** Variable from attitude towards SMC uptake among caregivers**Table 4.5.3:** Regression analysis to determine whether Socio-demographic factors affect level of attitude towards SMC uptake for children under five among caregivers in Ilorin, Kwara State

Socio-demographic factors	Unstandardized Coefficients		p-value	R-squared Value	ANOVA significant value
	B	Standard error			
(Constant)	1.938	0.218	0.001	0.083	0.007
Gender	0.010	0.059	0.866		
Age	-0.056	0.033	0.092		
Marital Status	-0.009	0.049	0.858		
Local Government Area	0.053	0.066	0.423		
Religion	0.105	0.073	0.150		
Households monthly income	-0.121	0.038	0.002		
Type of Family	-0.143	0.069	0.039		
Are you employed	-0.128	0.098	0.192		

Table 4.5.4: Regression analysis to determine whether Socio-demographic factors affect SMC uptake for children under five in Ilorin, Kwara State.

Discussion

Knowledge about malaria, attitudes toward the disease, and participation in preventative actions are key factors in understanding transmission and prevention of malaria at the person and household levels. In endemic areas, these elements are essential for preventing the spread of malaria. At the International, Regional, National, and District levels, specific interventions are required to successfully lower malaria cases and associated mortality. Therefore, this study intends to underscore the knowledge, attitude and practice of parents towards malaria chemoprophylaxis in Ilorin.

The majority of respondents were aged 31-40 years (41.2%) and 20-30 years (35.2%). Most caregivers were married (92%) and resided in Ilorin East (89.6%). A higher proportion were Muslims (84.4%), and most were employed (90%), with self-employment being the most common (73.6%). Monogamy was the predominant family structure (78.8%). Regarding household income, 48.4% earned below 50,000 Naira, while 34.4% earned between 51,000-100,000 Naira. This is in correlation with study done in Ogun state by Kio *et al.*, [8] where majority of the respondents were between 20-30 years of age, however as opposed to self-employment being most common in our study, majority in this study were civil servants with average level of income and good level of education.

Furthermore, the findings in our study highlight the varying levels of knowledge about malaria chemoprophylaxis among caregivers. While a majority have heard of seasonal malaria chemoprevention (SMC) and received related information for their child, there are still gaps in understanding. The distribution of knowledge levels, with only 16% rated as very good and a significant proportion categorized as poor or very poor, suggests the need for improved educational efforts. This prevalence is similar to the findings from previous studies conducted in sub-Saharan Africa, including Nigeria, Cameroon, Mozambique, and Ethiopia [9-11]. The poor knowledge may be attributed to factors such as the high illiteracy rate in the study region and the impact of the poor awareness, which may have disrupted malaria prevention efforts by limiting access to health education on symptoms, transmission, and prevention. Additionally, the rural pastoral nature of the study areas could have further influenced the results. Adequate symptom knowledge influences treatment-seeking behavior, reducing malaria spread. However, respondents showed low awareness of preventive measures. Only few recognized environmental cleanliness as a preventive step, while mosquito net use ranked highest. This aligns with previous studies highlighting poor knowledge of childhood disease prevention among Nigerian mothers, despite their level of education [12].

In addition, the majority of respondents in our study demonstrated a positive attitude toward malaria prevention among children under five, aligning with findings from previous studies conducted in other African nations [2,13,14]. This suggests a general awareness and willingness to engage in preventive measures. However, attitude alone may not be sufficient without adequate knowledge and resources to implement effective prevention strategies. Additionally, a strong belief and trust in healthcare providers emerged as a crucial factor influencing caregivers' decisions to adopt Seasonal Malaria Chemoprevention (SMC) for their children. Caregivers who have confidence in health professionals are more likely to adhere to medical advice, participate in prevention programs, and ensure their children receive appropriate malaria prophylaxis.

According to this study; the level of awareness of SMC (57.2%) among respondents does not translate to an equal level of uptake, as just about half (28.4%) of those that are aware of SMC have gotten SMC for their child. This is similar to the study by Diarra *et al.*, [15] whose study showed 70%

of acceptability of SMC despite 96% of respondents having knowledge of what SMC is about, which however contradicts the findings of Ibinaiye *et al.*, [16], that the level of awareness and knowledge are good predictors of uptake and adherence to SMC.

Topping the list among possible for the low uptake of SMC are poverty/illiteracy (30.4%), access to healthcare facilities (26.8%), side effects of the drug (17.6%) and superstitions (15.2%). All of these further corroborates findings from previous studies that has shown similar barriers to the uptake of SMC. From doubts about the effectiveness and safety of drugs gotten for free especially for mass drug distribution, to the fear of adverse effects and side effects [2,15-17] all of which are factors that could prevent the acceptance and uptake of SMC. The lack of access to healthcare facilities which is only second to illiteracy and poverty may be due to different factors, from lack of drugs in healthcare facilities, poor road network, daily activities clashing with time of scheduled visits and even poor attitudes of healthcare workers could deter some caregivers from accepting the SMC (2, 18). Ba *et al.*, [19] and Ogbulafor *et al.*, [2] and revealed that in locations where the acceptance and uptake of SMC was high majority of caregivers preferred that SMC be distributed to each household through door-to-door distribution, rather than having to go to fixed locations for collection, as this allows for continuance of their daily activities.

Though not significant, it was also shown that certain, sociodemographic factors such as gender, employment status and monthly income, could affect the level of uptake of SMC among caregivers. This further agrees with an earlier study by Ngasala *et al.*, [20], that gender, level of education and occupation (which may determine the level of household income) are some of the factors that determines the level of knowledge about malaria generally, which in turn could determine the level of awareness and uptake of SMC.

Conclusion and Recommendations

This study highlights the knowledge, attitude, and practice of parents regarding malaria chemoprophylaxis in Ilorin. While many caregivers are aware of seasonal malaria chemoprevention, there remain significant knowledge gaps that hinder effective uptake. Factors such as poverty, illiteracy, limited healthcare access, and concerns about side effects contribute to low SMC adoption. Although caregivers exhibit a positive attitude toward malaria prevention, this alone is insufficient without adequate resources and education.

To improve SMC uptake and malaria prevention efforts, the following recommendations are proposed:

◆ **Enhanced Health Education Campaigns:** Government and healthcare stakeholders should intensify awareness programs on malaria chemoprophylaxis, focusing on rural and underserved communities.

◆ **Improved Accessibility to Healthcare Services:** Expanding healthcare infrastructure, providing better road networks, and ensuring the availability of malaria prevention drugs will improve access.

◆ **Door-to-Door Drug Distribution:** Implementing home-based SMC distribution will enhance accessibility and uptake, especially in remote areas.

◆ **Addressing Socioeconomic Barriers:** Economic empowerment programs should be introduced to alleviate poverty, while literacy campaigns can improve malaria knowledge.

Ethical Consideration:

Ethical approval for this study was obtained from the Ministry of Health, Kwara State with ethical number ERC/MOH/2024/09/344. Participants were informed about the study objectives, and informed consent was obtained from all respondents. Confidentiality and anonymity of the data were ensured throughout the study.

Conflict of Interest:

None

Acknowledgments: All the authors are equally contributed for this project

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