

Drug Use Practices and Self-Treatment for Suspected Malaria in Ibadan, Nigeria

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Abstract. Antimalarial drug failures have been reported anecdotally in Nigeria, and malarial self-treatment practices could be a contributing factor. This study was designed to assess the pattern of drug use practices and self-treatment options among caregivers in Ibadan, Nigeria. We carried out a descriptive cross-sectional study among 283 study participant pairs (children under 5 years of age with suspected malaria and their caregivers). Structured questionnaires were used as research instruments. The results indicated that most caregivers were mothers (88.8%), 69% of caregivers self-prescribed and self-managed malaria for children under 5 years old without immediate hospital visits, and 76.4% of the caregivers believed most recommended and available antimalarial drugs were ineffective. Generally, 44.2% of respondents preferred and used antibiotics as a treatment strategy for malaria, 13.2% used agbo (a locally made liquid extract of plants and roots), 12.5% used prayers, and 19.6% used antimalarial drugs. Overall, only 57.1% of respondents stated that they always complete the standard antimalarial dosage regimen. The choice of malaria self-treatment options was significantly linked to the level of education. The findings identified antibiotics, agbo, and prayers as the immediate choices for self-treating malaria disease in Ibadan. Furthermore, incomplete adherence to antimalarial drugs is a general practice in Ibadan. Malaria self-treatment policy and continuous education on antimalarial drug use tailored to the different literacy and education levels of the general public is hereby recommended to reduce the risk of development of parasite resistance to effective anti-malarial drugs.

INTRODUCTION

Malaria is among the leading causes of death in children under 5 years globally.¹ The WHO estimated over 240 million cases and approximately 627,000 malaria deaths in 2020. The disease is endemic in most African populations, with an estimated 95% of the total global malaria cases occurring in the continent. Nigeria is responsible for about 27% of the total global incidences.²

Plasmodium falciparum is the most prevalent malaria parasite in Africa, and it causes the most severe form of malaria disease.^{3,4} Strategies implemented to prevent this disease have been primarily focused on vector control (reducing mosquito attack) and chemoprevention (effective use of drugs that suppress infections).⁵

Artemisinin combination therapy (ACT) is currently the recommended choice of anti-malarial treatment and has been adopted widely in Africa as the first line of treatment of both uncomplicated and severe malaria.⁶ Management of this devastating disease has been difficult due, in part, to distinct and high levels of *P. falciparum* genetic diversity present in different individuals, populations, transmission settings, and seasons within malaria-endemic zones.⁷ The diverse and complex genetic nature of *P. falciparum* has over the years led to the emergence of genotypic features, such as drug resistance to antimalarials.^{3,8}

In Nigeria, particularly in the Ibadan metropolis, there are anecdotal reports of drug resistance to commonly used antimalarials. There is also evidence of the use of other means to treat malaria, including local methods. Reports showed that about 80% of malaria cases among under 5 children are inadequately managed at community levels by home-based caregivers, with over 90% of caregivers initiating treatment

actions within 24 hours and only about 15% of the actions being appropriate.⁹ Recently, inappropriate malaria treatment practices were reported among caregivers in Benin, Ekiti, and Edo State of Nigeria.^{10–12} Such actions expose the malaria parasites to suboptimal drug levels, resulting in the development of resistance to the drug treatment of choice. This study surveyed home-based malaria treatment practices and their appropriateness in treating and managing malaria in Ibadan, southwest Nigeria.

MATERIALS AND METHODS

A descriptive cross-sectional study was carried out to assess the knowledge of *P. falciparum* as well as the pattern of home-based malaria treatment among Ibadan residents who subsequently visited Apete Primary Health Care Center, Apete; Al-Alim Hospital, Awotan-Apete; Adeoyo Maternity Center, Yemetu; and New Day Hospital, Olomi, Ibadan, Nigeria. A structured questionnaire was used as a research instrument. All malaria caregivers who visited the clinics with their wards for malaria treatment from July to August 2020 were recruited for the study. Written informed consent was obtained from the participants after carefully explaining the research to them. Ethical approval was obtained from the Oyo State Ministry of Health (AD013/479/1772^A). Inclusion criteria were all caregivers or individuals who presented their ward under 5 years of age to the clinic for malaria treatment and care providers who gave informed consent. Exclusion criteria were individuals who presented their ward with other diseases and individuals who did not give informed consent. Data retrieved were analyzed using SPSS version 20 for Windows (IBM Corp., Armonk, NY). A *P* value < 0.05 was considered significant.

RESULTS

A total of 283 study participant pairs (caregivers/children with suspected malaria) were recruited; this yielded a

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TABLE 1
Socio-demographic characteristics of the study participants

Parameter		Sex		Total	χ^2	P value
		Male	Female			
Care receivers	Sex, n (%)	142 (50.2)	141 (49.8)	283	–	–
	Age (months), n (%)				4.53	0.209
	< 30	35 (15.3)	32 (14.0)	67 (29.3)		
	31–60	70 (30.6)	51 (22.3)	121 (52.8)		
	61–90	10 (4.4)	14 (6.1)	24 (10.5)		
	> 90	6 (2.6)	11 (4.8)	17 (7.4)		
	Mean age (months)	64.58 ± 4.524	78.96 ± 4.993	71.75 ± 3.39	–	–
Caregivers	Sex, n (%)	21 (7.4)	262 (92.6)	283	–	–
	Education class, n (%)				29.24	< 0.0001
	None	2 (0.9)	24 (10.4)	26 (11.3)		
	Koranic	0 (0)	39 (17)	39 (17.0)		
	Primary	0 (0)	79 (34.3)	79 (34.3)		
	Secondary	9 (3.9)	32 (13.9)	41 (17.8)		
	Tertiary	4 (1.7)	22 (9.6)	26 (11.3)		
	Postgraduate	5 (2.2)	14 (6.1)	19 (8.3)		
	Occupation, n (%)				0.767	0.857
	Trader	16 (7.5)	144 (67.6)	160 (75.1)		
	Civil servant	2 (0.9)	19 (8.9)	21 (9.9)		
	Tailor	2 (0.9)	25 (11.7)	27 (12.7)		
Others	1 (0.5)	4 (1.9)	5 (1.8)			

response rate of 98.2%. The caregivers were mostly mothers (88.8%). The majority of the caregivers had only primary and secondary school education (34.3% and 17.8%, respectively) (Table 1). The mean age (months) of children with suspected malaria who were brought to the hospital by the caregivers within the study time frame was 71.75 ± 3.39 ; 75.7% of participants with suspected malaria visited the hospital, whereas 24.3% did not until the child became seriously ill. Of children with suspected malaria who reported at the hospital, 50.2% were male with an average mean age (months) of 64.58 ± 4.52 . Overall, 26.85% of children with suspected malaria had a confirmed diagnosis of malaria.

The frequency of self-prescription and self-management of malaria without immediate hospital visit was 69.0%, and 24.1% sought hospital care primarily immediately when they noticed malaria symptoms. Further analysis showed a significant difference ($\chi^2 = 27.60$, $P = 0.003$) in the likelihood of practicing self-prescription and self-management of malaria among the educated and non-educated caregivers. Generally, 57.1% of respondents completed their child's treatment dosage regimen; however, only 55% of those who primarily seek hospital care completed the malaria dosage regimen, whereas 47.3% of those that self-medicated and treated malaria without seeking hospital care primarily completed the treatment.

The majority of participants (76.4%) believed that most recommended and available antimalarial drugs used in treating malaria were ineffective. Of the respondents, 44.6% reported to have reverted to using antibiotics, 10.2% reported using agbo (a locally made liquid extract of plants and roots), and 12.4% stated that they used prayers; 21.5% used antimalarial drugs. However, of those who used antimalarial drugs, 32% reported that they did not complete the treatment. When asked about their preferred and the best treatment of malaria, 44.2% stated antibiotics, 13.2% stated agbo, 12.5% stated prayers, and only 19.6% stated antimalarial drugs. Further stratification with education showed that the majority (51.9%) of caregivers with lower than a tertiary level education reported using antibiotics, and only 4.9% said

they used antimalarial drugs as a malaria treatment option. Taken together, 8%, 0%, 3.8%, and 9.8% of participants with no education, koranic education, primary education, and secondary education, respectively, reported that they used antimalarial drugs as a malaria treatment option, whereas 26.9% and 61.6% of participants with tertiary and postgraduate education stated that they used antimalarials as malaria treatment drugs, respectively. Education status was found to be statistically associated with the most preferable drug choice in malaria treatment ($\chi^2 = 55.41$, $P < 0.0001$). Further analysis showed that caregivers with either koranic or no education were significantly associated with reported use of non-antimalarial drugs as their treatment choice for malaria for children ($\chi^2 = 43.126$, odds ratio [OR] = 12.98, $P = 0.0001$). Similarly, the use of non-recommended drugs for malaria was significantly associated with caregivers with either primary or secondary education ($\chi^2 = 29.718$, OR = 10.75, $P = 0.001$). Caregivers with tertiary and postgraduate education were significantly less likely to use non-antimalarial drugs as treatment methods for malaria management ($\chi^2 = 43.126$, OR = 0.077, $P = 0.001$).

Overall, 84.9% of respondents were well informed about mosquito bites as the causative vector for transmission, whereas 4.7% and 2.3% believed that drinking contaminated water and eating spoiled food caused childhood and adult malaria, and 5.4% believed in some combination of these, including also spiritual attacks.

Only 2.3% of caregivers had no idea of what causes malaria in both children and adult.

DISCUSSION

In sub-Saharan Africa, *P. falciparum* malaria is highly endemic, and the infection rate remains stable despite the implementation of various malaria control measures. Nigeria carries a disproportionately high burden of malaria, which is influenced by the high genetic diversity of the parasite.^{13–15} According to the WHO, malaria eradication and elimination

is one of the major solutions to reducing global mortality and morbidity.¹⁶

Over the years, resistance has been implicated with chloroquine, sulfadoxine-pyrimethamine, mefloquine, and quinine drugs.¹⁷ Due to the widespread resistance to these drugs, ACTs were recommended by the WHO in 2001.¹⁸ Currently, there are reports of ACT resistance.¹⁷ This development is a threat to the recent gains in malaria control and a challenge to the global eradication and elimination of malaria.¹⁹ Global studies using molecular markers, such as the *P. falciparum* Kelch13 gene, the *P. falciparum* multidrug resistance-1 (*pfmdr-1*) gene, the *P. falciparum* dihydrofolate reductase (*pfdhfr*) gene, and the *P. falciparum* dihydropteroate synthase (*pfdhps*) gene, have provided information for genetically detecting the emergence of antimalarial drug resistance.²⁰

In Nigeria, there are claims of antimalarial drug resistance, which may be compounded due to the availability of artemisinin monotherapy drugs over the counter. This study assessed self-prescribing practices to malaria management in Ibadan, southwest Nigeria. We observed a high incidence of malaria in our population,¹ similar to data reported by Babalola et al.²¹ Our study also corroborates findings of Amodu et al.²² that urban areas have high malaria incidence. Different factors, including self-medication,²³ have been shown to be associated with antimalarial drug resistance.²⁴

The huge burden of malaria with the limited access to inexpensive and high-quality healthcare has resulted in the majority of individuals in low- and middle-income countries practicing self-medication as a treatment strategy for malaria.¹⁶ Self-medication is a module of self-care intervention recognized by the WHO in reducing death;¹² however, the downsides include the increased risk of drug abuse and incorrect/inadequate dosing, which has been implicated in the spread and emergence of drug resistance.²⁵ More importantly, self-care has yielded no positive significant impact on mortality¹¹ and is therefore a setback to self-medication. Yet, self-medication is a common practice in Nigeria.²⁶

In this study, the majority of study participants were mothers who self-medicated and self-administered treatment to wards and care receivers. We observed the frequency of self-prescription and self-management of malaria without immediate hospital visit to be high, which compares favorably with the value obtained at a study by Omolase et al.²⁷ in Ibadan, Nigeria. It also corroborates other reports conducted in the western part of Nigeria.²⁸ Self-medication practice observed in the population is attributed to inexpensive drugs, the level of trust of self-medication evidenced by positive reports from friends and family members, readily available drugs for purchase over the counter without a professional prescription note, education status, and the financial cost of hospitals, which are similar to reports from different geographical locations.^{12,26,29,30} Our study revealed that the majority of caregivers could not correctly differentiate between symptoms of malaria and other diseases and that they could not correctly select drugs for malaria treatment. Antibiotics were reported to be the most frequently (41.3%) used self-medication drug for malaria treatment, which is similar to the findings of Kehinde and Ogunnowo.³¹ This could be due to the common perception in Nigeria that fever is often caused by a combination of typhoid and malaria, for which antibiotics are mostly used; hence

the indiscriminate use of antibiotics for managing malaria. Although some selected antibacterial compounds, such as doxycycline, rolitetracycline, minocycline, tetracycline, clindamycin, chlortetracycline, oxytetracycline, and chloramphenicol, have shown therapeutic and prophylactic activity against the malaria parasite,³² its long-term effect has been the spread of mutant malaria parasites.³³ The use of antibiotics (particularly tetracyclines and macrolides) as prophylaxis treatment for malaria has been the focus of many research groups. However, according to Gaillard et al.³⁴ antibiotics are discouraged in malaria monotherapies due to their slow action, the possibility of antibiotic drug resistance to bacteria, and the spread of resistant mutant malaria parasites.

In our study, 26.85% of the children with suspected malaria were confirmed positive for malaria upon diagnosis. The use of antibiotics could not be linked to the cases that were confirmed negative for malaria because the caregivers refused to give further details about the antibiotics used and the symptoms noticed when the children were suspected of having malaria. Thus, it is unclear how often the use of antibiotics is justified or unjustified.

Similar to reports by Dawaki et al.³⁵ and Nwaneri et al.¹¹ the majority of our recruited caregivers had knowledge of antimalarial drugs (such as ACTs being the medically recommended drugs for malaria treatment). However, less than 22% make use of it in malaria self-management. Hence, knowledge may not be the only influencing factor for appropriate use of drugs in malaria self-management. Factors such as poverty, the environment, the influence of people using nonprescribed drugs, a negative attitude of healthcare workers, and education may play a vital role in appropriate self-treatment for malaria. Similar to available reports,³⁶⁻³⁸ we found education level to be significantly associated with drug choice in malaria self-management. Our study showed that caregivers with no education were 20.8 times more likely to use non-antimalarial drugs in malaria management, whereas caregivers with primary or secondary education only were 12.98 and 10.75 times, respectively, more likely to use non-antimalarial drugs in malaria management than caregivers with tertiary education. This suggests that higher education level may lower the risk of using inappropriate drugs for malaria management. This is similar to the results reported by Penh.³⁹

In addition to antibiotics as a frequently used treatment for malaria, the study identified prayers and agbo as frequently used treatment options. Although some of the herbs used for the production of agbo have been confirmed to have antimalarial properties,^{40,41} the administration is not quantified, and there are risks of hepatotoxicity after usage. A 2016 report by Salawu et al.⁴² presented the average cost of malaria treatment in private hospitals in Ibadan to be approximately N4,000 per independent medical test carried out. This validates the finding that the high cost of treating and managing malaria in health centers may have encouraged the use of prayers and agbo as cheaper alternatives to malaria treatment in hospitals, as observed in our study.

Additionally, a greater percentage (42.9%) of our respondents reported that they did not complete the full course of malaria treatment even after hospital visits. This inappropriate treatment behavior has implications for the achievement of malaria eradication and the emergence of antimalarial drug resistance.¹² The adoption of an effective

communication and awareness strategy on antimalarial drug use is therefore important because the majority of our study participants believed most antimalarial drugs recommended for treating malaria are ineffective. The study further showed that, among the majority that believes antimalarial drugs are ineffective in malaria treatment, a high proportion (52.2%) do not usually complete their drug doses. Hence, we hypothesize that the anecdotal reports of antimalaria drug failure made by the general population are actually due to incorrect drug dosages used and incomplete adherence to the treatment course. This could contribute to long-term drug resistance. Genetic studies and molecular profiling of the *P. falciparum* kelch 13 gene and the *P. falciparum* multidrug-resistant genes of isolates from Ibadan, southwest Nigeria, is required to confirm the claims of drug resistance in Ibadan.

The study also showed that a remarkable high proportion of care providers were aware of the major mode of transmission of malaria, which is via mosquito bites; hence, effective intervention to reduce malaria can be achieved through the use of insecticides, treated mosquito nets, and maintaining a clean environment to prevent mosquito breeding.

Despite the significance of the findings, limitations need to be highlighted so that the findings can be more effectively interpreted and used. Sampling may suggest bias because respondents were recruited from hospitals only. The caregivers were not tested for antimalarial drug use at the end of the study, which would have provided a more comprehensive understanding of their drug use patterns. Similarly, income level and effectiveness of malaria intervention programs were not considered. Despite these limitations, the study findings are largely consistent with reported antimalarial drug use patterns in Ibadan, Nigeria.

CONCLUSION

This study identified antibiotics, agbo, and prayers as the immediate choice for self-treating malaria disease in Ibadan, Nigeria. Similarly, incorrect dosing and incomplete adherence to antimalarial drugs are general practices in Ibadan. We recommend the implementation of self-treatment policies for malaria, lowering the price of antimalarial drugs, and providing continuous education about the use of antimalarial drugs tailored to the different literacy and education levels of the general public. Also, molecular genetic studies should be carried out to identify the presence of *P. falciparum* drug-resistant genes in the population to ascertain and monitor the presence of *P. falciparum* antimalarial drug-resistant genes. Furthermore, we recommend that febrile children be evaluated with a malaria diagnostic test kit before treatment initiation.

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