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Antimalarial Usage and Associated Symptoms Among Malaria Patients Seeking Treatment at Makongeni Health Centre, Homa Bay County, Kenya

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Abstract

Malaria remains one of the most fatal diseases caused by plasmodium parasites in Sub-Saharan Africa. The disease is characterized by symptoms and resemble the flu, including fever, headache, vomiting, and among others. Malaria management in small healthcare centers continue to become challenging due to inadequate resources to invest in more robust diagnostics. Thus, antimalarial prescriptions continue to be a great challenge under such situations.

The current study aimed at exploring the usage of antimalarials and the symptoms of patients who sought treatment at Makongeni Health Centre, Homa Bay County, Kenya. Three hundred and ninety-five eligible patients completed a questionnaire for the study on various parameters including the drugs prescribed, and symptoms presented. The descriptive and inferential statistics to evaluate the data was achieved by the use SPSS software (version 25) at significance level $p \leq 0.05$.

The study shows that individuals who were young, illiterate, did not use bed nets, and were not given any medication were more vulnerable to malaria. Age group, education, the use of bed nets, and medications prescribed were all associated with a decreased risk of malaria. The study also investigated how clinicians prescribed medications for different symptoms, and it found that different drug combinations were employed depending on the symptoms.

In conclusion, the current study is a requisite in policy making with regards to the current management of malaria. Evidently, the malaria symptoms may overlap with other conditions such as common cold and thus prescription on such symptoms largely depends on other diagnostics which almost become challenging in small dispensaries across the country. The significance of early detection, appropriate treatment, and preventative measures like using bed nets are emphasized. More investigation is recommended in order to pinpoint the transmission of malaria and create practical preventative and control measures.

Keywords: Malaria, *Plasmodium*, Anopheles mosquitoes

INTRODUCTION

Malaria remains a significant health threat to the global human population. In 2018, the World Health Organization reported approximately 228 million cases of malaria, with an estimated 405,000 deaths occurring globally. African populations continue to bear the brunt of Malaria infections, accounting for an estimated 213 million (93 %) of cases and 93 % of deaths in 2018 (World Health Organization, 2019). In Kenya alone, approximately 3.5 million clinical cases and over 10,000 deaths are recorded each year, with western Kenya accounting for the majority of these cases (Center for Disease Control and Prevention, 2020). *Plasmodium falciparum* is responsible for the majority of lethal infections in the region (Touray et al., 2020)

Malaria is a complex disease that can cause a variety of symptoms such as fever, chills, headache, muscle pain, and fatigue (Warrell, 2017). However, symptoms can vary depending on the severity of the infection as well as the patient's age and immune status. Early detection and treatment with effective antimalarial drugs are critical for lowering the risk of complications and preventing death (Ademolue et al., 2017).

Malaria control and prevention rely heavily on the use of antimalarial drugs. Antimalarial drug availability and accessibility have increased significantly in recent years, particularly in Sub-Saharan Africa. The World Health Organization (WHO) recommends using artemisinin-based combination therapies (ACTs) as the first-line treatment for uncomplicated malaria, as well as long-lasting insecticidal nets (LLINs) for malaria prevention (WHO, 2022b). However, the efficacy of these interventions is dependent on a number of factors, including drug availability and affordability, drug quality, and patients' ability to access and adhere to the treatment regimen.

Despite the availability of effective antimalarial drugs, gaps in malaria management persist, particularly in Sub-Saharan Africa. There have been reports of inappropriate antimalarial drug use, including the use of substandard and counterfeit drugs, which can contribute to drug resistance and treatment failure (Newton et al., 2016). Furthermore, there are difficulties in diagnosing and treating severe malaria, particularly in resource-limited settings (Wang et al., 2016). Furthermore, there are disparities in malaria intervention access and utilization, particularly among vulnerable populations such as pregnant women and children (Tizifa et al., 2018).

The National Malaria Control Programme (NMCP) in Kenya is in charge of coordinating and implementing malaria control and prevention activities, such as the distribution of LLINs and the distribution of free antimalarial drugs in public health facilities (Githure et al., 2022). Despite these efforts, malaria management remains a challenge, particularly in rural areas where health facilities are frequently under-resourced and understaffed (Alvar et al., 2021).

The main objective of this study was to investigate the use of antimalarial drugs and the symptoms reported by patients at the Makongeni Health Centre in Kenya's Homa Bay county.

METHODOLOGY

Study Participants

The study included 395 patients from Homabay County's Makongeni Health Centre. The patients were chosen using the inclusion and exclusion criteria listed below. Table 1 depicts the participant distribution based on various demographic and clinical factors.

Study Design

The study was a cross-sectional survey, which means that data were collected at a single point in time. The survey involved administering a questionnaire to the patients in order to collect information on various demographic and clinical factors such as age, gender, occupation, level of education, bed net usage, drugs prescribed, and symptoms present.

Inclusion and Exclusion Criteria

Patients had to be seeking treatment at the Makongeni Health Centre and provide consent to participate in the study to be included in the study. Patients who did not provide consent, had a history of severe illness, or were unable to complete the questionnaire were barred from participating in the study. The study considered 395 people who met the selection criteria.

Data Collection Procedures

Consenting patients were given a questionnaire to complete as part of the data collection process. The questionnaire was designed to collect data on demographic and clinical factors such as age, gender, occupation, level of education, bed net usage, drugs prescribed, and symptoms present. A trained research assistant stationed at the Makongeni Health Centre administered the questionnaire. Before administering the questionnaire, the research assistants informed the patients about the purpose of the study and obtained their consent.

Data Analysis

The questionnaire data was entered into a database and analyzed using the statistical software SPSS version 25. To summarize the data and identify patterns and trends, descriptive statistics were used. To test the relationship between various demographic and clinical factors and the occurrence of malaria, inferential statistics such as chi-square tests were used.

Ethical Considerations

The study was approved as part of a larger project by Maseno Ethical Review Committee (MSU/DRPI/MUERC/00992/21) and the National Commission for Science, Technology, and Innovation (NACOSTI). The study was conducted in accordance with the guidelines set forth by the Declaration of Helsinki, which outlines ethical principles for medical research involving human subjects.

RESULTS

Transmission foci of malaria based on demographic patterns

Table 1 displays data on the correlation between demographics, clinical factors, and malaria occurrence, starting with age groups. The highest number of patients (28.1%) were aged 5-15, followed by those over 15 (33.7%) and under 5 (38.2%). Malaria was found in 92.7% of patients under five, with 7.3% testing positive. Gender breakdown: 62% female, 38% male. Males negative for malaria in 92.7%, females positive in 7.3%. Females tested negative 84.5% and positive 15.5%. Fewest patients were business people (7.3%) and farmers (2.3%). Students made up 42% of patients. 79.3% of businesspeople tested negative and 20.7% tested positive. Illiteracy was 37.7%, followed by primary education at 31.1%. 91.3 % illiterate patients were negative, 8.7 % were positive. 99.5 % used bed nets, only 0.5 % did not. 88% negative, 12% positive; drug prescription varies. 57.5% of patients were prescribed antibiotics and analgesics/others despite no presence of malaria. Only 4.1% of patients were not prescribed drugs and tested negative for malaria. Symptoms were the final parameter examined. Most patients presented with fever and cold (47.8%). 94.2% were negative and 5.8% were positive for the tests. Only 2% of patients had joint pain and tested negative for malaria. The study found a link between malaria, age group, education, bed net usage, and medication. Young, illiterate, bed net-avoiding, and non-medication-using patients were more vulnerable to malaria.

Table 1:
Chi-square of association to describe the transmission foci of malaria: the case of Makongeni Health Centre in Homa Bay County

Parameter		N (%)	Negative n (%)	Positive cases n (%)	df	χ^2 Value	*P*-value
Name	**Level**						
Age group	<5	151 (38.2)	140 (92.7)	11 (7.3)	2	11.910	0.003
	5-15	111 (28.1)	100 (90.1)	11 (9.9)			
	>15	133 (33.7)	106 (79.7)	27 (20.3)			
Gender	Male	150(38.0)	139(92.7)	11 (7.3)	1	5.725	0.017
	Female	245(62)	207(84.5)	38 (15.5)			
Occupation	Business Person	29 (7.3)	23 (79.3)	6 (20.7)	6	14.461	025
	Farmer	9 (2.3)	8 (88.9)	1 (11.1)			
	Office Worker	14 (3.5)	14 (100)	0 (0)			
	Student	166 (42.0)	142 (85.5)	24 (14.5)			
	Taxi Services	8 (2.0)	7 (87.5)	1 (12.5)			
	Unemployed	163 (41.3)	149 (91.4)	14 (8.6)			
	Others	6 (1.5)	3 (50.0)	3 (50.0)			
Education	Illiterate	149 (37.7)	136 (91.3)	13 (8.7)	3	8.583	0.035
	Primary	123 (31.1)	110 (89.4)	13 (10,6)			
	Secondary	87 (22.0)	73 (83.9)	14 (16.1)			
	Tertiary	36 (9.1)	27 (75.0)	9 (25.0)			
Bed Net Usage	No	2 (0.5)	0 (0.0)	2 (100.0)	1	14.194	<0.001
	Yes	393 (99.5)	346 (88.0)	47 (12.0)			

Parameter		N (%)	Negative n (%)	Positive cases n (%)	df	χ^2 Value	*P*-value
Name	Level						
Drugs Prescribed	No drugs prescribed	16 (4.1)	16 (100.0)	0 (0.0)	5	370.612	<0.001
	AL+Analgesics/Others	1 (0.3)	0 (0.0)	1 (100.0)			
	AL+Antibiotics+Analgesics/Others	5 (1.3)	0 (0.0)	5 (100.0)			
	Analgesics/Others Only	91 (23.0)	91 (26.3)	0 (0.0)			
	Antibiotics Only	7 (1.8)	7 (100.0)	0 (0.0)			
	Antibiotics+Analgesics/Others	227 (57.5)	227 (100.0)	0 (0.0)			
	AL+Antibiotics+Analgesics/Others	4 (1.0)	3 (75.0)	1 (25.0)			
	DA+Analgesics/Others	4 (1.0)	0 (0.0)	4 (100.0)			
	DA+Antibiotics+Analgesics/Others	40 (10.1)	2 (5.0)	38 (95.0)			
Symptoms	Cold/Headache Only	65 (16.5)	57 (87.7)	8 (12.3)	6	70.835	<0.001
	Cold+Joint Pains/Vomiting	5 (1.3)	5 (100.0)	0 (0.0)			
	Fever Only	63 (15.9)	61 (96.8)	2 (3.2)			
	Fever+Cold	189 (47.8)	178 (94.2)	11 (5.8)			
	Fever+Joint Pains/Vomiting	31 (7.8)	17 (54.8)	14 (45.2)			
	Fever+Joint Pains/Vomiting+Cold	34 (8.6)	20 (58.8)	14 (41.2)			
	Joint Pains Only	8 (2.0)	8 (2.3)	0 (0.0)			

Transmission foci of malaria based on symptoms and antimalarials

Table 2 shows the results of medication recommendations for various indications. Out of the total number of participants, 65 were given a mixture of AL (Artemether-lumefantrine) and analgesics for cold and headaches, whereas 43 were given AR (Artisunate) along with a combination of antibiotics and analgesics. There were no instances where participants were directed to use DA (Dihydroartemisinin piperaquine) and analgesics, or a combination of DA (Dihydroartemisinin piperaquine), antibiotics, and analgesics. 40% of the participants were only given analgesics for their "Cold+Joint Pains/Vomiting" symptoms, whereas another group of 40% were provided with both antibiotics and analgesics. AR (Artisunate) along with antibiotics and analgesics were prescribed to 73% of the participants solely for fever, while only 4.8% were given DA (Dihydroartemisinin piperaquine) along with antibiotics and analgesics. The medication combination most frequently prescribed for "Fever+Cold" involved the use of antibiotics and analgesics, with 60.3% of participants being administered this treatment. 32.3% of participants were prescribed a combination of antibiotics and analgesics as well as AR (Artisunate) for their "Fever+Joint Pains/Vomiting," while only 6.5% received DA (Dihydroartemisinin piperaquine) and analgesics. The drug combination consisting of AL (Artemether-lumefantrine), antibiotics, and analgesics was prescribed to 2.9% of the participants for the common symptoms of fever, joint pains, vomiting, and cold.

Table 2:
Chi-square of association describing the transmission foci of malaria: the case of Makongeni Health Centre in Homa Bay County

			Drugs Prescribed										
Symptoms		**N (%)**	AL+Analgesics n (%)	AL+Antibiotics+Analgesics n (%)	Analgesics Only n (%)	Antibiotics Only n (%)	Antibiotics+Analgesics n (%)	AR+Antibiotics+analgesics **n (%)**	DA+ Analgesics n (%)	DA+Antibiotics+Analgesics n (%)	**Not prescribed n (%)**	χ^2 **Value**	***P*-value**
	Cold/Headache Only	65 (16.5)	0 (0.0)	4 (6.2)	11 (16.9)	2 (3.1)	43 (66.2)	0 (0.0)	0 (0.0)	4 (6.2)	1 (1.5)	**143.456**	<0.001
	Cold+Joint Pains/Vomiting	5 (1.3)	0 (0.0)	0 (0.0)	2 (40.0)	0 (0.0)	2 (40.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (20.0)		
	Fever Only	63 (15.9)	0 (0.0)	0 (0.0)	11 (17.5)	1 (1.6)	46 (73.0)	0 (0.0)	0 (0.0)	3 (4.8)	3 (4.8)		
	Fever+Cold	189 (47.8)	0 (0.0)	0 (0.0)	51 (27.0)	2 (1.1)	114 (60.3)	1 (0.5)	1 (0.5)	12 (6.3)	8 (4.2)		
	Fever+Joint Pains/Vomiting	31 (7.8)	0 (0.0)	0 (0.0)	4 (12.9)	1 (3.2)	10 (32.3)	0 (0.0)	2 (6.5)	12 (38.7)	2 (6.5)		
	Fever+Joint Pains/Vomiting+Cold	34 (8.6)	1 (2.9)	1 (2.9)	6 (17.6)	1 (2.9)	10 (29.4)	3 (8.8)	1 (2.9)	10 (29.4)	1 (2.9)		
	Joint Pains Only	8	0 (0.0)	0 (0.0)	6 (75.0)	0 (0.0)	2 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)		

Symptoms, Microscopy and Antimalarials

The findings represent the findings of a study on the efficacy of various drugs prescribed for various symptoms. A total of 395 patients were studied, and the microscopy results were either negative (87.6 %) or positive (87.6 %) (12.4 %). The results were tested for significance using a 2 value of 70.835 and a p-value of 0.001, indicating that the results were highly significant.

The results were further classified into groups based on the drugs used and the symptoms being treated. For example, there was only one patient in the group of patients prescribed AL (Artemether-lumefantrine) drugs and analgesics who had symptoms of fever and joint pains/vomiting, and the microscopy results were positive.

Only 91 patients who were prescribed analgesics were studied, and all of them had negative microscopy results. In the group of patients who were only given antibiotics, 7 patients were studied, and all of them had negative microscopy results.

227 patients were studied in the group of patients prescribed antibiotics and analgesics, and all of them had negative microscopy results. Four patients were studied in the group of patients prescribed AR (Artisunate), antibiotics, and analgesics; three had negative microscopy results and one had a positive result. Four patients were studied in the group of patients prescribed DA (Dihydroartemisinin piperaquine) and analgesics, and all of them had positive microscopy results.

Overall, the findings suggest that different drug combinations prescribed for different symptoms may have different outcomes in terms of microscopy results.

*Table 3: Symptoms * Microscopy results * Drugs Prescribed Crosstabulation*

Drugs Prescribed N (%)			Microscopy results				
			N (%)	Negative n (%)	Positive n (%)	χ^2 Value	*P*-value
			395 (100.0)	346 (87.6)	49 (12.4)	70.835	<0.001
AL Analgesics	Symptoms	Fever+Joint Pains/ Vomiting+Cold	1 (100.0)	0 (0.0)	1 (100.0)		
	Total		1 (100.0)	0 (0.0)	1 (100.0)		
AL+Antibiot-ics+Analgesics	Symptoms	Cold/Headache Only	4 (80.0)	0 (0.0)	4 (100.0)		
		Fever+Joint Pains/ Vomiting+Cold	1 (20.0)	0 (0.0)	1 (100.0)		
	Total		5 (100.0)	0 (0.0)	5 (100.0)		
Analgesics Only	Symptoms	Cold/Headache Only	11 (12.1)	11 (100.0)	0 (0.0)		
		Cold+Joint Pains/ Vomiting	2 (2.2)	2 (100.0)	0 (0.0)		
		Fever Only	11 (12.1)	11 (100.0)	0 (0.0)		
		Fever+Cold	51 (56.0)	51 (100.0)	0 (0.0)		
		Fever+Joint Pains/ Vomiting	4 (4.4)	4 (100.0)	0 (0.0)		
		Fever+Joint Pains/ Vomiting+Cold	6 (6.6)	6 (100.0)	0 (0.0)		
		Joint Pains Only	6 (6.6)	6 (100.0)	0 (0.0)		
	Total		91 (100.0)	91 (100.0)	0 (0.0)		
Antibiotics Only	Symptoms	Cold/Headache Only	2 (28.6)	2 (100.0)	0 (0.0)		
		Fever Only	1 (14.3)	1 (100.0)	0 (0.0)		
		Fever+Cold	2 (28.6)	2 (100.0)	0 (0.0)		
		Fever+Joint Pains/ Vomiting	1 (14.3)	1 (100.0)	0 (0.0)		
		Fever+Joint Pains/ Vomiting+Cold	1 (14.3)	1 (100.0)	0 (0.0)		
	Total		7 (100.0)	7 (100.0)	0 (0.0)		
Antibiotics+An-algesics	Symptoms	Cold/Headache Only	43 (18.9)	43 (100.0)	0 (0.0)		
		Cold+Joint Pains/ Vomiting	2 (0.9)	2 (100.0)	0 (0.0)		
		Fever Only	46 (20.3)	46 (100.0)	0 (0.0)		
		Fever+Cold	114 (50.2)	114 (100.0)	0 (0.0)		
		Fever+Joint Pains/ Vomiting	10 (4.4)	10 (100.0)	0.0		
		Fever+Joint Pains/ Vomiting+Cold	10 (4.4)	10 (100.0)	0 (0.0)		
		Joint Pains Only	2 (0.9)	2 (100.0)	0 (0.0)		
	Total		227 (100.0)	227 (100.0)	0 (0.0)		
AR+Antibiot-ics+Analgesics	Symptoms	Fever+Cold	1 (25.0)	1 (100.0)	0 (0.0)		
		Fever+Joint Pains/ Vomiting+Cold	1 (75.0)	2 (66.7)	1 (33.3)		
	Total		4 (100.0)	3 (75.0)	1 (25.0)		

Drugs Prescribed N (%)			Microscopy results				
			N (%)	Negative n (%)	Positive n (%)	χ^2 Value	*P*-value
DA+Analgesics	Symptoms	Fever+Cold	1 (25.0)	0 (0.0)	1 (100.0)		
		Fever+Joint Pains/ Vomiting	2 (50.0)	0 (0.0)	2 (100.0)		
		Fever+Joint Pains/ Vomiting+Cold	1 (25.0)	0 (0.0)	1 (100.0)		
	Total		4 (100.0)	0 (0.0)	4 (100.0)		
DA+Antibiotics+Analgesics	Symptoms	Cold/Headache Only	4 (10.0)	0 (0.0)	4 (100.0)		
		Fever Only	2 (5.0)	0 (0.0)	2 (100.0)		
		Fever+Cold	12 (30.0)	2 (16.7)	10 (83.3)		
		Fever+Joint Pains/ Vomiting	12 (30.0)	0 (0.0)	12		
		Fever+Joint Pains/ Vomiting+Cold	10 (25.0)	0 (0.0)	10		
	Total		40 (100.0)	2 (5.0)	38 (95.0)		
Not Prescribed	Symptoms	Cold/Headache Only	1 (6.3)	1 (100.0)	0 (0.0)		
		Cold+Joint Pains/ Vomiting	1 (6.3)	1 (100.0)	0 (0.0)		
		Fever Only	3 (18.8)	3 (100.0)	0 (0.0)		
		Fever+Cold	8 (50.0)	8 (100.0)	0 (0.0)		
		Fever+Joint Pains/ Vomiting	2 (12.5)	2 (100.0)	0 (0.0)		
		Fever+Joint Pains/ Vomiting+Cold	1 (6.3)	1 (100.0)	0 (0.0)		
	Total		16 (100)	16 (100)	0 (0.0)		
Total	Symptoms	Cold/Headache Only	65 (16.5)	57 (87.7)	8 (12.3)		
		Cold+Joint Pains/ Vomiting	5 (1.3)	5 (100.0)	0 (0.0)		
		Fever Only	63 (15.9)	61 (96.8)	2 (3.2)		
		Fever+Cold	189 (47.8)	178 (94.2)	11 (5.8)		
		Fever+Joint Pains/ Vomiting	31 (7.8)	17 (54.8)	14 (45.5)		
		Fever+Joint Pains/ Vomiting+Cold	34 (8.6)	20 (58.8)	14 (41.2)		
		Joint Pains Only	8 (2.0)	8 (100.0)	0 (0.0)		
	Total		395 (100.0)	346 (87.6)	49 (12.4)	70.835	<0.001

DISCUSSIONS

The Makongeni Health Centre in Homabay County is one of the healthcare facilities that serves the local community. The facility provides malaria diagnosis, treatment, and prevention. The Makongeni Health Centre conducted this study to investigate the relationship between various demographic and clinical factors and the occurrence of malaria. The following study parameters are discussed.

Age group

The study discovered that the age group 5-15 years old had the highest number of patients diagnosed with malaria (28.1 %), followed by patients over 15 years old (33.7 %) and patients under 5 years old (38.2 %). These findings are consistent with other studies that have found a high prevalence of malaria in children under the age of five (Lubinda et al., 2021; Ssempiira et al., 2017). Children under the age of five are more likely to contract malaria due to a weakened immune system and a lack of acquired immunity (Tsegaye et al., 2021). Children of this age are also more likely to play outside, increasing their exposure to mosquito bites (Finda et al., 2019).

Gender

According to the study, 62 % of malaria patients were female, while 38 % were male. This finding is consistent with other studies that have found that females have a higher malaria incidence than males (Ochwedo et al., 2021; Odikamnoro et al., 2018; Shamebo and Petros, 2019). Females are more likely than males to contract malaria due to social and cultural factors such as gender roles, which expose females to mosquito bites more frequently. In some societies, females are responsible for household chores such as cooking and cleaning, which are frequently performed indoors and may expose them to mosquito bites. Several studies, however, have found that males are more likely to be affected by malaria (Sultana et al., 2017; Tripura et al., 2017). This therefore means that there is a possible variation in the transmission of malaria across the gender caused by other factors like occupation and place of residence.

Education

According to the study, the most patients diagnosed with malaria had no education (37.7 %), followed by patients with primary education (31.1 %). These findings are consistent with other studies that have found a higher incidence of malaria in low-education populations.(Ipa et al., 2020; Sultana et al., 2017). Malaria prevention strategies such as the use of bed nets and indoor residual spraying may be overlooked due to a lack of education. Educated people may also be more aware of the symptoms of malaria and seek treatment sooner.

Bed net usage

According to the findings, 99.5 % of patients used bed nets, while only 0.5 % did not. 88.0 % of patients who wore bed nets tested negative for malaria, while 12.0 % tested positive. These findings are consistent with previous research indicating that bed nets protect against malaria (Levitz et al., 2018; Ochomo et al., 2017). However, the fact that some patients who used bed nets tested positive for malaria may indicate that bed net use and maintenance needs to be improved. It is possible that the bed nets were not used consistently or were in poor condition, reducing their effectiveness in malaria prevention.

Thus, the findings of this study emphasize the importance of targeting high-risk populations in malaria prevention and control efforts, such as children under the age of five, females, and individuals with low levels of education. The high prevalence of malaria in Homabay County highlights the importance of ongoing investment in malaria control programs, such as the provision of effective and affordable treatment, increased access to bed nets, and malaria prevention education (WHO, 2022a). More research is required to identify and address the underlying social and environmental factors that contribute to this region's high malaria burden.

Furthermore, the use of drugs is a fundamental aspect of healthcare that aids in the management of various symptoms and illnesses. The selection of drugs, on the other hand, is not always straightforward and is influenced by a variety of factors such as the symptoms presented, the individual patient, and drug availability. The study documented the various drug combinations prescribed for symptoms such as a cold, headache, joint pains, vomiting, and fever.

Prescription Patterns for Cold/Headache Only

According to the findings, 16.5 % of participants with cold/headache received only artemether-lumefantrine (AL) and analgesics, while 66.2 % received artesunate (AR) and a combination of antibiotics and analgesics. No participants were given dihydroartemisinin piperaquine (DA) and analgesics, or DA and an antibiotic-analgesic combination. Studies on the effectiveness of AL in treating uncomplicated malaria back up its use for colds and headaches. Analgesics are commonly prescribed for headache relief and pain management. The high use of AR and antibiotics could be attributed to the high incidence of malaria and bacterial infections in the study area (Ochwedo et al., 2021).

Prescription Patterns for Cold+Joint Pains/Vomiting

The research found that 40% of participants with a cold, joint pains, and vomiting were only given analgesics, while 40% were given a combination of antibiotics and analgesics. The low drug use in this category could be attributed to the nature of the symptoms, which can be managed with non-pharmacological interventions such as rest and hydration. The effectiveness of analgesics in managing pain associated with joint pains and headaches justifies their use (Otambo et al., 2022; Uzochukwu et al., 2018).

Prescription Patterns for Fever Only

According to the findings, 73 % of participants with fever received AR and a combination of antibiotics and analgesics, while 4.8 % received DA and a combination of antibiotics and analgesics. The effectiveness of AR in treating uncomplicated malaria lends support to its use (Roussel et al., 2017). The low use of DA may be attributed to its high cost in comparison to AR. The high use of antibiotics could be attributed to the study area's high incidence of bacterial infections (Hopkins et al., 2017).

Prescription Patterns for Fever+Cold

According to the study, 60.3 % of participants with fever and cold were prescribed AR as well as a combination of antibiotics and analgesics, while 27 % were only prescribed analgesics. The high prevalence of malaria and bacterial infections in the study area justifies the use of AR and antibiotics. Analgesics are widely used due to their effectiveness in treating pain associated with fever and headaches (Green et al., 2021; Ochocinski et al., 2020).

Prescription Patterns for Fever+Joint Pains/Vomiting

According to the findings, 32.3 % of participants with fever, joint pains, and vomiting were given AR as well as a combination of antibiotics and analgesics, while 6.5 % were given DA and analgesics. The low drug use in this category could be attributed to the nature of the symptoms, which can be managed with non-pharmacological interventions such as rest and hydration. The effectiveness of analgesics in managing pain associated with joint pains and headaches supports their use (Urits et al., 2019).

Prescription Patterns for Fever+Joint Pains/Vomiting+Cold

The study also looked at prescription patterns for people who had fever, joint pains, vomiting, or cold symptoms. 45.6 % of those in this category were given AR and a combination of antibiotics and analgesics, while 9.2 % were given DA and analgesics. The increased use of antibiotics in this group could be attributed to the presence of cold symptoms, which could indicate a viral or bacterial infection requiring antibiotic treatment. However, antibiotic overuse is a concern because it may contribute to the development of antibiotic-resistant bacteria strains (Zainab et al., 2020).

Overall, the study suggests that healthcare providers should carefully evaluate and tailor their treatment plans for patients who present with fever, joint pains, vomiting, and cold symptoms, because the appropriate course of treatment may differ depending on the individual's symptoms and medical history. Non-pharmacological interventions, such as rest and hydration, should be included in the overall treatment plan. Additionally, efforts should be made to reduce antibiotic overuse and promote the proper use of these medications.

CONCLUSION

The results of the study highlight the susceptibility of different populations to malaria. It affirms that children, the illiterate, those who do not use bed nets, and those who are not on medication bears the brunt of the disease. The study also highlights the need for improved malaria prevention and control strategies to stop the disease's spread. These policies should take into account variables like age, education, bed net use, and prescription drug policies. Healthcare professionals and policymakers can decide how best to stop the spread of the disease and enhance patient outcomes by giving more attention to the factors that exacerbate the spread of malaria. This study ultimately serves as an excellent guide of the ongoing need for research, prevention initiatives, and treatment interventions to lessen the impact of malaria on impacted communities around the world.

RECOMMENDATIONS

The following recommendations to enhance malaria prevention and control measures are based on the study's findings:

1. Increased education and awareness campaigns are needed. According to the study, patients who are illiterate are more prone to malaria. Increased education and awareness campaigns that concentrate on populations with low literacy rates are thus necessary. People should learn about malaria transmission, symptoms, precautions, and the value of early detection and treatment from the campaigns.

2. Improved access to resources for malaria prevention and treatment should be prioritized. The study revealed that patients who did not use bed nets or who were not given any medication were more likely to contract the disease. Therefore, it is critical to increase access to these resources in regions where malaria incidence is high. This can be accomplished by offering bed nets and antimalarial medications for free or at a reduced cost, as well as by expanding access to diagnostic tools for early detection and treatment.
3. Identify additional effective prevention and control measures by conducting research: Although the study offered helpful insights into the elements influencing the development of malaria, additional research is required to pinpoint more efficient prevention and control measures. Future research can examine the impact of variables like climate, socioeconomic status, and the structure of the healthcare system on the prevalence of malaria and create specialized interventions to address these variables.

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Conflict of Interest

The authors declare no conflict of interest

Authors' Contribution

The authors of this study made significant contributions to the research project. LM was instrumental in obtaining the funds required to complete the study. LM also designed the study, collected and analyzed the data, interpreted the findings, and wrote the manuscript. ST helped with the study's design and read and provided feedback on the manuscript. KR was also instrumental in the study's design, data analysis, and manuscript review. Overall, the collaboration and efforts of all three authors were critical to the success of this research project.

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