

# Knowledge, awareness and practices regarding malaria in Western Area Rural District, Sierra Leone: a household-based cross-sectional survey at the midpoint of the National Malaria Strategic Plan (2016-2020)

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## Research

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## Abstract

**Background** Sierra Leone is a highly endemic area for malaria, and the implementation of the National Malaria Strategic Plan (2016-2020) has reached its midpoint. To provide more specific guidance for interventions in the future, a household-based cross-sectional survey was conducted to elucidate the knowledge, attitudes and practices regarding malaria and malarial control measures among the general public.

**Methods** Three communities (Grafton, Jui and Kossoh) in the Western Area Rural District that were in close proximity to Sierra Leone's capital city of Freetown were included. Households were randomly selected and interviewed with a structured questionnaire covering malaria infection, diagnosis, treatment and prevention, as well as knowledge of malaria prevention, in collaboration with the National Malaria Control Program of the Ministry of Health and Sanitation, Sierra Leone.

**Results** A total of 262 qualified questionnaires were included. The average cost for meals per day is approximately 30000 Leones in each household. The rate of awareness, indicated by reporting having heard of malaria, was 98.1% (257/262), and 86.6% (227/262) of the respondents knew that mosquito bites are the main route of transmission. In addition, 80.9% (212/262) of the respondents sought health advice or treatment for the illness, and a similar percentage of respondents had been tested for malaria, mostly with rapid diagnostic tests (RDTs). A high demand for long-lasting insecticidal nets (72.1%) matched the serious shortage (61.8%, 162/262), and of the households that reported a lack of nets, 66 had children younger than five years old.

**Conclusion** The malaria burden is still high. Although public awareness of malaria prevention is high, based on this survey, there is a shortage of the necessary supplies and a limited use of preventive measures in these three communities. Therefore, the public's knowledge of malaria should be sustained and reinforced, and the distribution and use of malaria prevention measures should be promoted to support the achievement of the planned objectives.

## Background

Malaria is endemic in Sierra Leone; the entire population is at risk of exposure because Sierra Leone is an area of stable malarial endemicity [1]. Sierra Leone's high malaria disease burden accounted for approximately 48% of outpatient morbidity and approximately 38% of mortality in children younger than five years according to the national Malaria Indicator Survey conducted in 2016 [2]. Although significant progress with regard to reducing mortality has been made, it is still a major public health concern. The control of malaria remains a priority in the national health agenda of Sierra Leone.

A multipronged strategy to control malaria, including vector control interventions, diagnostic testing, treatment with quality-assured artemisinin-based combination therapies, and standardized case management training manuals for community and facility treatment providers, has been developed and implemented in Sierra Leone based on the World Health Organization (WHO) recommendations [3]. The goals are for 80% of the population to have appropriate levels of knowledge and uptake/practice of malaria prevention and management strategies, all the at-risk population to have access to the appropriate preventive interventions, 80% of individuals with suspected malaria cases to have access to confirmatory diagnostic testing, and all individuals with malaria to receive effective treatment by 2018, according to the current Sierra Leone National Malaria Strategic Plan (2016-2020) (SL-NMSP) [3].

The awareness of malaria symptoms, transmission, prevention and treatments is closely related to the implementations of malaria control programs [4-6]. A knowledge, attitudes and practices (KAP) survey about malaria could help policy makers better understand the current situation and guide malaria control strategies. Therefore, this study is conducted to determine the knowledge, attitudes and practices regarding malaria and its control measures in the general public through a household-based survey at the midpoint of the implementation of the SL-NMSP.

## Materials And Methods

### *Study site*

Three communities (Grafton, Jui and Kossoh) in Western Area Rural District within close proximity to Sierra Leone's capital city Freetown were included in this household-based survey on malaria. This district is home to a very religiously and ethnically diverse population. Grafton is a [trade](#) center. Jui and Kossoh are neighborhood towns. Kossoh town is surrounded by a large [forest](#) reserve, and its major industries are [farming](#) and [coal mining](#).

### *Participants, questionnaire and data collection*

A total of 300 households in the three designated communities were randomly selected as survey respondents using a cluster sampling design. One adult member from each selected household was interviewed with a structured questionnaire covering demographic information, economic status, basic knowledge of malaria, and malaria prevention and control practices. When medicines were discussed, packages of various drugs were displayed to the participants.

The survey was conducted between 17 December and 19 December 2018 in collaboration with the National Malaria Control Program of the Ministry of Health and Sanitation, Sierra Leone. Local staff from Sierra Leone-China Friendship Biological Safety Laboratory [7] were trained in prior to their involvement in the administration of the survey.

### *Data management and statistical analysis*

Data were input and cross-checked in EpiData version 3.1 [8, 9]. Then, descriptive statistics and percentages were obtained using Microsoft Excel 2010 software. Differences in distributions of variables according to the daily cost of meals in each household were evaluated using the chi-square ( $\chi^2$ ) test or Fisher's exact test by SPSS software version 20.0 (IBM, USA) and  $P < 0.05$  was considered statistically significant.

## Results

A total of 300 households were investigated, and 262 qualified questionnaires were finally included in the analysis after checking for questionnaire completion and logic. The survey covered 1645 residents, with approximately 6 persons per family. The average cost of meals per day was approximately 30000 Leones in each household (one US dollar was equal to 8000 Leones in December 2018). Three groups were established according to the cost of meals. Group 1 was defined as families paying  $\leq$  20000 Leones/household per day for meals, and this group contained 475 persons in 97 households; Group 2 was defined as families paying  $\leq$  40000 and  $\leq$  20000 Leones/household per day, and this group contained 778 persons in 123 households; and Group 3 was defined as families paying  $>$  40000 Leones/household per day, and this group contained 392 persons from 42 households.

### *Malaria infection, diagnosis and treatment*

A total of 308 persons in 87 households, 430 persons in 106 households and 191 persons in 39 households in Group 1, 2 and 3, respectively reported having had a fever in 2018 ( $P = 0.594$ , Fisher's exact test). The distribution of individuals with malaria among the groups in 2018 is shown in Table 1.

**Table 1. The distribution of individuals with malaria in households in the three communities in the Western Area Rural District, Sierra Leone, 2018**

Group	Number of respondents suffered from malaria/households			
	Once	Twice	3 times	$>$ 3 times
1	46/20	62/29	29/12	107/38
2	68/32	52/24	31/13	133/43
3	15/12	32/13	1/1	35/10

Moreover, approximately 79.4%, 79.7% and 88.1% of the respondents in Groups 1, 2 and 3, respectively, sought professional advice or treatment for the illness from any source ( $P = 0.421$ , Fisher's exact test). Additionally, 76.6%, 71.4% and 64.9% of the respondents in Groups 1, 2 and 3, respectively, reported preferring to seek advice and treatment from the public medical sector ( $P = 0.117$ , Fisher's exact test) (Table 2). No significant differences were found among the three groups with respect to the decision to seek assistance from the public sector ( $P = 0.765$ , Fisher's exact test) or the private sector ( $P = 0.468$ , Fisher's exact test) (Table 3).

**Table 2. The distribution of medical sectors people seeking health advice or treatment in the three communities in the Western Area Rural District, Sierra Leone, 2018**

Medical sector	Group			Total
	1	2	3	
Public sector only	59	70	24	153
Private medical sector only	14	17	12	43
Both sectors	3	11	1	15
Don't answer	1	0	0	1
Total	77	98	37	212

**Table 3. The detail of public or private medical sectors people selected for health care seeking in the three communities in the Western Area Rural District, Sierra Leone, 2018**

Group	Public medical sectors						Subtotal	Private Hospital	Private Clinic	Mission/Faith-based Hospital	Private n Mission-based C
	Government Hospital	Government Health Center	Mobile Clinic	Community health worker	Other Public Sector						
1	42	9	5	0	3	59	7	0	0	1	
2	44	13	6	4	3	70	9	1	1	1	
3	17	4	2	1	0	24	6*	0	0	4*	

\*: there was one respondent seeking advice or treatment in private sectors of private hospital and Mission/Faith-based Clinic.

Furthermore, 84.5%, 84.6% and 83.3% of the respondents in Groups 1, 2 and 3, respectively, reported that they and their family members always visited a health care worker or doctor when they suspected they had contracted malaria ( $P = 0.487$ , Fisher's exact test). Among the individuals who went to see a health care worker or doctor, they reported visiting a professional every time or most of the times they suspected they had contracted malaria, and there were no differences among the three groups ( $\chi^2 = 2.882$ ,  $df = 6$ ,  $P = 0.830$ ) (Table 4).

**Table 4. Malaria diagnosis and anti-malarial medicine taking in the three communities in the Western Area Rural District, Sierra Leone, 2018**

Question & Answer	Group			Total	Percentage
	1	2	3		
<b>When you and your family suspected you were infected with malaria, did you always go to see a health worker/doctor?</b>					
	82	104	35	221	84.4%
answer	10	8	2	20	7.6%
<b>How often?</b>	5	11	5	21	8.0%
every time	38	42	16	96	43.4%
most of time	26	44	13	83	37.6%
sometimes	11	12	3	26	11.8%
only when they showed severe condition	7	6	3	16	7.2%
<b>When you or any member of your family suspected that they had malaria, did the health worker/ doctor conduct a malaria test?</b>					
	76	98	36	210	80.2%
answer	15	14	2	31	11.8%
<b>Did the Doctor / health worker explain to you the test to be done?</b>	6	11	4	21	8.0%
	53	69	22	144	55.0%
remember	25	24	8	57	21.8%
answer	9	15	7	31	11.8%
<b>What type of test did they say they were going to perform?</b>	10	15	5	30	11.5%
	51	66	26	143	54.6%
microscopy	1	3	1	5	1.9%
remember	30	37	9	76	29.0%
answer	15	17	6	38	14.5%
<b>When you and your family were infected with malaria, did you take the anti-malarial medicine?</b>					
every time	49	40	19	108	41.2%
most of time	30	49	15	94	35.9%
sometimes	9	15	2	26	9.9%
only when they showed severe condition	0	2	0	2	0.8%
answer	5	7	3	15	5.7%
<b>What anti-malarial medicines did you take?</b>	4	10	3	17	6.5%
chloroquine	3	3	0	6	2.3%
combination with Artemisinin	1	2	0	3	1.1%
artemunate+Lumafantrine	58	69	24	151	57.6%
artemunate+Amodiaquine	17	28	9	54	20.6%
primaquine	4	4	1	9	3.4%
others	0	1	1	2	0.8%
others: specify	16	18	5	39	14.9%
answer	7	8	3	18	6.9%
<b>When did (NAME(S)) take the anti-malarial medicine?</b>					
1 day after fever	87	91	32	210	80.2%
2 days after fever	4	15	5	24	9.2%
3 days after fever	0	0	0	0	0.0%
4 or more days after fever	1	7	1	9	3.4%
don't know	0	2	0	2	0.8%
answer	5	8	4	17	6.5%
<b>Were the antimalarial drugs FREE which you and your family took?</b>					
they are free for all	29	33	8	70	26.7%
only for children, pregnant women and breast-feeding women	1	6	2	9	3.4%
others	64	76	29	169	64.5%
answer	3	8	3	14	5.3%
<b>When you and your family were infected with malaria, did you take the full dosage of antimalarial drugs which was prescribed by doctor/health worker?</b>					
take full dosages every time	78	96	35	209	79.8%
sometimes some dosage was left	15	15	3	33	12.6%
some dosages were left every time	1	3	0	4	1.5%
answer	3	9	4	16	6.1%
<b>If not all drugs taken, please explain why:</b>					
got recovery before finishing all of them	15	15	3	33	89.2%
drugs made me have headache, nausea	0	0	0	0	0.0%
was too busy to remember taking all the dosage	0	2	0	2	5.4%
others: specify	1	1	0	2	5.4%
don't answer	0	0	0	0	0.0%

As recalled by the respondents, the health care worker or doctor performed a malaria test when they visited because they suspected that they had contracted malaria (80.1%) ( $P = 0.435$ , Fisher's exact test), and the malaria rapid diagnostic tests (RDT) was the most commonly used test ( $P = 0.882$ , Fisher's exact test); however, approximately half of the respondents reported that the doctors or health care workers did not explain the test to them ( $\chi^2 = 2.783$ ,  $df = 6$ ,  $P = 0.841$ ) (Table 4).

Most respondents took anti-malarial medicine every time or almost every time they were diagnosed with malaria ( $P = 0.344$ , Fisher's exact test), and approximately 79.8% of them took the full course of treatment every time as prescribed by the doctor or health care worker ( $P = 0.489$ , Fisher's exact test).

Artesunate and lumefantrine (51.7%) and artesunate and amodiaquine (19.1%) were the top two choices of combination therapy. The most common reason given for the early termination of a course of treatment was having recovered prior to finishing all the doses ( $P = 0.815$ , Fisher's exact test). Moreover, approximately 80.2% of the respondents reported starting anti-malarial medicine on the same day that they noted the fever ( $P = 0.095$ , Fisher's exact test), and approximately 64.5% of them responded that not all kinds of anti-malarial medicine were free ( $P = 0.399$ , Fisher's exact test) (Table 4).

### Malaria prevention measures

In this survey, 188 households had long-lasting insecticidal nets (LLINs) ( $\chi^2 = 1.466$ ,  $df = 2$ ,  $P = 0.482$ ), but more nets were required because 189 respondents said that they did not have enough LLINs in their households ( $P = 0.253$ , Fisher's exact test), so resulting in children under the age of 5 years in 66 households not having LLINs to sleep under ( $P = 0.410$ , Fisher's exact test). Only 146 respondents had slept under nets the night before the survey ( $P = 0.331$ , Fisher's exact test). Furthermore, some members in 162 households with nets did not sleep under LLINs, which could lead to cross-infection ( $\chi^2 = 4.359$ ,  $df = 4$ ,  $P = 0.363$ ). The LLINs were mainly distributed by the governmental hospital/health centers and community health centers (Table 5).

Table 5. Malaria prevention practices in the three communities in the Western Area Rural District, Sierra Leone, 2018

Question & Answer	Group			Total	Percentage
	1	2	3		
<b>1. Do you have a mosquito treated bed nets in your home?</b>					
Yes	70	91	27	188	71.8%
No	27	32	15	74	28.2%
<b>2. Did you sleep under a mosquito net last night?</b>					
Yes	57	71	18	146	55.7%
No	37	46	23	106	40.5%
Don't answer	3	6	1	10	3.8%
<b>3. Is there anyone in your household who did not sleep under treated bed nets last night?</b>					
Yes	53	81	28	162	61.8%
No	37	34	13	84	32.1%
Don't answer	7	8	1	16	6.1%
<b>4. Are there enough treated bed nets in your household?</b>					
Yes	31	25	9	65	24.8%
No	62	95	32	189	72.1%
Don't answer	4	3	1	8	3.1%
<b>5. Do all children under 5 years in your household sleep under treated bed nets at night?</b>					
Yes	36	52	14	102	38.9%
No	25	28	13	66	25.2%
No children under 5	36	41	13	90	34.4%
Don't answer	0	2	2	4	1.5%
<b>6. Where did you get the treated bed nets?</b>					
Government Hospital/Health Center	56	57	17	130	49.6%
Mobile Clinic	1	0	0	1	0.4%
Community Health Center	8	23	9	40	15.3%
Private Hospital/ Clinic	0	7	1	8	3.1%
Pharmacy	1	0	0	1	0.4%
Shop	2	5	3	10	3.8%
Traditional Healer	0	0	0	0	0.0%
Others	13	12	1	26	9.9%
Don't answer	16	24	13	53	20.2%
<b>7. Did you spray insecticide to kill mosquitoes in your house?</b>					
Often	13	13	7	33	12.6%
Sometimes	9	20	8	37	14.1%
Seldom	13	27	8	48	18.3%
Never	61	63	19	143	54.6%
Don't answer	1	0	0	1	0.4%
<b>8. Did you spray insecticide to kill mosquitoes outside your house?</b>					
Often	0	4	1	5	1.9%
Sometimes	3	1	2	6	2.3%
Seldom	6	6	8	20	7.6%
Never	87	110	28	225	85.9%
Don't answer	1	2	3	6	2.3%
<b>9. Does your house have doors or windows screen which could stop the mosquitoes to go into the house?</b>					
Yes	13	34	11	58	22.1%
No	83	89	30	202	77.1%
Don't answer	1	0	1	2	0.8%
<b>10. Do you and your family often stay outside of the house at night (such as for walk, exercises, enjoy the cool air, work, etc)</b>					
Often	68	85	31	184	70.2%
Sometimes	19	26	6	51	19.5%
Seldom	5	8	2	15	5.7%
Never	4	2	3	9	3.4%
Don't answer	1	2	0	3	1.1%

In addition, a total of 143 households never sprayed insecticide indoors to kill mosquitoes ( $P = 0.217$ , Fisher's exact test), and 225 households never sprayed insecticide outside ( $P = 0.003$ , Fisher's exact test); the proportions of households that did not take implement these preventive measures were especially high in Group 1 (89.7%) and Group 2 (89.4%). Furthermore, more than three quarters of the respondents reported that they did not have a door or window screen to prevent mosquitoes from entering their houses ( $P = 0.020$ , Fisher's exact test), and the proportion of respondents without screens was especially high in Group 1 (85.6%). Additionally, most families reported staying outside of the house at night ( $P = 0.800$ , Fisher's exact test) (Table 5).

### ***Knowledge of malaria***

In this survey, almost all the respondents had heard about malaria (98.1%, 257/262) and knew that the main route of transmission was through mosquito biting (86.6%, 227/262). Fever, body aches or joint pain, and loss of appetite were the top three clinical manifestations they reported (Table 6). A total of 173 respondents reported that they would always go to see a doctor or health care worker when they suspected they had malaria, while 48 interviewees said they would take some of the anti-malarial medicine kept in their houses first. The expensive costs (mentioned by 176 respondents) and the long distance (mentioned by 26 respondents) were the main factors preventing people from visiting the doctor or health care worker (Table 6). Sleeping under LLINs (198), keeping their surrounding clean (84) and using insecticide spray intended for use against mosquitoes (20) were the most common methods of malaria prevention employed (Table 6).

**Table 6. Knowledge of malaria transmission, symptom and prevention in the three communities in the Western Area Rural District, Sierra Leone, 2018**

Question & Answer	Group			Total	Percentage
	1	2	3		
<b>1. Have you or any member of your family ever heard of an illness called malaria?</b>					
Yes	94	121	42	257	98.1%
No	3	2	0	5	1.9%
<b>2. In your opinion, what cause malaria?*</b>					
Mosquito bites	82	106	39	227	86.6%
Eating immature sugarcane	0	0	0	0	0.0%
Eating dirty food	3	3	1	7	2.7%
Drinking beer/palm Wine	0	0	0	0	0.0%
Drinking dirty water	7	8	1	16	6.1%
Getting soaked with rain	0	0	0	0	0.0%
Cold or changing weather	1	1	1	3	1.1%
Witchcraft I. injections/drugs	0	1	0	1	0.4%
Eating oranges or mangos	0	2	1	3	1.1%
Eating plenty oil	2	1	0	3	1.1%
Sharing razors/blades	0	0	0	0	0.0%
Don't answer	8	11	2	21	8.0%
<b>3. Can you tell any symptoms of malaria?*</b>					
Fever	39	59	18	116	44.3%
Excessive sweating	7	10	2	19	7.3%
Feeling cold	32	29	11	72	27.5%
Headache	24	27	4	55	21.0%
Nausea and vomiting	10	18	3	31	11.8%
Dizziness	21	29	16	66	25.2%
Loss of appetite	34	46	16	96	36.6%
Body ache or joint pain	43	45	14	102	38.9%
Body weakness	33	43	12	88	33.6%
Refusing to eat or drink	1	0	1	2	0.8%
Jaundice	5	1	0	6	2.3%
Dark urine	12	9	5	26	9.9%
Others	6	2	2	10	3.8%
Don't answer	1	0	0	1	0.4%
<b>4. What should you do when you suspect getting malaria infection?*</b>					
Must go to see the doctor/health worker	65	77	31	173	66.0%
Take some anti-malarial drugs kept in house	17	26	5	48	18.3%
Not necessary to see the doctor/health worker and take drugs	1	2	0	3	1.1%
Go to see the doctor/health worker only when shown severe condition	4	6	5	15	5.7%
Others: Specify.	6	9	3	18	6.9%
Don't answer	4	3	0	7	2.7%
<b>5. What are the reasons you think that someone would not go to see the doctor/health worker when he or she gets malaria infection?*</b>					
We are all used to it and no necessary to see the doctor	0	0	2	2	0.8%
Prayers could make us recover	0	0	0	0	0.0%
They are strong enough and could recover even if they do not see the doctor	0	0	0	0	0.0%
They have anti-malarial drugs and take it when necessary	4	11	4	19	7.3%
It is unnecessary to see the doctor/health worker for recovering from malaria	0	0	2	2	0.8%
It is too expensive to see the doctor/health worker	68	82	26	176	67.2%
It is too far to go to see the doctor/health worker	23	1	2	26	9.9%
Other reasons	0	24	7	31	11.8%
Don't answer	5	7	1	13	5.0%
<b>6. How can someone protect themselves against malaria?*</b>					
Sleep under treated bed net	71	93	34	198	75.6%
Untreated mosquito net	0	1	0	1	0.4%
Use mosquito repellent	1	2	1	4	1.5%
Use mosquito insecticide spray (Shelltox)	10	7	3	20	7.6%
Take preventive medication	4	4	3	11	4.2%
Indoor residual spray (IRS)	1	3	3	7	2.7%
Use mosquito coils	5	8	2	15	5.7%
Cut grass around house	6	5	0	11	4.2%
Eliminate stagnant water	7	9	5	21	8.0%
Keep surroundings clean	27	44	13	84	32.1%
Don't drink dirty water	1	1	1	3	1.1%
Contaminated food	2	3	2	7	2.7%
Use mosquito screens on windows and doors	2	1	3	6	2.3%
Others: specify	11	10	3	24	9.2%
Don't answer	1	1	1	3	1.1%
<b>7. Where do you think the mosquito larvae live? DO NOT PROMPT ANSWER</b>					
In water	49	77	27	153	58.4%
In weed	0	4	0	4	1.5%
In rubbish	25	20	9	54	20.6%

I don't know	16	16	4	36	13.7%
Don't answer	7	6	2	15	5.7%

\*: it is a multiple-choice question.

## Discussion

Malaria remains one of the most serious public health issues and is responsible for high proportions of morbidity and mortality in Sierra Leone. In the present study, overall high levels of knowledge regarding the causes of malaria, prevention mechanisms and symptoms, and active seeking of treatment for malaria from health care providers were found among Sierra Leoneans, similar to the results in the MIS 2013 & 2016 [2, 10]; these results with regards to knowledge and practices support malaria control [11-13].

Globally, vector control is the most commonly accomplished through the use of LLINs and indoor residual spraying (IRS), with the aim of reducing the transmission by preventing human–vector contact and killing vector mosquitoes [14, 15]. The goal was for the entire at-risk population to employ preventive measures, including the use of LLINs, IRS and larval source management, by 2017 in Sierra Leone. However, 72.1% of the respondents required more nets, which may explain the high percentage (61.8%, 162/262) of households and the high proportion of children under five years old who did not sleep under the nets at night according to this survey. This indicates a large gap in obtaining and using nets by the most vulnerable groups who are not benefiting as much as hoped from preventive malaria interventions. In addition, screens for doors and windows that are cost-effective to install and maintain are a supplementary public health intervention to prevent humans from being bitten by mosquito vectors indoors, thereby significantly reducing the transmission of malaria. However, screens seem to have been neglected in the regular malaria control campaigns [16, 17], resulting in fewer than 25% of households having door or window screen in this survey, and a general low awareness of the role of screens. In addition, a low level of implementation of IRS and outside spraying and a high level of engagement in activities outside of the house at night were found, despite the presence of many mosquitoes.

The early diagnosis and prompt treatment of malaria reduces the transmission of the disease and prevents deaths. It is critical for people to seek diagnosis and care as soon as they experience any symptoms of malaria. It is encouraging that more than 80% of the respondents reported that they visited the doctor in a timely manner, and a similar percentage of respondents reported being tested for malaria, usually with RDTs. However, approximately three-quarters of the respondents said that the doctors did not interpret the test results for the patients. Therefore, a good opportunity to provide health education and promote malaria control and prevention is being missed. A home-based RDT that could be performed by trained family members rather than at a healthcare facility may improve the timeliness of the diagnosis of malaria [18, 19]. Moreover, the reported adherence to completing the course of antimalarial treatment was close to 80% at the clinic or if self-administration at home. Reasons for the lack of adherence were reported to be sickness after the first dose, insufficient food to take the medicine, forgetting to take the medicine, and poor instructions provided by the community health center (CHC) [20]. In addition, the cost of medical treatment and the distance from the hospital must also be considered.

However, there were some limitations of this study. First, this was a small-sample cross-sectional study conducted in 3 communities, and the findings are not yet nationally representative. Second, the actual differences in the cost of meals among the three groups in this study were not significant. Third, the collected data were based on respondent recall, and the data may be biased. Therefore, the results of the study highlight the need for more extensive investigations of the KAP regarding malaria in Sierra Leone.

## Conclusion

In conclusion, in these three communities, public awareness of malaria prevention measures was relatively high in this survey, but the malaria burden was still higher than because the lack of sufficient anti-malarial supplies and the limited use of preventive measures against malaria. Thus, the existing knowledge of malaria should be sustained and reinforced, and the availability and use of malaria prevention measures should be promoted to achieve the goals of the SL-NMSP.

## Declarations

### Acknowledgement

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### Contribution

JHY and CJZ conceived the study, developed questionnaire, conducted fieldwork. LLW and JHY analyzed data, and wrote the manuscript. SJS and BK contributed to the study design. EN and AK conducted fieldwork and supervised fieldwork. XXH, XC, XW and WL contributed to data collation and cross-checking. All authors read and approved the final draft.

### Conflict of interest

No conflicts of interest were reported.

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### Ethics Approval and consent to participate

This survey was approved by the Sierra Leone Ethics and Scientific Review Committee. The purpose and procedure of the study were explained to the participants prior to obtaining their consent.

### Consent for Publication

Not applicable.

### Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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