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

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Research

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Abstract

Background The malaria epidemic is high in Sierra Leone, and the implementation of the National Malaria Strategic Plan (2016-2020) has reached its middle stage. In order to guide the interventions more specifically in future, a household-based cross-sectional survey was conducted to understand the public perception of knowledge, attitudes and practices of malaria and its control.

Methods Three communities (Grafton, Jui and Kossoh) in Western Area Rural District within close proximity to Sierra Leone's capital city of Freetown were included. Households were randomly selected and interviewed with a structural questionnaire covering malaria infection, diagnosis, treatment and prevention, as well as the 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 around 30000 Leones in each household. The awareness rate of having heard of malaria is 98.1% (257/262) and knowing mosquito biting as its main route of transmission is 86.6% (227/262) respectively. And 80.9% (212/262) of the respondents sought health advice or treatment for the illness, and similar percentage of them could be tested for malaria, mostly through RDTs. A great demand of long-lasting insecticidal nets (72.1%) was raised to fulfill the high shortage (61.8%, 162/262) in households, and of them there were 66 families having children under five years old.

Conclusion Malaria burden is still high. Although public awareness of malaria prevention sounds well in this survey, the fact that the coverage of supplies and the use of preventive measures against malaria is low in households within the three communities. It is suggested that an advanced campaign should be carried out to scale up not only the knowledge on malaria but also the actual coverage and usage of malaria prevention measures, contributing to the achievements of planned objectives.

Background

Malaria is endemic in Sierra Leone; the entire population of this country are exposed and live in stable malarial areas [1]. Sierra Leone's high malaria disease burden, accounted for approximately 48% of outpatient morbidity and around 38% of mortality among children under five according to the national Malaria Indicator Survey (2016) [2]. Although significant progress on reducing mortality has been made in the fight against malaria, it is still a major public health concern. Malaria control remains a priority within the national health agenda in this country [3].

A multi-pronged strategy for malaria control, including vector control interventions, diagnostic testing, treatment with quality-assured artemisin-based combination therapies, and standardized case management training manuals for community and facility treatment providers have been developed and implemented in Sierra Leone corresponding to WHO recommendations [3]. And, it was expected to achieve: 1. 80% of the population at least have appropriate knowledge and up-take/practice of malaria prevention and management services, 2. all the population at risk will be protected with appropriate preventive interventions, and 3. 80% of suspected malaria cases at least have access to confirmatory diagnosis and all malaria cases 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 implementation of malaria control programs [4-6]. A malaria knowledge, attitudes and practices (KAP) survey could help policy makers to better understand current situation and guide practices in fighting against malaria. Therefore, this study is conducted to understand the public perception of knowledge, attitudes and practices of malaria and its control measures through the household-based survey in the middle of implementation of 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 seat around a large [forest](#) reserve, its major industries are [farming](#) and [coal mining](#).

Participants, questionnaire and data collection

A total of 300 households in the designated communities were selected randomly using a cluster sampling design as survey respondents in the three communities. One adult member from selected households were interviewed with a structured questionnaire covering demographic information, economic status, basic knowledge of malaria as well as the practice of malaria prevention and control in families. When asked about the medicine being used, a package of various drugs was displayed to participants.

The survey was conducted in December 2018 with collaboration of 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 and conducted the survey.

Data management and statistical analysis

Data was input and cross-checked by EpiData version 3.1 [8, 9]. Then, descriptive data and percentages were presented using Microsoft Excel 2010 software. Differences in distribution according to the daily cost for meals in each household were evaluated using the chi-square (χ^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 into the following analysis after data checking of completeness of the questionnaire and logical accuracy before and after. It covered 1645 residents, and about 6 persons were in per family. And the average cost for meals per day is around 30000 Leones in each household (One US dollar was equal to 8000 Leones around during December 2018). Three groups were set up according to the meal cost level. Group 1 was $\leq$ 20000 Leones/household per day, there were 475 persons in 97 households; Group 2 was $\leq$ 40000 Leones/household per day, 778 persons were in 123 households; and a sum of 392 persons from 42 households were in Group 3 at the meal cost $>$ 40000 Leones/household per day.

Malaria infection, diagnosis and treatment

A total of 308 persons in 87 households, 430 persons in 106 households and 191 persons in 39 households from Group1 – 3 respectively were reported to have fever in the year of 2018 ($P = 0.594$, Fisher's exact test). The frequency and the population of malaria suffering among them in the year of 2018 was shown in Table 1.

Moreover, there were about 79.4%, 79.7% and 88.1% of the respondents from group 1-3 accordingly seeking health advice or treatment for the illness from any source ($P = 0.421$, Fisher's exact test). And, 76.6%, 71.4% and 64.9% of the respondents among three groups reported to prefer public medical sectors only respectively ($P = 0.117$, Fisher's exact test) (Table 2). In addition, no significance was found related to the selection of different medical sectors among three groups referring to public sectors ($P = 0.765$, Fisher's exact test) and private sectors ($P = 0.468$, Fisher's exact test) separately (Table 3).

Furthermore, 84.5%, 84.6% and 83.3% of the respondents from Group 1 – 3 respectively reported that they and their family members always went to see a health worker or doctor when they were suspected to be infected with malaria ($P = 0.487$, Fisher's exact test). Of those went to see a health worker or doctor, they went every time or most of times when being suspected as malaria and the overall frequency was similar among the three groups ($\chi^2 = 2.882$, $df = 6$, $P = 0.830$) (Table 4).

In their memory, the health worker or doctor performed a malaria test when they visited due to the suspected malaria (80.1%) ($P = 0.435$, Fisher's exact test), and malaria RDT was the most used test ($P = 0.882$, Fisher's exact test), but nearly half of the doctors or health workers didn't explain the test for them ($\chi^2 = 2.783$, $df = 6$, $P = 0.841$) (Table 4).

Most of respondents reported taking anti-malarial medicine every time when being diagnosed as malaria or most of the time ($P = 0.344$, Fisher's exact test), and about 79.8% of them took the full dosages every time prescribed by doctor/health worker ($P = 0.489$, Fisher's exact test), and Artesunate+Lumafantrine (51.7%) and Artesunate+Amodiaquine (19.1%) were the first two choices. The reason of not taking all medicine was mainly that they recovered before finishing all the dosages ($P = 0.815$, Fisher's exact test). Moreover, about 80.2% of the respondents reported to start taking the anti-malarial medicine since the same day when they were fever ($P = 0.095$, Fisher's exact test), and about 64.5% of them responded that all kinds of the anti-malarial medicine were not 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 didn't have enough LLINs in their households ($P = 0.253$, Fisher's exact test), so resulting in children under 5 years in 66 households couldn't sleep under LLINs ($P = 0.410$, Fisher's exact test). And only 146 respondents slept under nets at the night before the survey ($P = 0.331$, Fisher's exact test). To make matters worse, some members in 162 households didn't sleep under LLINs which would cause 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).

Besides, a total of 143 households never sprayed insecticide indoor to kill mosquitoes ($P = 0.217$, Fisher's exact test), and 225 households never sprayed insecticide outside ($P = 0.003$, Fisher's exact test), especially among group 1 (89.7%) and group 2 (89.4%). Furthermore, more than three quarters of the respondents reported that they didn't have doors or windows screen for preventing mosquitoes enter into their houses ($P = 0.020$, Fisher's exact test), especially in the first group (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 respondents have heard about malaria (98.1%, 257/262) and its main transmission pattern of mosquito bites (86.6%, 227/262). Fever, body ache 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 the doctor/health worker when they were suspected as malaria, and 48 interviewees would take some anti-malarial medicine kept in house firstly. Expensive costs (mentioned by 176 respondents) and the far distance (mentioned by 26 respondents) were the main factors that stop people seeing the doctor/health worker (Table 6). Sleeping under LLINs (198), keeping surrounding clean (84) and using mosquito insecticide spray (20) were the most selected choices for the malaria prevention (Table 6).

Discussion

Malaria remains one of the most serious public health issues responsible for morbidity and mortality in Sierra Leone, although overall high levels of knowledge on the causes of malaria, prevention mechanisms, symptoms, and health care seeking to treat malaria were found among Sierra Leoneans in the present study which is in favor of malaria control [10-12] just like that in the MIS 2013 & 2016 [2, 13].

Vector control through the use of LLINs and indoor residual spraying (IRS) interventions are the most commonly used tools globally to reduce malaria transmission through preventing human–vector contact and kill the vector mosquitoes [14, 15]. And it was expected to cover all population at risk with preventive measures including the use of LLINs, IRS and larval source management by 2017 in Sierra Leone. However, 72.1% of respondents requiring more nets, may be the potential reason of the high percentage (61.8%, 162/262) of households and children under five years old in 66 families couldn't sleep under the nets at night in this survey. This indicates a big gap in obtaining and using nets by the most vulnerable groups who are not benefiting as much as hoped from malaria interventions. Besides, screen for doors and windows which is cost-effective to install and maintain has been considered as a supplementary public health intervention to prevent human bitten by the mosquito vectors indoors and significantly reduce malaria transmission. However, it was easily ignored in common malaria control campaigns [16, 17], such as less than 25% of households had door or window screen in this survey, in addition to a low level of awareness of the role of screen. In addition, the low usage of IRS and outside spraying plus the high engagement in activities outside of the house at night was found, although there were so many mosquitoes.

Early diagnosis and prompt treatment of malaria reduces transmission of the disease and prevents deaths. It is critical that people seek diagnosis and care as soon as they experience any symptoms of malaria. It is nice to see that more than 80% of the respondents could go to the doctor in time, and similar percentage of them could be tested for malaria, and malaria RDTs was used mostly. But around three quarters of respondents said that the doctors didn't interpret test results to patients. Thereby, a good opportunity for health education and promotion on malaria control and prevention may be missed. And a home-based rapid diagnostic test by trained family members rather than visiting a healthcare facility for clinical testing may improve the timeliness of malaria diagnosis [18, 19]. Moreover, complete adherence of taking antimalarial medicine approached to 80%, while similar ratio of self-administration at home. Explanations included sickness after the first dose, insufficient food to take the medicine, forgetting to take the medicine, and poor instructions provided by the CHC [20]. In addition, the cost of medical treatment and the distance from the hospital must also be considered.

Conclusion

In conclusion, the public awareness of malaria prevention was relatively satisfactory in this survey, but the malaria burden is still higher than expected due to the fact that the coverage of anti-malarial supplies and the use of preventive measures against malaria is low in households within the three communities. Thus, an advanced campaign should be carried out to scale up not only the knowledge on malaria but also the actual coverage and use rate of malaria prevention measures, thereby achieve the goal of reducing new cases of the disease by 40 percent by 2020 in Sierra Leone.

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. XXW, 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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Tables

Table 1. The distribution of malaria cases in households

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

Table 2. The distribution of medical sectors people seeking health advice or treatment

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

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

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

Table 4. Malaria diagnosis and anti-malarial medicine taking

Question & Answer	Group			Total	Percentage
	1	2	3		
When you and your family suspected you were infected with malaria, did you always go to see a health worker/doctor?					
	82	104	35	221	84.4%
answer	10	8	2	20	7.6%
How often?	5	11	5	21	8.0%
Every time	38	42	16	96	43.4%
Most of time	26	44	13	83	37.6%
Seldom	11	12	3	26	11.8%
When they showed severe condition	7	6	3	16	7.2%
When you or any member of your family suspected that they had malaria, did the health worker/ doctor conduct a malaria test?					
	76	98	36	210	80.2%
answer	15	14	2	31	11.8%
Did the Doctor / health worker explain to you the test to be done?	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%
What type of test did they say they were going to perform?	10	15	5	30	11.5%
	51	66	26	143	54.6%
scopy	1	3	1	5	1.9%
remember	30	37	9	76	29.0%
answer	15	17	6	38	14.5%
When you and your family were infected with malaria, did you take the anti-malarial medicine?					
time	49	40	19	108	41.2%
Most of time	30	49	15	94	35.9%
Seldom	9	15	2	26	9.9%
	0	2	0	2	0.8%
When they showed severe condition	5	7	3	15	5.7%
answer	4	10	3	17	6.5%
What anti-malarial medicines did you take?					
Chloroquine	3	3	0	6	2.3%
Combination with Artemisinin	1	2	0	3	1.1%
Chloroquine+Lumefantrine	58	69	24	151	57.6%
Chloroquine+Amodiaquine	17	28	9	54	20.6%
Chloroquine	4	4	1	9	3.4%
None	0	1	1	2	0.8%
Please specify	16	18	5	39	14.9%
answer	7	8	3	18	6.9%
When did (NAME(S)) take the anti-malarial medicine?					
Day after fever	87	91	32	210	80.2%
Day after fever	4	15	5	24	9.2%
Day after fever	0	0	0	0	0.0%
Two 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%
Are the antimalarial drugs FREE which you and your family took?					
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%
Is FREE	64	76	29	169	64.5%
answer	3	8	3	14	5.3%
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?					
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%
If not all drugs taken, please explain why:					
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%
I'm too busy to remember taking all the dosage	0	2	0	2	5.4%
Please specify	1	1	0	2	5.4%
Don't answer	0	0	0	0	0.0%

Table 5. Malaria prevention practices in the communities

Question & Answer	Group			Total	Percentage
	1	2	3		
1. Do you have a mosquito treated bed nets in your home?					
Yes	70	91	27	188	71.8%
No	27	32	15	74	28.2%
2. Did you sleep under a mosquito net last night?					
Yes	57	71	18	146	55.7%
No	37	46	23	106	40.5%
Don't answer	3	6	1	10	3.8%
3. Is there anyone in your household who did not sleep under treated bed nets last night?					
Yes	53	81	28	162	61.8%
No	37	34	13	84	32.1%
Don't answer	7	8	1	16	6.1%
4. Are there enough treated bed nets in your household?					
Yes	31	25	9	65	24.8%
No	62	95	32	189	72.1%
Don't answer	4	3	1	8	3.1%
5. Do all children under 5 years in your household sleep under treated bed nets at night?					
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%
6. Where did you get the treated bed nets?					
Government Hospital/Health Center	56	57	17	130	49.6%
Mobile Clinic	1	0	0		
Community Health Center	8	23	9	40	15.3%
Private Hospital/ Clinic	0	7	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%
7. Did you spray insecticide to kill mosquitoes in your house?					
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%
8. Did you spray insecticide to kill mosquitoes outside your house?					
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%
9. Does your house have doors or windows screen which could stop the mosquitoes to go into the house?					
Yes	13	34	11	58	22.1%
No	83	89	30	202	77.1%
Don't answer	1	0	1	2	0.8%
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)					
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%

Table 6. Knowledge of malaria transmission, symptom and prevention

Question & Answer	Group			Total	Percentage
	1	2	3		
1. Have you or any member of your family ever heard of an illness called malaria?					
Yes	94	121	42	257	98.1%
No	3	2	0	5	1.9%
2. In your opinion, what cause malaria?*					
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%
3. Can you tell any symptoms of malaria?*					
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%
4. What should you do when you suspect getting malaria infection?*					
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%
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?*					
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%
6. How can someone protect themselves against malaria?*					
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%
7. Where do you think the mosquito larvae live? DO NOT PROMPT ANSWER					
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.