

# Awareness and Behavior regarding Mosquito Borne Diseases and Its Correlates among Urban Slum Residents of Burdwan Municipality, West Bengal(India)

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## ABSTRACT

### Background

Mosquito-borne diseases are major public-health problems in overcrowded, polluted areas like slums even after implementation of various measures under the umbrella of National Vector-Borne Disease Control Program (NVBDCP). Information about awareness of slum-dwellers and their behaviors towards mosquito-borne diseases are essential for their prevention. This study aimed to assess awareness, preventive and care-seeking behaviors towards mosquito-borne diseases among slum residents of Burdwan Municipality and to check for mosquito-breeding places in and around their houses.

### Materials and Methods

A community-based, cross-sectional descriptive study was conducted in 226 households of urban field practice areas of the department of Community Medicine, selected through random sampling, with a pre-designed, pre-tested schedule from October 2022 to January 2023.

### Results

The present study revealed that out of a total of 226 households, more than one-fourth (26.5%) had poor awareness regarding the names of diseases caused by mosquitoes. None were aware about the diurnal variation in mosquito biting pattern. More than half (56.6%) had poor awareness about symptoms of malaria and more than one-thirds (35.4%) had poor awareness regarding symptoms of dengue. Majority had poor awareness regarding symptoms of chikungunya, filariasis and Japanese encephalitis i.e. 93.8%, 83.6% and 96.9% respectively. More than two-third (67.7%) had satisfactory awareness regarding preventive methods against mosquito-borne diseases. Majority (90%) used mosquito nets as personal protective behavior. Among the households who had a history of mosquito-borne diseases, only one-thirds (34%) sought health-care within 48 hours of symptoms onset and 83% sought health-care from public facilities. Bivariate analysis using chi-square test revealed socio-demographic characteristics such as gender, education, occupation had significant association with awareness regarding mosquito-borne diseases.

### Conclusions

There is a need for awareness generation and behavior change communication on mosquito-borne diseases, and enhance community participation in implementing preventive measures for the same.

**Keywords:** Awareness, behavior, mosquito-borne diseases, preventive, slum

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## INTRODUCTION

Mosquitoes are one of the deadliest creatures on earth because of their ability to transmit diseases to humans which causes millions of deaths every year.<sup>[1]</sup> The diseases which spread by the bite of an infected mosquito are known as mosquito-borne diseases.<sup>[2]</sup> Mosquito-borne diseases with high prevalence include Malaria, Dengue, Filariasis, Japanese Encephalitis (JE) and Chikungunya. The incidence of these mosquito-borne diseases is linked with economic and social development of the community. There are various factors which govern the transmission of the diseases.<sup>[3]</sup> In a developing country like India where unplanned urbanization is a common thing, mosquito-borne diseases transmit immensely. Significant variation in temperature and climate with rainfall further add to India being an endemic country for various mosquito-borne diseases. Distribution of these diseases is determined by a complex dynamic of environmental and social factors. WHO estimated that India accounts for three-quarter of all malaria cases in South-East Asia with 95% population in the country residing in malaria endemic areas. In case of dengue, it is now endemic in the entire country. Not only is the number of cases increasing but recurring outbreaks of dengue are also occurring in several places like Delhi, West Bengal, Uttar Pradesh, Odisha, Puducherry etc. When it comes to JE, epidemics are reported from many parts of India. Out of total Acute Encephalitis Syndrome (AES)/JE cases and deaths reported in the country more than 85% are contributed by five states, namely West Bengal, Bihar, Uttar Pradesh, Assam and Tamil Nadu. When it comes to chikungunya, although not generally fatal, in the year 2006 India experienced an explosive outbreak affecting more than 1.4 million people in 13 states. Regarding filariasis, about 2.5 million people are exposed to the risk factors, about 2 million are microfilariae carriers and 1.2 million disease cases occur in India.<sup>[4]</sup> The state of West Bengal, is experiencing active transmission of dengue at different urban, peri-urban and rural places in recent years. Malaria, which is now a disease for elimination, is also occurring in significant numbers in some

pockets of several districts. The state has around 35,803 cases of lymphatic filariasis and 19 districts being considered as endemic. The state government had launched special drive of Mass Drug Administration (MDA) to eradicate filariasis in five districts namely Purulia, Bankura, Birbhum, Murshidabad and Paschim Bardhaman.<sup>[5]</sup> Every year sporadic JE cases are reported from the various districts of West Bengal, indicating its endemicity in this state. Rise in dengue cases is evident from a state report showing 965 cases of dengue till 21<sup>st</sup> week of 2022,<sup>[6]</sup> as compared to 214 cases in previous year. The report also shows 27 dengue cases in the district of Purba Bardhaman as compared to zero cases in previous year. Prevalence of mosquito-borne diseases may be due to the lack of community participation and interventions. Key success in controlling mosquito-borne diseases depends on awareness about clinical manifestation, early healthcare seeking behavior and various preventive practices taken by the community. Thus, the professional mosquito management organizations should ensure that community members are receiving the most accurate and effective information about tools used in their areas as most of the time the tools used to control mosquitoes are diverse and often misunderstood. Accordingly, it is critical to measure the level of awareness and behaviors of community-dwellers in the direction of lowering the prevalence of mosquito-borne diseases. Simultaneously, eliminating mosquito habitat from communities is an important step in controlling mosquito-borne diseases. Adequate attention to the environment like proper drainage of stagnant water, clearing clogged gutters, properly discarding old tires, buckets, bottles etc. can decrease the scale of transmission of mosquito-borne diseases. Thus, with the above background the present study was conducted to assess the level of awareness, preventive and care-seeking behaviors towards mosquito-borne diseases among slum residents of Burdwan Municipality and to check the presence of mosquito-breeding places in and around their houses.



## MATERIALS AND METHODS

### Study type, design, area and population:

This was a community based descriptive study, cross-sectional in design, conducted in Burdwan Municipality of West Bengal, India during October 2022 - January 2023. In Burdwan Municipality area, ward no.17 was selected by convenience sampling as it is the Urban Field Practice Area of the Dept. of Community Medicine, Burdwan Medical College. There are six slums in this ward namely, Kalabagan, Muchipara, Canal Par, Bhutgoro Par, Kantapukur and Sadarghat bastee which constituted the study area. Residents of these slums for one year, willing to give informed consent were the study population.

### Sample Size and Sampling Technique:

Sample size was estimated using the formula  $n = [(Z_{1-\alpha/2})^2 \times P(1-P)] / d^2$ , where P is the proportion of good knowledge regarding mosquito borne diseases, taken as 16% [7], with absolute precision 5%, confidence interval 95% and non-response rate 10%. The final estimated sample size was 226 households. A sampling frame of households situated in the study area was prepared with the help of urban-ASHAs and from that the estimated 226 households were selected by Simple Random Sampling (SRS) technique. Head of the family of selected households were the study subjects with whom the interview was conducted.

### Tools and Technique:

- Socio-demographic information: A predesigned and pretested proforma was used for collecting socio-demographic information of study subjects such as age, sex, religion, caste, literacy, marital status, occupation, total family income, family size and socioeconomic status.
- Assessment of awareness and behavior of the study subjects regarding mosquito borne diseases: A predesigned and pretested schedule was used to assess awareness and behavior of the study subjects regarding mosquito borne diseases. The schedule also consisted of an environmental checklist which was used to observe the presence of potential mosquito breeding places in and around the households of

study subjects. The schedule was designed with the help of standard textbooks of Community Medicine and by reviewing literature on mosquito borne diseases relevant to the objectives of present study. Content validity of the tool was evaluated by subject experts and reliability was assessed by Cronbach's alpha whose value was 0.712. The schedule consisted of open ended questions. It was translated into Bengali and back translated to English for semantic and linguistic equivalence. Assessment of level of awareness was done using a scoring system with 9 items, each item having a certain number of specified correct answers. For each correct response score "1" and for wrong response or if responded as "do not know" score "0" was given to participants. According to the number of correct responses a total score was given to participants for each item and further level of awareness of participants is categorized as "poor", "satisfactory" and "good" as per their scores for individual items. Appendix 1 shows the schedule and the scoring pattern used.

### Data Collection and ethical approval:

Data were collected after receiving approval from Institutional Ethics (Memo no.- BMC/ I.E.C/ 021). Prior to data collection, the district and municipality level health authorities were informed, and their cooperation was sought. Participants of the study were briefed about the purpose and process of the study. Prior to data collection informed consent was obtained. They were also assured about the confidentiality of information.

### Data Management and Analysis:

Collected data were checked for completeness and consistency and then the data were entered in the computer on Microsoft Excel (2019, Version 18.2301.1131.0) Data Sheets. The principles of descriptive statistics were applied to organize and present the data in tables and diagrams. Data were analyzed using chi-square test of significance with the help of Statistical Package for Social Sciences software (version 23.0).

## RESULTS

A total of 226 participants were studied among which 163 (72.1%) were males and the rest 63 (27.9%) were females. Age of study participants ranges from 26 years to 57 years with 33.6%, 44.2% and 22.1% of subjects from the age group of 26-40, 41-55 and above 55 years respectively. Majority of subjects (97.3%) were Hindu and the rest were Muslims. There were 48 (21.2%) subjects with education of middle school and above, 100 (44.2%) subjects were of primary school and 78 (34.5%) were illiterate. Majority of the participants 132 (58.4%) were employed and among them common occupations were rice-mill workers, e-rickshaw drivers and shop-keepers. More than two third of the subjects (69%) lived in joint families and the majority of the subjects (93.8%) belonged to lower middle and lower socio-economic class according to modified B.G. Prasad scale 2021.

## Level of awareness

Level of awareness of study participants regarding mosquito borne diseases is presented in Table 1. More than one fourth (26.5%) of the study participants had poor awareness regarding the names of diseases caused by mosquitoes. None of the subjects were aware about the diurnal variation in mosquito biting pattern. More than half of subjects (56.6%) had poor awareness about symptoms of malaria. More than one third (35.4%) of subjects had poor awareness regarding symptoms of dengue. Majority of subjects had poor awareness regarding symptoms of chikungunya, filariasis and Japanese encephalitis i.e. 93.8%, 83.6% and 96.9% respectively. Two third (67.7%) of subjects had satisfactory awareness regarding preventive methods against mosquito borne diseases. Majority of participants 128 (56.6%) had acquired information regarding mosquito borne diseases from community level health workers followed by friends and neighbors 71 (31.4%) and from posters 33 (14.6%), television 19 (8.4%) and newspapers 14 (6.2%).

**Table 1- Distribution of study participants according to their level of awareness regarding mosquito borne diseases. (n=226)**

Sl.no.	Domains of awareness	Level of awareness regarding mosquito borne diseases, Frequency (%)		
		Poor	Satisfactory	Good
1	Names of the diseases caused by mosquitoes	60 (26.5)	96 (42.5)	70 (31.0)
2	Breeding places of mosquitoes	74 (32.7)	86 (38.1)	66 (29.2)
3	Diurnal variation in mosquito biting pattern	226 (100.0)	0 (0)	0 (0)
4	Symptoms of malaria	128 (56.6)	73 (32.3)	25 (11.1)
5	Symptoms of dengue	80 (35.4)	83 (36.7)	63 (27.9)
6	Symptoms of chikungunya	212 (93.8)	12 (5.3)	2 (0.9)
7	Symptoms of filariasis	189 (83.6)	37 (16.4)	0 (0)
8	Symptoms of JE	219 (96.9)	7 (3.1)	0 (0)
9	Preventive methods against mosquito borne diseases	56 (24.8)	153 (67.7)	17 (7.5)

### Preventive and health care seeking behavior

Preventive and health care seeking behavior of study participants towards mosquito borne diseases table 2 and 3. Most common preventive measure was use of mosquito nets (90%) followed by mosquito repellent coils, vaporizers, creams etc. Preventive behavior of participants was further classified as poor, acceptable, satisfactory and good which is explained in table 2.

**Table 2- Distribution of study subjects according to their preventive behavior towards mosquito borne diseases. (n=226)**

Use of various personal preventive measures by study subjects (multiple responses)		
Sl.no.	Preventive methods	No. (%)
2.1	Use of mosquito net while sleeping	203 (89.8)
2.2	Use of mosquito repellent vaporizers/coils	200 (88.5)
2.3	Use of mosquito repellent cream	20 (8.8)
2.4	Screening of windows	42 (18.6)
Classification of preventive behavior		
Sl.no.	Classification	No. (%)
2.5	Poor (using none of the measures)	00 (00)
2.6	Acceptable (using any one measure)	226 (100)
2.7	Satisfactory (using any two measures)	121 (53.5)
2.8	Good (using any three or more measures)	56 (24.8)

Out of 226 participants, 29 (12.8%) had a history of mosquito borne diseases in their family in the last 6 months thus, only from these 29 respondents various health care seeking behavior

was assessed. Majority of subjects (65.5%) sought medical care after 48 hours of symptoms onset and 82.7% sought health care from government health care facilities.

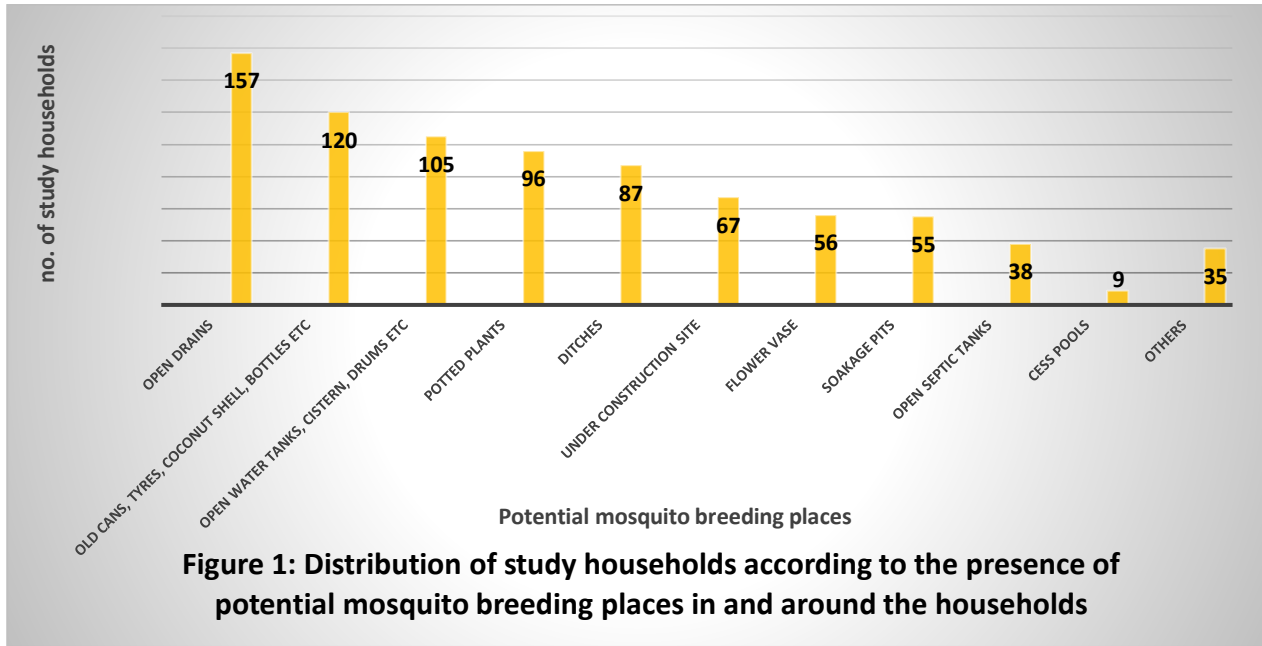
**Table 3- Distribution of study subjects according to their care seeking behavior towards mosquito borne diseases.**

Sl.no.	Care seeking behavior of study subjects	No. (%)	
3.1	h/o mosquito borne diseases in the family in the last 6 months. (n=226)	Yes 29 (12.8)	No 197 (87.2)
3.2	Duration between onset of symptoms and care seeking. (n=29)	Within 48 hours 10 (34.5)	After 48 hours 19 (65.5)
3.3	Place of care seeking. (n=29)	Public facility 24 (82.7)	Private practitioner 5 (17.3)

**Potential mosquito breeding places**

Figure 1 represents the presence of potential mosquito breeding places in and around the houses of study participants. Open drains were

the most frequently encountered breeding places in the study area.



**Figure 1: Distribution of study households according to the presence of potential mosquito breeding places in and around the households**

**Associates of awareness and behavior regarding mosquito borne diseases**

Chi-square test was used to analyze the association between level of awareness of study subjects regarding mosquito borne diseases and their socio-demographic characteristics.

Association between level of awareness of study subjects in various domains of mosquito borne diseases and statistically significant socio-demographic characteristics are shown in table 4.

**Table 4: Association between level of awareness regarding mosquito borne diseases and the socio-demographic characteristics. (n=226)**

Socio-demographic characteristics	poor	satisfactory	good	total	Test of significance (χ <sup>2</sup> test)
1. Level of awareness regarding names of the diseases caused by mosquito					
<b>GENDER</b>					
Male	34 (20.9)	76 (46.6)	53 (32.5)	163 (100.0)	P value-0.007 χ <sup>2</sup> value- 9.95 df-2
Female	26 (41.3)	20 (31.7)	17 (27.0)	63 (100.0)	
Total	60 (26.5)	96 (42.5)	70 (31.0)	226 (100.0)	
<b>EDUCATION</b>					
Illiterate	31 (39.7)	25 (32.1)	22 (28.2)	78 (100.0)	P value-0.003 χ <sup>2</sup> value- 16.42 df-4
Primary school	24 (24.0)	49 (49.0)	27 (27.0)	100 (100.0)	
Middle school and above	5 (10.4)	22 (45.8)	21 (43.8)	48 (100.0)	





Total	60 (26.5)	96 (42.5)	70 (31.0)	226 (100.0)	
<b>2. Level of awareness regarding symptoms of malaria</b>					
<b>EDUCATION</b>					
Illiterate	48 (61.5)	21 (26.9)	9 (11.5)	78 (100.0)	P value-0.030
Primary school	62 (62.0)	31 (31.0)	7 (7.0)	100 (100.0)	$\chi^2$ value- 10.71
Middle school and above	18 (37.5)	21 (43.8)	9 (18.8)	48 (100.0)	df-4
Total	128 (56.6)	73 (32.3)	25 (11.1)	226 (100.0)	
<b>3. Level of awareness regarding preventive measures</b>					
<b>EDUCATION</b>					
Illiterate	23 (29.5)	54 (69.2)	1 (1.3)	78 (100.0)	P value-0.00
Primary school	28 (28.0)	66 (66.0)	6 (6.0)	100 (100.0)	$\chi^2$ value- 20.84
Middle school and above	5 (10.4)	33 (68.8)	10 (20.8)	48 (100.0)	df-4
Total	56 (24.8)	153 (67.7)	17 (7.5)	226 (100.0)	
<b>OCCUPATION<sup>†</sup></b>					
Skilled	1 (10.0)	6 (60.0)	3 (30.0)	10 (100.0)	P value-0.028
Semi-skilled	18 (24.3)	51 (68.9)	5 (6.8)	74 (100.0)	$\chi^2$ value- 17.25
Unskilled	9 (18.8)	33 (68.8)	6 (12.5)	48 (100.0)	df- 8
Unemployed	9 (20.5)	33 (75.0)	2 (4.5)	44 (100.0)	
Retired	19 (38.0)	30 (60.0)	1 (2.0)	50 (100.0)	
Total	56 (24.8)	153 (67.7)	17 (7.5)	226 (100.0)	

Association between level of awareness regarding preventive measures against mosquito borne diseases is statistically-significant with the

use of personal protection measures by study subjects ( $p = 0.00$ ).

## DISCUSSION

The current study is conducted with an aim to assess the level of awareness, preventive and care-seeking behaviors of slum residents towards mosquito borne diseases and to check the presence of mosquito-breeding places in and around their houses. The current study shows 35% participants were illiterate which is comparable with the findings of a study done by Singh VK, Agarwal R, Singh G in Agra district<sup>[8]</sup> where 38% participants were found to be illiterate. Also, similar findings were observed in a study done by Vala M et al in Rajkot district of Gujarat<sup>[9]</sup> where 32% respondents were illiterate. In the current study 44.2% subjects were educated up to primary school which is comparable with the 45.6% respondents who had education up to primary level in the study conducted in Agra.<sup>[8]</sup> In the present study, 31% of study participants in the slum areas had good

awareness regarding the names of diseases caused by mosquitoes, whereas a study done in Karnataka by Muralidhar M. Kulkarni et al<sup>[7]</sup> showed good knowledge only in 15.5 % respondents in slum areas. Regarding awareness on mosquito breeding places, 30.4% participants did not know about where mosquitoes lay eggs in a study done in Rajkot city done by A.B. Patel et al.<sup>[10]</sup> The present study yielded similar findings where 32.7% participants have poor awareness regarding the breeding sites of mosquitoes. In the present study it is found that the majority of respondents had poor awareness regarding symptoms of JE (96.9%), chikungunya (93.8%) and filariasis (83.6%). For symptoms of malaria more than half (56.6%) of respondents had poor awareness level. This result is very much comparable with a study done by A.B. Patel et al



<sup>[10]</sup>. In the current study it was found that 25% participants had poor awareness regarding preventive measures against mosquito borne diseases, similar finding was found in study done by Prakash R et al in Katihar district of Bihar <sup>[11]</sup> where 20% study subjects did not have any knowledge regarding mode of preventive measures from mosquito bites. The participants were asked about the source of their information. In a study done by R. Bayas et al in the state of Maharashtra, <sup>[12]</sup> majority of the participants (56.8%) gathered knowledge about mosquito borne diseases from social media while as far as the present study is concern the most common source of information was health workers (56.6%). Current study shows that 31% subjects had acquired information regarding mosquito borne diseases from friends and neighbors which was consistent with the findings by Prakash R et al from a study done in Katihar district of Bihar <sup>[11]</sup> where 28% participants reported friends/relatives as the main source for their knowledge.

Use of mosquito nets is the most commonly used preventive measure by the participants of the present study (89.8%) whereas in a study done by A. Ghosh et al in Bankura district, <sup>[13]</sup> the most common way of personal protection to the study population was use of various types of mosquito repellants (43%) and use of mosquito bed nets was only 24.5% among them. Also, in the study done by V.N. Koduri et al in Telangana, <sup>[14]</sup> mosquito bed nets are not the measure of choice, here the most common method of personal protective measure used was mosquito coils (28.72%) followed by liquid repellents (26.06%). In the study from Bankura district, <sup>[13]</sup> it is surveyed that only 37.3% respondents sought medical treatment from the government health system while in the present study the proportion of participants seeking health care from the government health care facilities are much higher i.e. 82.7%. These differences in the level of awareness and

preventive and care seeking behavior of study participants may be attributed to the more intensified efforts towards generating public awareness regarding the horridness of mosquito borne diseases and its preventive measures. Also, the differences may be because of more effective IEC campaigns by health care workers in the communities as in the recent times there was a high incidence of dengue in the district. <sup>[6]</sup>

Most frequently encountered potential breeding place for mosquitoes was open drains around the households i.e. 69.5% followed by presence of old canes, tyres, coconut shells and bottles inside the households (53%). This scenario demands active involvement of government and other stakeholders along with active participation of community dwellers to improve the environmental condition and thus quality of life in this area. The research topic of the present study was very much relevant to the current need of the community especially of the slum dwellers which stands out to be the strength of the study. The study was conducted on the slum residents of only a single municipal ward which limits the external validity of the study findings. A larger community-based study including a greater number of municipal wards would have been better for generalizability of the study findings.

## CONCLUSION

This study revealed that the level of awareness regarding various domains of mosquito borne diseases was not satisfactory among most of the study population and negligible awareness about Japanese Encephalitis, Chikungunya and biting pattern was observed. Therefore, it is recommended to enhance and prioritize IEC activities regarding these diseases among community dwellers. To minimize mosquito breeding places, information on environmental modification should be imparted to the community and regular monitoring by stakeholders is recommended.





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## APPENDICES

**Appendix 1: Schedule to assess the level of awareness of study participants regarding mosquito borne diseases**

Sl No.	Items/ Topics	Response	Max Score
1	Name of mosquito borne diseases (Malaria/Dengue/Filaria/Chikungunya/JE/don't know)	Poor- $\leq 1$ Satisfactory 2 Good- $> 2$	5
2	Breeding places of mosquitoes (stagnant water/dirty water/artificial collection of water/swampy places/don't know)	Poor- $\leq 1$ Satisfactory 2 Good- $> 2$	4
3	Diurnal variation in mosquito biting pattern	Poor- 0 Good- 1	1
4	Symptoms of malaria (fever/chills/headache/vomiting/nausea/don't know)	Poor- $\leq 1$ Satisfactory 2 Good- $> 2$	5
5	Symptoms of dengue (fever/severe headache/body ache/nausea/vomiting/rashes/don't know)	Poor- $\leq 1$ Satisfactory 2 Good- $> 2$	5
6	Symptoms of chikungunya (fever/ joint pain / muscle pain/headache/nausea/fatigue/ don't know)	Poor- $\leq 1$ Satisfactory 2 Good- $> 2$	6
7	Symptoms of chronic filariasis (lymphedema of extremities/hydrocele/don't know)	Poor- 0 Satisfactory 1 Good- 2	2
8	Symptoms of JE (fever/ seizures / change in mental status/ don't know)	Poor- $\leq 1$ Satisfactory 2 Good- $> 2$	3
9	mosquito borne disease prevention methods (personal protection/clearing water collection/insecticidal spraying/larvivorous fishes)	Poor- $\leq 1$ Satisfactory 2 Good- $\geq 3$	4

*Texts within parentheses were the expected responses from study participants.*