

Original Research Article

Readiness of malaria elimination in community and health facility of Mannaung Township, Rakhine State, Myanmar in 2022: a mixed-methods study

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ABSTRACT

Background: Myanmar aims to eliminate *Plasmodium falciparum* malaria by 2025 and all human strains by 2030. In 2018, three townships including Mannaung township in Rakhine State were chosen for elimination pilot projects. The readiness assessment of community health-seeking behaviour and healthcare services of a malaria surveillance system for malaria elimination was conducted in Mannaung township.

Methods: In December 2022, a mixed-methods survey interviewed 400 villagers regarding health-seeking behaviour and in-depth interviews (IDI) with Healthcare Providers (HCPs) from eight Health Centers and three hospitals for healthcare services of surveillance systems for malaria elimination.

Results: Of 400 households, 154 (38.5%) had at least one family member contracting fever in the last 3 months. Among the 686 members contacted, 220 (32.1%) had a fever within the 3 months. Of these reported fever, 70 respondents (31.8%) were tested with RDT of which 51 (72.9%) were tested within 24 hours. Three main themes emerged from qualitative data analysis: experience of malaria prevention and control activities, malaria case-based response activities and suggestions to improve malaria surveillance. Although most of the HCPs expressed their understanding of testing criteria for malaria elimination, some had a knowledge gap in malaria elimination response activities. The HCPs received malaria elimination training in 2019, but they suggested providing malaria elimination-related training annually.

Conclusions: The readiness assessment revealed delayed health-seeking behaviour in malaria thus awareness raising within the community should be provided. The HCPs need to enhance their ability to conduct surveillance activities for malaria elimination.

Keywords: Seeking-behaviour, Surveillance, Malaria elimination, Myanmar

INTRODUCTION

Myanmar aims to eliminate *Plasmodium falciparum* by 2025 and all human malaria species of human malaria by 2030. The malaria annual parasite incidence (API) of less

than one township was defined to conduct malaria elimination township. The number of townships declaring to conduct malaria elimination has increased year by year 211, 262, and 275 townships in 2019, 2020, and 2021 respectively.¹

Myanmar is adopting a '1-3 initiative' whereby 'case investigation, classification and response' and 'focus investigation, classification, and response' will be merged into a single package of interventions ('case and focus investigation, classification and response'). This will require malaria cases to be reported within one day and full case investigation and response actions to be taken within 1-7 days or as early as possible.²

Myanmar has seen a remarkable reduction in malaria morbidity and mortality during the last decade since 2010. Therefore, these data reflect significant improvements and shift from the malaria control program to the malaria elimination program.

Rakhine is one of the states with a high malaria morbidity rate before 2012. In 2019, the Annual Blood Examination Rate (ABER) increased to 12.8%. Even though the number of examined cases increases year by year, the malaria positivity rate was reduced. There were 340,000 examined cases and 5,325 positive cases in 2019. Malaria prevention and control activities have been mainly supported by the Global Fund (GF) and six implementing partners in this State.³

In 2018, the Technical Support Group (TSG) allowed the piloting of elimination activities in three townships in Rakhine State (Toungup, Rambree, and Mannaung) in collaboration with implementing partner support. In 2021, the National Malaria Control Program (NMCP) expanded the elimination townships to 12 townships and worked with this implementing partner in these townships. Among these three pilot townships, Mannaung township had no Indigenous case since 2017 and ABER more than 10% was for four years.³

However, WHO certification has not been given at the sub-national level such as the State/Regional level and township level.⁴ While waiting for zero local cases in other townships, existing malaria-zero indigenous townships may be reintroduced, and re-established, resulting in malaria-endemic conditions. Moreover, Mannaung township is the only township that meets the criteria for malaria elimination. Therefore, whether this township is ready for elimination or not is an important concern in malaria elimination in Myanmar.

The study aims to assess the readiness for malaria elimination in Mannaung Township, Rakhine State, by assessing the community health-seeking behavior regarding fever and the healthcare services of the malaria surveillance system for malaria elimination.

METHODS

A cross-sectional study with a mixed method design (quantitative and qualitative) was conducted in Mannaung township, Rakhine State in December 2022 (Figure 1).

The quantitative study involved 400 villagers aged 18 to 60 years from four selected villages to identify the health-seeking behaviours of household members for fever. The samples were selected from four different geographic categories (coastal, forest, plain, and farm), with one village from each category. A village with at least 200 households was randomly selected from each geographic category. Then, 100 households were systematically chosen from each village of four. One household member from the selected household aged 18 to 60 was interviewed face-to-face. The data were collected through face-to-face interviews using the Kobo tool with a semi-structured questionnaire form.

For the qualitative survey, twelve healthcare providers from all RHCs and hospitals were included. In-depth interviews were conducted with 12 healthcare providers using the KII guide, each lasting 30–45 minutes. Furthermore, the outpatient register (OPD register books), malaria carbonless register books, and malaria logistics at the health center were also observed using an observation checklist.

Statistical analysis

Quantitative data was cleaned and analyzed by using SPSS version 25. The health-seeking behaviour for fever were described using frequencies and percentages.

In the qualitative approach, thematic analysis was performed. Field notes were validated by listening to audio recordings during transcription. Summary transcripts of handwritten notes were prepared daily and elaborated on after the study's completion. Each audio-recorded interview was transcribed verbatim and analyzed individually. The data was checked for accuracy and thoroughly read multiple times to understand their contents. Textual data were disaggregated to identify similarities and differences, grouping similar themes to explore the healthcare services of surveillance systems for malaria elimination.

RESULTS

Background characteristics

The majority of respondents 233 (58.3%) are aged 45 years and above, with females comprising 260 (65%). Most have primary education 259 (64.8%), followed by middle education 86 (21.5%) and the least graduated 6 (1.5%). The largest occupational group is farming 208 (52.0%), followed by casual labor 110 (27.5%), with other jobs including water-related jobs 32 (8.0%), and selling 31 (7.8%). Most respondents' families earn between 100,000-200,000 MMK monthly 157 (39.3%), while 52 (13.0%) earn over 300,000 MMK per month (Table 1).

Table 1: Socio-demographic characteristics of the respondents (n=400).

Socio-demographic characteristics	Frequency	Percentage (%)
Age group (years)		
18-24	24	6
25-34	51	12.8
35-44	92	23.0
>45	233	58.3
Sex of the respondent		
Male	140	35.0
Female	260	65.0
Educational status		
Primary	259	64.8
Middle	86	21.5
High	33	8.3
University	16	4.0
Graduated	6	1.5
Occupation		
Water-related workers	32	8.0
Farm	208	52.0
Forest related workers	6	1.5
Casual labor	110	27.5
Seller	31	7.75
Staff (both government and private)	8	2.0
Others	5	1.25
Monthly family income (Myanmar kyats)		
< 100,000	116	29.0
100,000-200,000	157	39.3
200,000-300,000	75	18.8
>300,000	52	13.0

Treatment seeking behaviour

Of the 400 households, 154 (38.5%) households had any family member contracting fever in the last 3 months.

Among the 686 members contacted, 220 (32.1%) had a fever within the last 3 months.

Of those reported fever cases (n=220), 142 (64.6%) fever patients sought treatment at appropriate places such as the township/station hospital, rural health center (RHC), sub-health center (SC), and auxiliary midwives (AMW). Meanwhile, 76 (34.6%) sought treatment at inappropriate places such as self-treatment, quacks, and traditional healers, and two cases (0.9%) did not seek any treatment. After first-time treatment, 134 (94.4%) of those who went to the correct treatment places recovered, compared to 59 (77.6%) of those who went to inappropriate treatment places. The remaining 25 patients (11.4%) from the first treatment continued to seek their second treatment.

Of the unrecovered fever patients eight (5.6%) from the correct treatment places continued treatment at the health center. Among the 17 (22.4%) unrecovered fever patients who initially sought inappropriate treatment, 11 (64.7%) fever patients changed to appropriate health centers, while six (35.3%) fever patients continued with inappropriate treatment. After the second treatment, six patients still had not recovered. Among these six patients, four people took treatment at the health center, one was referred to Yangon for further treatment. However, one patient continued treatment at inappropriate places (Figure 2).

In terms of treatment-seeking intervals, 79 (35.9%) of the fever patients were treated at appropriate treatment-seeking places within 24 hours of the onset of the fever. Nearly half of the respondents with fever approached government health facilities 93 (42.3%) for treatment followed by self-medication 61 (27.7%). Although 351 (87.8%) of the 400 households had access to malaria blood testing facilities, only 70 (31.8%) of the fever cases utilized the malaria diagnostic facility of blood testing. Among them, 51 (23.2%) were tested within 24 hours (Table 2).

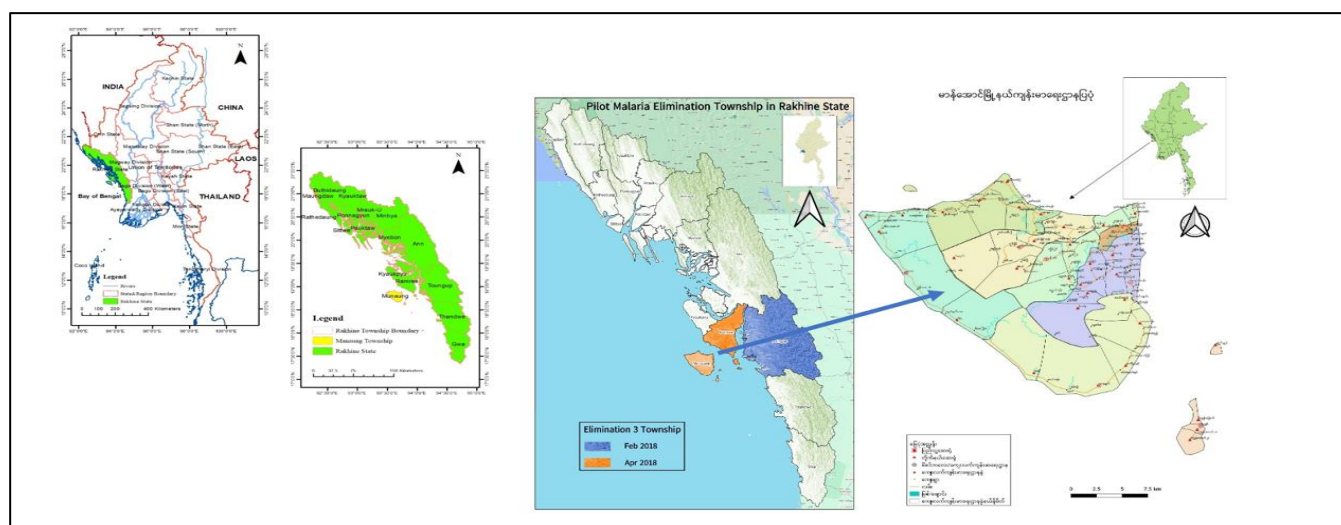


Figure 1: The study area; Mannaung Township, Rakhine State, Myanmar.

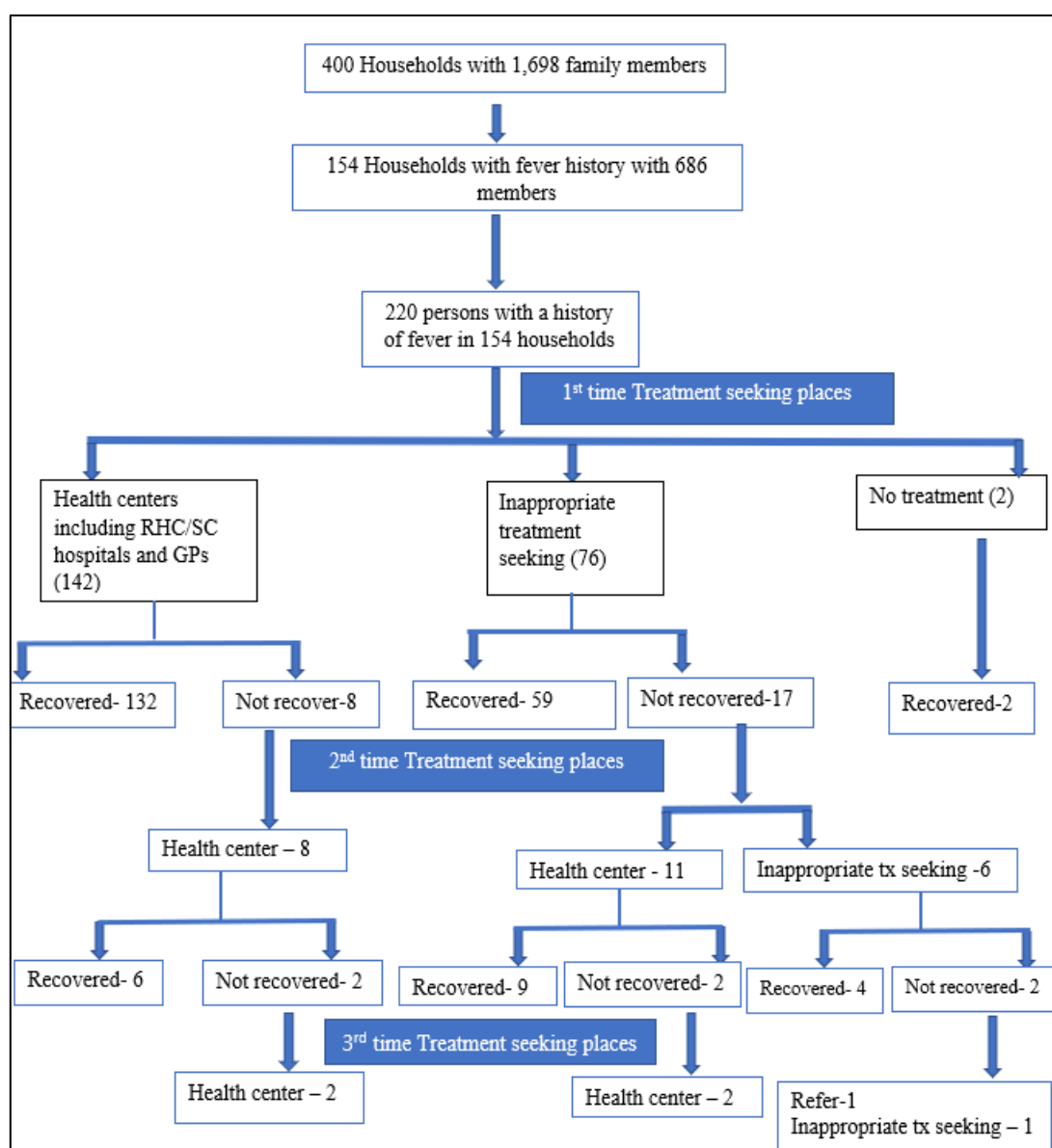


Figure 2: Health-seeking behaviour diagram of the fever of the community in this survey.

Healthcare services of surveillance system for malaria elimination

Twelve healthcare providers, comprising four females and eight males, who have resided in the locality for a minimum of one year, participated. Each healthcare provider has served with the Ministry of Health (MoH) for at least seven years (Table 3).

After conducting thematic analysis, three major themes and four sub-themes were identified in (Table 4).

Experience of malaria prevention and control activities

blood testing, health education, distribution of long-lasting insecticide-treated bed nets (LLIN)

Response activities in a case-based malaria surveillance system

Response activity, capacity building and training,

Suggestion to improve malaria surveillance

Support including the financial, technical. Coordination with the general administrative department.

Theme 1: Experiences of malaria prevention and control activities

Almost all participants have had previous experiences in reducing the malaria burden by implementing malaria prevention and control measures. The main interventions

utilized were blood testing with RDT and/or microscopy and treatment with artemisinin combination therapy (ACT), the distribution of long-lasting insecticide-treated

bed nets, and providing health education on malaria prevention, such as using bed nets and wearing long sleeves.

Table 2: Health-seeking behaviour-related fever within 3 months.

Health-seeking behaviour	Frequency	Percent
Blood testing facility for malaria in the village (n=400)		
Yes	351	87.8
No	49	12.2
Households with a history of fever within 3 months (n=400)		
Yes	154	38.5
No	246	61.5
Household members in 154 households with a history of fever within 3 months (n=686)		
Yes	220	32.1
No	466	67.9
The time interval between the onset of fever and treatment-seeking places (n=220)		
At appropriate places	142	64.6
Within 24 hours	79	35.9
> 24 hours and 72 hours	39	17.7
4-15 days	24	10.9
At inappropriate treatment-seeking places	76	34.6
No treatment	2	0.9
RDT test (n=220)		
Yes	70	31.8
No	150	68.2
Duration of onset of fever and date of blood testing (n=220)		
Within 24 hours	51	23.2
>24 hours and 72 hours	10	4.5
4-15 days	1	0.5
Uncertain	8	3.6
No blood testing	150	68.2

Table 3: The background information of the healthcare providers.

ID	Age	Sex	Position	Total service years	Service years in current position
1	47	M	Health assistant	15 years	1 year, 6 months
2	52	F	Health assistant	26 years	3 years
3	54	M	Health assistant	25 years	17 years
4	39	M	Township medical officer	10 years	2 years and 6 months
5	37	M	Malaria inspector (MI)	16 years	2 years
6	30	M	Public health supervisor-1	10 years	1 year
7	34	M	Station medical officer	7 years	3 years
8	49	F	Health assistant	27 years	17 years
9	47	M	Health assistant	23 years	3 years
10	39	F	Trained nurse	13 years	13 years
11	50	F	Lady health visitor	28 years	10 years
12	48	M	Health assistant	21 years	7 years

Blood testing

Most participants expressed that they conducted blood testing and treated patients with Artemisinin combination therapy (ACT). Early diagnosis and appropriate treatment were the main strategies in reducing malaria transmission.

Previously, they tested only the fever cases who came to their clinics. However, in recent years, in the elimination area, they have tested all fever cases, individuals with travel history outside Mannaung township, and immigrants in Mannaung township. Sometimes, healthcare providers faced the challenge as some people

did not want to be tested for malaria even if they had a fever.

“Before the malaria elimination project, we tested all fever cases who came to our clinic but not all people around the house of malaria positive case” (47 years, HA, male)

“For malaria elimination, the most important thing is to do blood testing in villages to meet 10% of ABER. Migrant workers are also tested, and HE sessions are conducted.” (37 years, MI, male)

“There was a difficult situation in blood testing of people without fever. The community did not want to do the malaria blood testing if they didn’t suffer from fever even though some suffered from fever.” (54 years, HA, male)

Health education and community awareness of malaria prevention measures

The majority of the participants reported that they mainly provided health education related to the prevention and control of malaria transmission and encouraged the use of LLINs or ordinary nets to avoid mosquito bites anytime and anywhere.

“The community improved their knowledge to sleep with LLIN or ordinary nets and the utilization of mosquito nets was increased by doing the health education up to their villages.” (30 years, PHS-1, male)

Table 4: Themes and sub-themes of in-depth interviews with the healthcare providers

Themes	Sub-themes
Experience in malaria prevention and control activities	Blood testing
	Health education
	Distribution of long-lasting insecticide-treated bed nets
Response activities in a case-based surveillance system	Response activity
	Capacity building and training
Suggestion for improved malaria surveillance	Support including the financial, technical
	Coordination with the general administrative department

Distribution of long-lasting insecticide-treated bed nets (LLIN)

The respondents mentioned that they distributed the LLINs over the last 4-5 years and that the community used these LLINs. The LLINs utilization was increased and the malaria cases were reduced.

“We mainly distributed insecticide-treated bed nets supported by NMCP.” (54 years, HA, male).

Theme 2: Response activities in case-based surveillance systems

Response activities

Some participants (four) explained that malaria elimination could be achieved through a case-based surveillance system involving case notification, case investigation, foci investigation, and response, each with specific objectives. However, eight participants were unfamiliar with the case investigation, foci investigation, and response.

“If I get a malaria positive case, case notification, case investigation, foci investigation and respond activities must be done.” (37 years, MI, male).

“There was no malaria case in my HF and no case notification form, CI, or FI forms at my HF. I heard the FI but I didn't remember what activities were done in which condition.” (49 years, HA, female).

Capacity building and training

Capacity-building activities, including annual refresher training and new initiatives for updated technology and surveillance systems, are crucial for malaria elimination. Most healthcare providers received malaria elimination training in 2019, except for two Health Assistants (HAs) who missed it. Neither the Township Medical Officer (TMO) nor the Senior Medical Officer (SMO) have ever received this training. Despite this, most healthcare providers expressed a strong desire to attend malaria elimination-related training.

“I would like to join the training if there will be malaria elimination training to enhance my understanding of the current program situation.” (34 years, SMO, male)

Theme 3: Suggestion for improve malaria surveillance

About half of the participants stated that malaria surveillance activities were not adequate for malaria elimination. Therefore, they suggested improving the

malaria surveillance activities for malaria elimination. They thought that the gaps were difficulty in controlling population mobility, inadequate health education for malaria testing and proper treatment, and transportation difficulties in conducting case-based surveillance and support.

Support including the financial, technical

In Mannaung township, malaria elimination activities were supported by one of the implementing partners, especially in blood testing to achieve the 10% of ABER. One participant reported that malaria surveillance activities, particularly reducing ABER, were weak compared to the previous two months due to the suspension of the support for malaria blood testing by the implementing partner three months ago.

The healthcare providers suggested providing malaria elimination training and refresher training annually. Another suggestion was to distribute pamphlets or posters with messages encouraging the use of LLINs while sleeping, utilizing the health care services at the health facility within 24 hours of the onset of fever, and increasing blood testing.

For active case surveillance, the healthcare providers went to the villages for blood testing. During case-based surveillance, the travel costs for healthcare providers should be supported by implementing partners.

“I suggested distributing the LLINs and Poster, pamphlets, and training from the State level for malaria elimination.” (47 years, HA male)

“I suggested giving a present to a person who was tested for malaria to increase the blood testing. URC should support the travel cost to all health care providers including the staff from the main center.” (54 years, HA, male)

Coordination with the general administrative department

They stated that population mobility was important things for malaria elimination so they wanted to know about the group of people entering their villages within their health facilities. The general administrative department can know the population mobility inside or outside the township. They suggested close coordinating with the GAD and sharing the information between them.

“To improve malaria surveillance, coordinate with the township general administration department and community support group to detect all immigrants from other areas.” (30 years, PHS 1, male).

DISCUSSION

This study assessed the readiness for malaria elimination in Mannaung Township, focusing on community health-

seeking behaviour and healthcare services of a malaria surveillance system for malaria elimination.

Early diagnosis and prompt treatment of malaria cases can significantly improve patient outcomes and reduce transmission, which is crucial for malaria elimination. In the malaria elimination era, active, passive, and reactive case detection are conducted to identify asymptomatic parasitemia and prevent onward transmission. Therefore, the community needs to visit the health center within 24 hours after the onset of the fever to interrupt the onward transmission of malaria. However, only 64.6% of the fever history cases sought treatment at appropriate treatment places and just 35.9% took treatment within 24 hours.

Early diagnosis and prompt treatment of malaria cases can significantly improve patient outcomes and reduce transmission, which is crucial for malaria elimination. In the malaria elimination era, active, passive, and reactive case detection are conducted to identify asymptomatic parasitemia and prevent onward transmission.

Seeking treatment within 24 hours is extremely important, especially in Mannaung township in which zero malaria cases for more than four years. As a result, the community has little or no immunity and is thus more likely to develop severe malaria. Therefore, early treatment-seeking behaviour needs to be strongly encouraged in this area to prevent severe malaria as well as the reintroduction of malaria. However, 64.6% of the fever history cases took treatment at appropriate treatment places, and among them, only 35.9% took treatment within 24 hours in this study.

This finding was consistent with the study in malaria-endemic regions of Myanmar where treatment-seeking at health centers was followed by self-medication and also Lao.^{5,6} In contrast with other studies in South Africa⁷, Ghana (20208 and 20139), Senegal, and Kenya, Indonesia in which over 50% of individuals sought treatment at health centers.¹⁰⁻¹² Conversely, the treatment-seeking rate in this study is higher than those reported in studies from Cambodia, Western Kenya, and Wa ethnic, Myanmar, and Ethiopia where the proportion of treatment-seeking at the proper places such as health centers was below 30%.¹⁴⁻¹⁶

Moreover, the malaria testing among the fever patients was 31.8% and the blood testing within 24 hours was 23.2% among the fever cases in this study. However, the blood testing rate for malaria was higher than in malaria-endemic regions of Myanmar study where 28% were tested and half of them tested within 24 hours. This was also higher than the rate in the Wa ethnic group in Myanmar, Ethiopia 16 (8.9%).¹⁵ However, in contrast, the testing rate was lower than in studies from Cambodia, and Kenya.^{13,14}

Therefore, this community displayed delay-seeking behaviour, and the healthcare providers did not test all fever cases even though the health staff mentioned that they tested all fever cases and the people outside of the Mannaung township. This was alarming for maintaining malaria elimination.

In-depth interviews with healthcare providers revealed a decline in malaria cases, attributed to community health education, the distribution of long-lasting insecticidal nets, and blood testing. During the malaria transmission, early diagnosis and prompt treatment were crucial. However, in the malaria elimination era, blood testing of all fever cases and mobile populations is essential to prevent onward transmission and avoid the reintroduction of malaria. The NMCP targeted the Annual Blood Examination Rate (ABER) of at least 10% to prove no malaria case was detected even though the blood testing was sufficient. Therefore, the malaria surveillance system monitors ABER 10% of the total population through active, passive, and reactive case detection to identify asymptomatic parasitemia and prevent onward transmission.

Some healthcare providers were unfamiliar with malaria elimination surveillance activities such as case notification, case investigation (clarifying the case), foci classification, and response due to the prolonged absence of malaria cases. Although they understood the criteria for blood testing in malaria elimination, they did not test all fever patients.¹⁷

The HCPs received township-level elimination training in 2019, but some missed this training. The township medical officer (TMO) and the station medical officer (SMO) had never attended malaria elimination training, so they expressed their desire to enhance their capacity. Annual malaria elimination training should be provided to improve healthcare providers' understanding of malaria prevention methods and elimination concepts.¹⁸

Moreover, healthcare providers often depend on the support of travel costs from implementing partners for active surveillance to achieve ABER targets. However, they need to understand and take ownership of their responsibilities for blood testing in malaria elimination. Recognizing the importance of this task and taking the initiative is crucial, as excessive dependence on external support can undermine the sustainability of elimination efforts.

Limitation

The health-seeking questions directed at respondents with household members who had a fever in the past three months may be subjected to recall bias, where respondents may not accurately remember details or actions taken during the fever episode.

Additionally, the study did not assess the determinants or explore the reasons for not seeking appropriate treatment in cases of fever.

CONCLUSION

The readiness assessment revealed delayed health-seeking behaviour concerning malaria, indicating a need for awareness-raising within the community. Healthcare providers must enhance their ability to conduct surveillance activities for malaria elimination.

Recommendations

The program should prioritize comprehensive training for all healthcare providers to ensure a clear understanding of malaria elimination procedures including detailed surveillance activities necessary to achieve malaria elimination. The program should emphasize sustaining blood testing for malaria elimination independently, without relying on support from external organizations. The findings of the study directly reflect the public awareness of malaria, highlighting the need to reinforce the importance of early diagnosis and treatment of malaria.

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