Preplanned Studies

Challenges of Sustaining Malaria Community Case Management in 81 Township Hospitals along the China-Myanmar Border Region — Yunnan Province, China, 2020

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Summary

What is already known on this topic?

The health workforce at township hospitals in the China-Myanmar border region has played a key role in sustaining Community case management of malaria (CCMm), while few studies have investigated their performance and challenges.

What is added by this report?

Sustaining CCMm in the region was subject to the following major challenges: insufficient training on malaria diagnosis and testing, lacking necessary and timely treatment for patients, and risks of instability among the malaria workforce.

What are the implications for public health practice?

These challenges called for the national and provincial authorities to provide regular trainings and intensive supervision to strengthen malaria diagnosis and treatment capacity in the region and to set up incentive mechanisms and individual career development paths to sustain the workforce.

Through years of malaria elimination efforts, China has been on track for the World Health Organization (WHO)'s malaria-free certification after reporting 3 consecutive years of 0 indigenous case since 2017 (*1*). Sustaining the elimination efforts in the border region of Yunnan Province is critical as it shares a long borderline with Myanmar without natural barriers and faced malaria importation and the risk of re-establishment due to mutual business and population movement (*2–4*). Community case management of malaria (CCMm) promotes the early detection, prompt testing, and appropriate treatment of malaria in communities. To consolidate the efforts, this study assessed the status of CCMm in 81 township hospitals of 6 border counties in Yunnan in 2020 by investigating the knowledge and practice of health workforce and their challenges in the delivery of malaria diagnostic and treatment services through a structured questionnaire. The results showed that the CCMm was satisfactory for case recognition and testing by rapid diagnostic tests (RDTs), while both training on malaria diagnosis and providing necessary treatment for patients were insufficient, and risks of instability in the malaria workforce existed. It is recommended to provide regular training and intensive supervision for the malaria workforce to identify strategies to sustain the workforce.

The study was conducted from July to December 2020. All relevant malaria health staff (568) of all township hospitals (81) from 6 counties (Yingjiang, Tengchong, Cangyuan, Longling, Longchuan, and Lushui) was included in the study. The 6 counties were selected out of 18 total border counties by having a higher number of imported malaria cases in the border region between January 1, 2017 and December 31, 2019 according to the data from China Information System for Disease Control and Prevention (CISDCP).

The questionnaire was generated using an online survey tool Wenjuanxing (WJX, https://www.wjx.cn/, in Chinese) and was pretested among 32 health staff in Tengchong County and Simao County. The finalized questionnaire was delivered to the targeted respondents by a mobile application and administrated by the field investigators of local CDCs. Written informed consent was obtained from each respondent. Results were collected by WJX and analyzed by Microsoft Office Excel (version 2019; Microsoft Corp, Beijing, China).

The average age of the respondents was 32.15±8.40 years and 53.7% (305/568) were aged between 30–50 years; 88.4% (502/568) had bachelor's degree or junior college degree in medicine. Among all the respondents, 44.7% (254/568) were physicians responsible for the diagnosis and treatment of malaria, 26.4% (150/568) were lab technicians responsible for testing the malaria suspects, and 28.9% (164/568) were public health

doctors responsible for reporting infectious diseases and conducting epidemiological investigations.

Most physicians (94.9%, 241/254) would suspect malaria if any patient presented symptoms including chills, fever, and shivering. However, half (50%, 127/254) of the respondents had not received any training on diagnosis and treatment of malaria over the past 3 years, and nearly one-third (33.1%, 84/254) of respondents had never had a patient with malaria infection during their practice. In addition, 53.5% of respondents did not provide malaria treatment in local hospitals (Table 1).

Most lab technicians had knowledge of (96.7%, 145/150) and were capable (90.7%, 136/150) of using RDTs, while 55.3% (83/150) of them were not adequately trained for preparing blood films, and 47.3% (71/150) could not identify *Plasmodium* species through microscopy. Only 50.7% (76/150) were trained on microscopy examination of *Plasmodium* during the past 3 years (Table 2).

Among the 164 public health doctors, 29.3% (48/164) reported a lack of regular review of blood films by local county CDCs. Over a quarter (28.7%, 47/164) mentioned shortages of necessary anti-malarial drugs in their hospitals. Almost every respondent (99.4%, 163/164) was engaged in the malaria health education activities, while the promotion via official WeChat account only made up for 26.2% (43/174). In addition, 68.3% (112/164) reported "no change" in terms of the number of malaria health staffs during the last 3 years. Inadequate training (70.7%, 116/164) and professional movement (59.8%, 98/164) stood out as 2 major challenges (Table 3).

DISCUSSION

This study assessed the knowledge and practices of the physicians, lab technicians, and public health doctors who worked at the township hospitals in border counties in Yunnan and the challenges during their work on malaria. Positive findings from the study included the following: local township health staff at the Yunnan border area was relatively young and well educated; physicians were vigilant in recognizing the

TABLE 1. Physicians' knowledge and practice of malaria diagnosis and treatment in the 81 township hospitals of 6 border counties, Yunnan Province, 2020.

Variable	Yingjiang, n (%)	Tengchong, n (%)	Cangyuan, n (%)	Longling, n (%)	Longchuan, n (%)	Lushui, n (%)	Total, n (%)
Knowledge of malaria symptoms							
Yes	49 (98.0)	71 (94.7)	17 (77.3)	46 (97.9)	21 (95.5)	37 (97.4)	241 (94.9)
No	1 (2.0)	4 (5.3)	5 (22.7)	1 (2.1)	1 (4.6)	1 (2.6)	13 (5.1)
Trained in last 3 years							
Yes	37 (74.0)	28 (37.3)	7 (31.8)	28 (59.6)	10 (45.5)	17 (44.7)	127 (50.0)
No	13 (26.0)	47 (62.7)	15 (68.2)	19 (40.4)	12 (54.6)	21 (55.3)	127 (50.0)
Recognize high-risk groups							
Returnees	49 (98.0)	72 (96.0)	18 (81.8)	43 (91.5)	19 (86.4)	32 (84.2)	223 (87.8)
Migrants	43 (86.0)	67 (89.3)	16 (72.7)	44 (93.6)	18 (81.8)	32 (84.2)	220 (86.6)
Women	11 (22.0)	16 (21.3)	4 (25.0)	13 (27.7)	9 (40.9)	9 (23.7)	62 (24.4)
Children	13 (26.0)	22 (29.3)	7 (43.8)	15 (31.9)	8 (36.4)	11 (29.0)	76 (29.9)
Others	1 (2.0)	4 (5.3)	4 (25.0)	2 (4.3)	0 (0.0)	1 (2.6)	12 (4.7)
Provided treatment							
Yes	31 (62.0)	35 (46.7)	15 (68.2)	23 (48.9)	8 (36.4)	6 (15.8)	118 (46.5)
No	19 (38.0)	40 (53.3)	7 (31.8)	24 (51.1)	14 (63.6)	32 (84.2)	136 (53.5)
Last malaria patient received							
Never	11 (22.0)	13 (17.3)	9 (40.9)	21 (44.7)	10 (45.5)	20 (52.6)	84 (33.1)
<5 years ago	19 (38.0)	23 (30.7)	5 (22.7)	8 (17.0)	6 (27.3)	3 (7.9)	64 (25.2)
5–10 years ago	14 (28.0)	23 (30.7)	3 (13.6)	10 (21.3)	3 (13.6)	8 (21.1)	61 (24.0)
>10 years ago	6 (12.0)	16 (21.3)	5 (22.7)	8 (17.0)	3 (13.6)	7 (18.4)	45 (17.7)
Total	50 (19.7)	75 (29.5)	22 (8.7)	47 (18.5)	22 (8.7)	38 (15.0)	254 (100.0)

TABLE 2. Lab technicians' knowledge and practice on malaria testing including use of rapid diagnostic tests (RDTs) in the 81 township hospitals of 6 border counties, Yunnan Province, 2020.

Variable	Yingjiang, n (%)	Tengchong, n (%)	Cangyuan, n (%)	Longling, n (%)	Longchuan, n (%)	Lushui, n (%)	Total, n (%)
Know about RDTs							
Yes	33 (100.0)	32 (94.1)	20 (95.2)	28 (100.0)	16 (100.0)	16 (88.9)	145 (96.7)
No	0 (0)	2 (5.9)	1 (4.8)	0 (0)	0 (0)	2 (11.1)	5 (3.3)
Be able to use RDTs							
Yes	33 (100.0)	29 (85.3)	20 (95.2)	26 (92.9)	16 (100.0)	12 (66.7)	136 (90.7)
No	0 (0)	5 (14.7)	1 (4.8)	2 (7.1)	0 (0)	6 (33.3)	14 (9.3)
Use RDTs in daily work							
Always	11 (33.3)	13 (38.2)	4 (19.1)	19 (67.9)	4 (25. 0)	0 (0)	51 (34.0)
Sometimes	22 (66.7)	16 (47.1)	15 (71.4)	7 (25.0)	11 (68.8)	10 (55.6)	81 (54.0)
Never	0 (0.0)	5 (14.7)	2 (9.5)	2 (7.1)	1 (6.3)	8 (44.4)	18 (12.0)
Blood film preparation							
Skillful	15 (45.5)	13 (38.2)	8 (38.1)	10 (35.7)	5 (31.3)	8 (44.4)	59 (39.3)
Not skillful	13 (39.4)	20 (58.8)	13 (61.90)	18 (64.3)	10 (62.5)	9 (50.0)	83 (55.3)
No	5 (15.2)	1 (2.9)	0 (0)	0 (0)	1 (6.3)	1 (5.6)	8 (5.3)
Received microscopy training							
Yes	16 (48.5)	16 (47.1)	7 (33.3)	19 (67.9)	5 (31.3)	13 (72.2)	76 (50.7)
No	17 (51.5)	18 (52.9)	14 (66.7)	9 (32.1)	11 (68.8)	5 (27.8)	74 (49.3)
Microscopy ability							
Can identify species	16 (48.5)	18 (52.9)	6 (28.6)	7 (25.0)	3 (18.8)	5 (27.8)	55 (36.7)
Cannot identify species	10 (30.3)	11 (32.4)	11 (52.4)	18 (64.3)	10 (62.5)	11 (61.1)	71 (47.3)
No	7 (21.2)	5 (14.7)	4 (19.1)	3 (10.7)	3 (18.8)	2 (11.1)	24 (16.0)
RDTs stock outs in last 1 year							
Yes	1 (3.0)	1 (2.9)	1 (4.8)	1 (3.6)	1 (6.3)	0 (0)	5 (3.3)
No	32 (97.0)	33 (97.1)	20 (95.2)	27 (96.4)	15 (93.8)	18 (100)	145 (96.7)
Total	33 (22.0)	34 (22.7)	21 (14.0)	28 (18.7)	16 (10.7)	18 (12.0)	150 (100.0)

malaria patients; and almost all lab technicians knew and were able to use RDTs. Challenges were also identified in three aspects. First, there was insufficient training on malaria diagnosis and testing. The results showed that lab technicians had a low proficiency in preparing blood films and public health doctors regarded lacking adequate training for malaria as one of their major challenges in work. The findings were consistent with the previous studies (5–7) that suggested that training the malaria workforce was urgently required to sustain the malaria diagnosis and treatment capacity in the post-elimination era. Second, there was a lack of necessary treatment for patients. Only 46% of the interviewed physicians confirmed providing the necessary treatments to patients that had been diagnosed with malaria, which might partially be linked to a shortage of antimalarials. Nevertheless, delayed treatment would threaten the life of severe

malaria patients and might leave untreated patients become indirect infection sources that lead to a secondary infection from imported cases. Finally, there were risks of instability among the local malaria workforce. Although the movement of malaria health staff was not obvious, 59.8% and 36.0% of the public health doctors regarded the instability (movement) of staff and the aging of experienced staff as challenges. According to our follow-up interviews, with the elimination of malaria, fewer cases were received in local township hospitals (some hospitals have even not received any malaria patients in the past 3 years), which might explain the shift of the malaria workforce. On the other hand, experienced staff tends to get into upper-level medical facilities once they accumulate enough experiences at the township level and this would contribute to losses of the experienced malaria workforce.

TABLE 3. Public health doctors' knowledge and practice on malaria case management and the challenges in the 81 township hospitals of 6 border counties, Yunnan Province, 2020.

Variable	Yingjiang, n (%)	Tengchong, n (%)	Cangyuan, n (%)	Longling, n (%)	Longchuan, n (%)	Lushui, n (%)	Total, n (%)
Review of blood films							
Yes	21 (72.4)	30 (73.2)	12 (80.0)	28 (90.3)	7 (41.2)	18 (58.1)	116 (70.7)
No	8 (27.6)	11 (26.8)	3 (20.0)	3 (9.7)	10 (58.8)	13 (41.9)	48 (29.3)
Assist in case investigation							
Perform case survey	19 (65.5)	28 (68.3)	10 (66.7)	29 (93.6)	12 (70.6)	22 (71.0)	120 (73.2)
Provide case information	7 (24.1)	11 (26.8)	5 (33.3)	2 (6.5)	3 (17.7)	7 (22.6)	35 (21.3)
Others	1 (3.4)	2 (4.9)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.8)
No	2 (6.9)	0 (0)	0 (0)	0 (0)	2 (11.8)	2 (6.45)	6 (3.7)
Assist in foci response							
Fill in registration form	21 (72.4)	27 (65.8)	7 (46.7)	28 (90.3)	7 (41.2)	26 (83.87)	116 (70.7)
Survey of companions	5 (17.2)	7 (17.1)	2 (13.3)	2 (6.5)	4 (23.5)	2 (6.45)	22 (13.4)
Vector investigation	0 (0)	0 (0)	2 (13.3)	0 (0)	0 (0)	0 (0)	2 (1.2)
Vector control	0 (0)	0 (0)	0 (0)	0 (0)	1 (5.9)	0 (0)	1 (0.6)
Health education	1 (3.5)	8 (19.5)	4 (26.7)	1 (3.2)	2 (11.8)	1 (3.23)	17 (10.4)
No	2 (6.9)	0 (0)	0 (0)	0 (0)	3 (17.7)	2 (6.5)	7 (4.3)
Antimalarials in stock							
Yes	20 (69.0)	34 (82.9)	10 (66.7)	30 (96.8)	9 (52.9)	14 (45.2)	117 (71.3)
No	9 (31.0)	7 (17.1)	5 (33.3)	1 (3.2)	8 (47.1)	17 (54.8)	47 (28.7)
Health education							
Provide leaflets in hospital	21 (72.4)	29 (70.7)	15 (100.0)	27 (87.1)	14 (82.4)	24 (77.4)	130 (79.3)
Malaria Day campaign	18 (62.1)	39 (95.1)	11 (73.3)	26 (83.9)	9 (52.9)	22 (71.0)	125 (76.2)
Promotion in villages	22 (75.9)	28 (68.29)	11 (73.3)	21 (67.7)	13 (76.5)	24 (77.4)	119 (72.6)
Promotion via WeChat	5 (17.2)	14 (34.15)	4 (26.67)	15 (48.4)	2 (11.8)	3 (9.7)	43 (26.2)
No	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3.2)	1 (0.6)
Movement of malaria staff							
Increase	10 (34.5)	7 (17.1)	5 (33.3)	0 (0)	3 (17.7)	5 (16.1)	30 (18.3)
Reduce	4 (13.8)	1 (2.4)	0 (0)	2 (6.5)	1 (5.9)	5 (16.1)	13 (7.9)
No change	15 (51.7)	31 (75.6)	10 (66.7)	28 (90.3)	9 (52.9)	19 (61.3)	112 (68.3)
Unknown	0 (0)	2 (4.9)	0 (0)	1 (3.2)	4 (23.5)	2 (6.5)	9 (5.5)
Malaria-related work							
Radical treatment	9 (31.0)	21 (51.2)	6 (40.0)	21 (67.7)	5 (25.4)	8 (25.8)	70 (42.7)
Insecticide spray	26 (89.7)	23 (56.1)	14 (93.3)	20 (64.5)	13 (76.5)	22 (71.0)	118 (72.0)
Promote nets use	23 (79.3)	31 (75.6)	11 (73.3)	20 (64.5)	16 (94.12)	23 (74.2)	124 (75.6)
Distribute antimalarials	17 (58.6)	31 (75.6)	11 (73.3)	28 (90.3)	12 (70.6)	23 (74.2)	122 (74.4)
Challenges							
Staff shifting	17 (58.6)	22 (53.7)	8 (53.3)	20 (64.5)	7 (41.2)	24 (77.4)	98 (59.8)
Aging of experienced staff	10 (34.5)	17 (41.5)	6 (40.0)	8 (25.8)	5 (29.4)	13 (41.9)	59 (36.0)
Lack motivation	9 (31.0)	8 (19.5)	1 (6.7)	8 (25.8)	4 (23.5)	9 (29.0)	39 (23.8)
Heavy workload	14 (48.3)	20 (48. 8)	12 (80.0)	9 (29.0)	4 (23.5)	17 (54.8)	76 (46.3)
Inadequate training	21 (72.4)	28 (68.3)	9 (60.0)	24 (77.4)	13 (76.5)	21 (67.7)	116 (70.7)
Others	1 (3.5)	2 (4.9)	1 (6.7)	0 (0)	0 (0)	0 (0)	4 (2.4)
Impacted by COVID-19							
Yes	6 (20.7)	14 (34.2)	4 (26.7)	5 (16.1)	1 (5.9)	7 (22.6)	37 (22.6)
No	23 (79.3)	27 (65.9)	11 (73.3)	26 (83.9)	16 (94.1)	24 (77.4)	127 (77.4)
Total	29 (17.7)	41 (25.0)	15 (9.1)	31 (18.9)	17 (10.4)	31 (18.9)	164 (100.0)

According to the WHO framework of malaria elimination (*8*), maintaining the malaria technical expertise and sustaining financial and political commitment at national and subnational levels are among the key points for countries to prevent re-establishment of malaria transmission. In this regard, it is necessary for local government of the border region to sustain their current efforts, with additional focus on training the local health workforce; increasing supervision on malaria testing and treatment; strengthening the capacities on risk identification; and sustaining the local malaria workforce through certain strategies such as include the stability of malaria workforce as a key performance indicator in health facilities. Yunnan's malaria diagnostic reference laboratory has improved the standardization of blood examination in the province since its establishment in 2012 (*7*). It is recommended to reinforce its function in the training of lab technicians and supervision of the quality on slide preparation. Raising the malaria awareness of the public and the targeted groups is also recommended. As most malaria patients admitted in hospitals were the returning laborers who worked in construction sites, lumbering and mine industry (*9*), we encourage local health facilities to increase use of social applications such as WeChat [the most widely used mobile social application in China, which has proven improvement in efficiency of public health education (*10*)] for disseminating information on malaria prevention among the general public and targeted groups including the laborers and the related companies to provide tailored information.

The study was subject to at least two limitations: First, selection of the study groups might not capture all relevant information. For instance, the performance of case notification was not assessed because the duty falls into different positions across hospitals, and those who are responsible for case notification might not be covered in the study. Second, the respondents were subject to potential recall bias. The answers of the respondents were not capable of being cross verified as the study did not cover patients or the hospitals' administrators.

In conclusion, the CCMm in Yunnan border townships has performed satisfactorily in terms of case detection and testing by RDTs, whereas training on both malaria case diagnosis and treatment is insufficient and the risk of workforce instability exists. It is recommended to provide regular training and intensive supervision to strengthen the malaria diagnosis and treatment capacity in the region and to set up incentive mechanisms and individual career development path to sustain the workforce.

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