

KNOWLEDGE OF KEY PLAYERS ON VECTOR CONTROL AT INDONESIA'S COMMUNITY HEALTH CENTERS: A QUALITATIVE STUDY IN MALARIA ELIMINATION PHASE AREAS

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Abstract. Malaria and epidemiological investigation surveys are important aspects that must be understood by key players in the malaria program. A good understanding of these two aspects will strengthen efforts to control the risk factors for malaria in supporting the implementation of the main malaria elimination strategy. This exploratory qualitative study sought to observe the knowledge relating to epidemiological investigation and malaria vector surveys of the key players in the malaria program at the community health centers in Garut and Sukabumi Regencies, Indonesia. The informants in this study were the heads of the health centers, the managers of the malaria program, and the village malaria cadres who were involved in the vector control process in 2018 and 2019 at the selected health centers. Data collection was carried out using open questionnaires and in-depth interviews; such data were analyzed using deductive coding approach. Most of the answers given by the informants were different and not in line with the explanations in the national malaria control manual. The informants were weak in the knowledge of malaria vector control, vector surveys and epidemiological investigation. The program managers' understanding about malaria control is of low similarity when compared to the national malaria control manual.

Keywords: elimination, health centers, Indonesia, malaria, epidemiological investigation, program manager

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INTRODUCTION

Malaria is a disease that is still prevalent in tropical countries such as Indonesia. The government of Indonesia has targeted the elimination of malaria in all regions by 2030 (Asia Pacific Malaria Elimination Network, 2020; MOH RI, 2009), where a main strategy for malaria elimination has been disseminated with a focus on case management, surveillance, and vector control. The successful implementation of this strategy requires good execution from all parties, which includes community health centers (*puskesmas*) as the vanguard that directly implements the strategy in the field. Good primary health center management and the availability of qualified human resources are important factors in supporting the implementation of the main malaria elimination strategy (WHO, 2019).

The incidence of malaria is more commonly reported in eastern Indonesia, but that does not mean that West Java, as the most populous province in Indonesia, is devoid of this disease. Garut and Sukabumi Regencies are areas in West Java Province that have a history of malaria cases and have malaria receptive areas (*ie*, there is a presence of indigenous cases). Each health center in the malaria receptive areas of these two districts are expected to be able to carry out surveillance and control of malaria vectors because all districts/cities in West Java are expected to start the elimination maintenance phase in 2020 (West Java Provincial Health Office, 2017). At the time of writing, Garut Regency has been declared to be in the elimination maintenance phase, while Sukabumi Regency is still being assessed for a malaria-free certificate.

Malaria cases can come from various regions in Indonesia and can be from both local transmission (indigenous cases) and imported cases.

Malaria cases are caused by *Plasmodium* spp, the microorganism that causes malaria, and is transmitted by the malaria vector, the *Anopheles* spp mosquito. Therefore, the malaria and epidemiological investigation surveys are important aspects to be understood by the key players in the malaria program. A good understanding of these two aspects will strengthen efforts to control the risk factors for malaria (Herdiana *et al*, 2016).

Knowledge about malaria, which consists of knowledge on vector control, vector surveys, treatment of patients, and epidemiological investigation, is important for the key players in the malaria program to comprehend (Hemingway *et al*, 2016). Efforts to control malaria optimally require human resources who understand the data related to these aspects of the disease. Human resources with inadequate knowledge of malaria control will undermine the quality of malaria control in health centers. However, malaria control standards are often not met due to the lack of human resource capacity to properly carry out the planning process (Beier *et al*, 2008).

The training of human resources in health centers is thus important. The form, method and substance of training are determined by the current status of human resources in the malaria program. The knowledge of key players in the malaria program, including the knowledge and characteristics of malaria, can be used to design focused and appropriate training (Hasyim *et al*, 2020). This study sought to observe the knowledge of key players in the malaria program in community health centers in the Garut and Sukabumi Regencies, Indonesia; particularly knowledge related to epidemiological investigation and malaria vector surveys. In addition, this study also describes in more detail the areas of knowledge that were the most and least comprehended by the key players in the malaria program. The study results are intended to serve as a guide in determining the content that needs to be incorporated to train key players working in malaria elimination programs and pre-elimination areas.

MATERIALS AND METHODS

An exploratory qualitative study was conducted among the key players

in the malaria program at the health centers: the heads of the health centers, the managers of the malaria program, and the village malaria officers who were involved in the vector control process in 2018 and 2019 at the selected health centers. The selected health centers were those that implemented malaria control service in 2018 and 2019. Five malaria receptive area health centers in Garut Regency and 10 health centers in malaria receptive areas in Sukabumi District were selected. The process of selecting informants was discussed in advance with the heads of the health centers. After the informants were identified and expressed a willingness to participate in this study, a time was then set for data collection.

Data collection was conducted using written responses to open-ended questions and in-depth interviews. The informants' characteristics included age, gender, last education level, position, experience in managing malaria programs (Table 1). The questionnaire (as outlined in Table 2) was given to the informants fill in the answers and handed back to the researcher directly. The questionnaire comprised of 17 knowledge questions related to vector control carried out by the health centers. Researchers and five qualitative experts had made assessment indicators for each question. Knowledge of vector control was divided into three main themes: definitions of malaria cases, receptivity, and epidemiological investigation. The questionnaire was intended to observe the extent of knowledge of the informants at each health center regarding vector control in accordance with the national malaria control manual (MOH RI, 2017). The informants' answers were then compared with the explanation from the national malaria control manual (MOH RI, 2017).

Deductive coding approach was used to analyze the data. Three main themes (definitions of malaria cases, receptivity, and epidemiological investigation) serves as primary codes. The codes were linked appropriately to the corresponding quotations. A team of five experienced qualitative researchers and five qualitative experts discussed the comparison of each answers from each question. Keywords were created and linked with appropriate codes and quotations. The generated keywords and the quotations were reviewed and critiqued carefully. The group review exercise lasted one day resulting in classification of four levels of similarity to the

national malaria control manual: very similar to the manual if the answers covers 90% or above of the keywords, somewhat similar if it covers 70-89% of the keywords, somewhat different if it covers 50-69% of the keywords, and very different it only covers below 50% of the keywords. The similarity keywords for each question is listed on the study report (Fuadzy and Peneliti, 2020).

Ethical clearance for this study was reviewed and approved with the number LB.02.01/2/KE.475/2020 and issued by the Health Research Ethics Commission of the Indonesian Health Research and Development Agency. Written informed consent was obtained from all participants before data collection began. To protect the confidentiality of informants, we assigned a number code for each informant.

RESULTS

Twenty-eight informants were acquired from the health centers in Sukabumi, while 16 people were acquired from the health centers in Garut. Complete details on the characteristics of the informants can be seen in Table 1.

Knowledge about malaria case definition, receptivity, and epidemiological investigation

Table 2 lists the detail of the similarity comparison between the informants' answers and the national malaria manual. Most of the answers given by the informants were different and not in line with the explanations in the manual.

Knowledge about malaria cases definitions

Regarding the definitions of malaria cases, only one of the seven questions was answered well by most informants; this was the question related to the definition of imported cases.

Table 1
Informant characteristics

Informant's characteristic	Frequency, <i>n</i> (%)
Age	
20-40 years	16 (36.36)
40-60 years	26 (59.09)
>60 years	2 (4.55)
Gender	
Male	39 (88.64)
Female	5 (11.36)
Highest education level	
University	33 (75)
Highschool	9 (20.45)
Elementary	2 (4.55)
Position	
Head of Community's Health Center	15 (34.09)
Programmer	16 (36.36)
Village malaria cadres	13 (29.55)
Experience in managing malaria program	
Yes	29 (65.91)
No	15 (34.09)

"Malaria cases that were obtained from residents after traveling to malaria-endemic areas." (Informant 8)

"Cases transmitted outside the local area (district/city)." (Informant 12)

Questions related to the increase of indigenous cases in a month in an elimination area were the questions with the least amount of correct answers. According to the manual, in an elimination stage area, malaria outbreaks are

Table 2

Similarity comparison of each respondent's answers with the manual

No.	Questions	Similarity comparison
1.	What is the definition of a suspected malaria case?	Somewhat similar
2.	What is the definition of a confirmed malaria case?	Somewhat similar
3.	What is the meaning of indigenous case?	Somewhat similar
4.	What is an imported case?	Very similar
5.	What is a relapse case?	Somewhat similar
6.	What is an induced case?	Somewhat different
7.	What is an index case?	Somewhat different
8.	What is a receptive region?	Somewhat different
9.	What is active focus?	Somewhat different
10.	What is inactive focus?	Somewhat different
11.	What is free focus?	Somewhat different
12.	Does increase of indigenous cases in a month in the elimination area explain something? Please elaborate.	Somewhat different
13.	Does discovery of indigenous cases in maintenance areas explain something? Please elaborate.	Somewhat different
14.	What is the definition of PE 1-2-5?	Somewhat different
15.	What indicates local transmission?	Somewhat similar
16.	How is the contact survey on indigenous cases carried out?	Very different
17.	What is the basis of contact survey on imported cases?	Somewhat similar
18.	What do you know about receptivity and receptive areas?	Somewhat similar
19.	How do you calculate larval density?	Very different
20.	How do you calculate MBR (man biting rate)?	Very different
21.	What is the malaria control for a non-active focus area?	Somewhat different

determined if there is an increase in the number of indigenous cases at least two times in a month. Most of the informants did not answer the increase of at least two times but answered that they rather waited for more cases or concluded from only one case.

Knowledge about receptivity

Only one question was answered well by most of the informants; it was the question related to a receptive area marked by the discovery of *Anopheles* spp. Most informants could answer that the existence of *Anopheles* is a sign that an area is receptive, yet some informants were still unable to answer how often the receptivity data must be updated. Most of the respondent could not answer questions about local transmission indication, which supposed to focused on positive malaria case especially with kids <9 years old, vector and its breeding places, and lots of cases in women.

“Indication of local transmission characterized by no history of traveling to endemic areas more than four weeks ago.” (Informant 13)

The questions that most of the informants could not answer were questions related to the calculation of man biting rate (MBR). Only 6 of 44 informants answered this question according to the explanation in the manual. Similarly, the number of informants who could answer questions related to the calculation of larval density was also minimal, although slightly more than the questions related to MBR.

Knowledge about epidemiological investigation

Knowledge about epidemiological investigation were acquired from question about epidemiological investigation, known as PE 1-2-5 in Indonesia, and contact survey. One out of 44 informants answered the question about PE 1-2-5 with perfect similarity with the manual.

“PE 1-2-5, On day one, confirmation of malaria case is reported within 1 X 24 hours; the case must be reported to the district/city health office. An epidemiological investigation (PE) must be conducted at least on day two. Countermeasures must be done no later than day five.” (Informant 2)

The question related to contact surveys on imported cases based on the receptivity of a region were well answered by some informants. However, only a few were able to state the activities of contact surveys in indigenous cases and the stages of contact survey activities.

“The contact survey in indigenous cases is carried out by examining: all families around the case, neighbors living within a 100 m radius or 20 houses around the case, friends who work in the same environment as the case and the contact survey is carried out in stages (I don't know the level).” (Informant 25)

The radius of contact survey for neighbors was supposed to be 200 meters or 5 houses around the case and indeed contact survey was carried out in stages, however, most of the informants could not answer these stages. If a positive case is found again after the first contact survey is carried out, a contact survey is carried out again with the same radius or an expanded radius.

Availability of malaria program human resources

Based on the interviews, it was found that the presence of malaria positive patients always placed the malaria program as the top priority task. Several informants stated that the availability of human resources was sufficient. However, when further explored, many informants noted that they feel their institution lacked human resources because one person could handle more than one task. These conditions caused them to have difficulty in focusing on carrying out their duties in the malaria control program. The informant who expressed that the number of human resources was sufficient also added

that this sufficiency was achieved because many of the jobs were integrated. If the jobs were not squeezed, then the workers would be overwhelmed by their duties. When this condition occurred, the work carried out would not be effective and would be detrimental to all the programs/activities held by these personnel.

“There are three of us (programmer, village malaria cadre, microscopic technician). Actually, it’s not enough, ma’am, because I’m a programmer and also a village malaria cadre, but on the other hand I am also an operator in a pharmacy ma’am, so sometimes we have to divide our time, but if there are positive cases, other tasks are sure to be left behind.”
(Informant 9)

Availability of the manual for maintenance of malaria elimination

Most informants were unable to demonstrate the availability of a correct malaria elimination maintenance manual. Almost all of the books shown were malaria management books or village malaria cadre pocketbooks, not all of them had physical books or they were not obtained from the relevant agencies. Some respondents also stated that they had never seen the book. Most stated that the availability of a malaria management book was downloaded from the internet in the form of a file on a computer. The malaria management book was also rarely read and could only be read when there is free time.

“The module... yes, the malaria module. I think we have it, with the malaria program, sometimes I read it when I’m not busy.” (Informant 22)
“Yes, but it’s still a soft file, if I’m not mistaken, ma’am ... but it hasn’t been printed out yet, it’s still on the laptop or computer.” (Informant 18)

DISCUSSION

The results of the knowledge assessment indicated that most of the

answers to each of the questions posed to the informants were different and not in line with the explanations in the national malaria control manual. Socialization and training to match users' perception of the national malaria control manual should be the main agenda of each policymaker because the common perception and knowledge of each malaria key player is the start of the successful elimination of malaria (Ajayi *et al*, 2020).

The first thing that needs to be done to improve the capacity of health workers is to provide adequate and well-distributed guidance. The results of this study indicated that most program managers do not use or do not even own the definite manual. The Guidebook for the Maintenance of Malaria Elimination issued by the Directorate for Prevention and Control of Vector-borne and Zoonotic Diseases (Dit P2PTVZ) should be one of the guidebooks for key holders of the malaria program. This guide is the latest manual that can be used to prevent the return of malaria cases, both imported and local transmission. This guide is an appropriate reference to guide key players in malaria control in pre-elimination and post-elimination areas to carry out malaria management, vector surveys, and epidemiological investigation (MOH RI, 2017). This study assessed the knowledge of key malaria players based on the elimination maintenance manual issued by the Dit P2PTVZ (MOH RI, 2017). The poor knowledge indicates that knowledge of malaria vector control was not evenly distributed among informants who should be the key players in the malaria vector control program run by the health centers.

The knowledge similarity comparison showed that there were informants who possess very good knowledge, while some are the opposite. This indicates that the distribution of good knowledge is not evenly distributed among the human resources. These results also indicate that the efforts made by district or provincial level policy holders to increase knowledge of the key players in the malaria program are not yet optimal, because the knowledge possessed by key malaria players from each health center should not be much different from each other. The distribution of uneven quality program managers had led to shortcomings in the program management process and had an impact on high malaria cases (WHO, 2015).

The results in Table 2 show that informants were weak in knowledge regarding vector surveys and epidemiological investigation. Knowledge related to vector surveys and epidemiological investigation is very important for the managers of malaria programs because this knowledge is useful for making a better vector control planning framework. Lack of knowledge related to vector surveys and epidemiological investigation results in unstandardized malaria control activities in each region (Xia *et al*, 2014). This adversely affects the malaria control process in the regions because it hinders activity planning and field data analysis (Moise *et al*, 2018). For example, if program managers do not understand the PE 1-2-5 epidemiology investigation method, then the planning of time, infrastructure and related human resources required for epidemiological investigation of a suspected patient cannot be estimated, which will result in the ineffectiveness of the activity (Prasetyowati *et al*, 2021).

The results of this study show that the question regarding case definition is the question with the highest similarity to the manual. This may occur because the criteria for eliminating malaria is to pay close attention to the number of indigenous cases and imported cases in an area (Murhandarwati *et al*, 2015). Each informant, who is a key player in the malaria program, will pay special attention to malaria cases and the classification of these cases. Meanwhile, questions such as MBR calculation, vector larvae calculation, and contact survey had the lowest similarity compared to other questions. It is possible that the low similarity is due to questions that are too technical and rarely used because they have started to enter the period of malaria elimination.

The poor knowledge could also be caused by the large number of tasks assigned to program managers. The results of in-depth interviews show that almost all program managers are assigned to more than one task. Too many activities and the burden of thinking about other tasks may cause program managers to be less able to explore, learn, and remember the procedures and standards for vector control and epidemiological investigation according to the manual. Program managers have quite a lot of tasks and workloads and this workload may be increased with various additional tasks assigned to them at the health centers where they work. Overlapping workloads on

the same personnel can cause the malaria program to run ineffectively and inefficiently, especially for activities related to malaria vector control which require focus and attention (Bourdier, 2016).

The high rate of the change of program managers and the lack of training for managers are also significant factors that hinder the progress of the malaria control process. These obstacles mean that the newly appointed program managers often lack the capacity to control malaria (Williams *et al*, 2004). In addition, malaria is no longer a priority program in several regions, where local policies often adjust their list of priority programs. Therefore, when malaria cases become rare, it will result in reduced budgets, facilities, and infrastructure for handling the disease. This is a problem because 90% of the emergence of malaria in an area is influenced by the implementation of malaria control efforts in that area (Cohen *et al*, 2012).

Training may be conducted through a short course model such as the one offered by the Centers for Disease Control and Prevention (CDC) (CDC, 2021), but there is another solution in the form of a malaria community intervention program, such as the one in KulonProgo. This program concluded that increasing the capacity of the community is a basic step in preventing and reducing the incidence of malaria in the community (Mahmudah *et al*, 2018). Thus, one of the steps to improve malaria management in Indonesia is to involve community representatives as village malaria cadre officers.

Village malaria cadres play an important role in malaria control because they are the representatives of the health center closest to the community. Some of the tasks of the village malaria cadres include active and passive patient detection, epidemiological surveys, and vector control (MOH RI, 2009). Health cadres chosen from the community have an important role in the prevention, education and control of malaria cases in the community (Sunguya *et al*, 2017). The first step in making village malaria cadres as one of the key players in the malaria program is to increase their knowledge relating to the tasks they will carry out. Heads of health centers and program managers play an important role in this (Murhandarwati *et al*, 2014).

However, this study has several limitations. Our study is a cross-sectional study conducted in one period of time so that the concluded

results cannot be generalized for all periods. Moreover, this study also uses qualitative data to describe opinions and experiences from 2018 to 2019. Another limitation of this study is the small number of samples. The researcher determines whether the information extracted is sufficient to describe the malaria program in the study area or not. Therefore, the researchers had determined the informants who could explain correct and accountable information related to the malaria program in the two districts and some bias caused by personal opinion might be presented.

Regardless of the existing limitations, to the best of the author's knowledge, this article is the first to discuss in detail about the themes of knowledge related to the surveillance, vectors and epidemiological investigation in places experiencing the elimination phase. This article can be used as a basis for determining training themes that can increase the knowledge of the key players in the malaria program in a focused community health center. Knowledge themes from this research can be used to compile a curriculum for interventions in the form of short training. Studies related to the effectiveness of these interventions may be considered for further research.

Overall, the knowledge of key players relating to epidemiological investigation and malaria vector surveys in the community health centers' malaria program in these two locations in Indonesia is still not in line with the national malaria manual. Efforts are needed to improve knowledge through training for key players in each health center.

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CONFLICT OF INTEREST DISCLOSURE

The authors declare no conflict of interest.

REFERENCES

- Ajayi IO, Ajumobi O, Ogunwale A, *et al.* Is the malaria short course for program managers, a priority for malaria control effort in Nigeria? Evidence from a qualitative study. *PLoS One* 2020; 15: e0236576.
- Asia Pacific Malaria Elimination Network. Indonesia National Strategic Plan 2020-2024, 2020 [cited 2022 Feb 21]. Available from: URL: <https://www.apmen.org/resources/indonesia-national-strategic-plan-2020-2024>
- Beier JC, Keating J, Githure JI, Macdonald MB, Impoinvil DE, Novak RJ. Integrated vector management for malaria control. *Malar J* 2008; 7 (Suppl 1): S4.
- Bourdier F. Health inequalities, public sector involvement and malaria control in Cambodia. *J Soc Issues Southeast Asia* 2006; 31: 81-115.
- Centers for Disease Control and Prevention (CDC). Field Epidemiology Training Program, 2021 [cited 2021 Apr 20]. Available from: URL: www.cdc.gov/globalhealth/fetp
- Cohen JM, Smith DL, Cotter C, *et al.* Malaria resurgence: a systematic review and assessment of its causes. *Malar J* 2012; 11: 122.
- Fuadzy H, Peneliti T. Research report: determination of vector control resource indicators at health center level in malaria receptive areas, West Java Province, 2020 [cited 2021 Apr 20]. Available from: URL: https://drive.google.com/file/d/1oSps_mODQS9DNTvOtBFEEhLfzBHi61Wo/view [in Bahasa Indonesia]
- Hasyim H, Firdaus F, Prabawa A, *et al.* Potential for a web-based management information system to improve malaria control: an exploratory study in the Lahat District, South Sumatra Province, Indonesia. *PloS One* 2020; 15: e0229838.

- Hemingway J, Shretta R, Wells TN, *et al.* Tools and strategies for malaria control and elimination: what do we need to achieve a grand convergence in malaria? *PLoS Biol* 2016; 14: e1002380.
- Herdiana H, Cotter C, Coutrier FN, *et al.* Malaria risk factor assessment using active and passive surveillance data from Aceh Besar, Indonesia, a low endemic, malaria elimination setting with *Plasmodium knowlesi*, *Plasmodium vivax*, and *Plasmodium falciparum*. *Malar J* 2016; 15: 468.
- Mahmudah NA, Esaputri I, Bayuangga H, *et al.* Knowledge, attitude, and practice of malaria community worker towards prevention and control of malaria in Kokap, Kulon Progo: a pilot study, 2020 [cited 2021 Apr 20]. Available from: URL: https://www.researchgate.net/publication/345968534_Knowledge_Attitude_and_Practice_of_Malaria_Community_Worker_towards_Prevention_and_Control_of_Malaria_in_Kokap_Kulon_Progo_A_Pilot_Study/fulltext/5fb3826d45851518fdacc5cb/Knowledge-Attitude-and-Practice-of-Malaria-Community-Worker-towards-Prevention-and-Control-of-Malaria-in-Kokap-Kulon-Progo-A-Pilot-Study.pdf
- Ministry of Health Republic of Indonesia (MOH RI). Decree of Indonesian Ministry of Health No 293/MENKES/SK/IV/2009 about the Malaria Elimination in Indonesia. 2009 [cited 2021 Apr 20]. Available from: https://jdih.bantenprov.go.id/uploads/peraturan/2022pg0036015_1661920034.pdf [in Bahasa Indonesia]
- Ministry of Health of Republic of Indonesia (MOH RI). Technical manual of malaria epidemiology investigation and mapping of focus areas (Elimination and maintenance areas), 2017 [cited 2021 Apr 20]. Available from: URL: Available from: <https://idoc.pub/queue/buku-petunjuk-teknis-penyelidikan-epidemiologi-malaria-dan-pemetaan-wilayah-fokus-daerah-eliminasi-dan-pemeliharaan-34m7dwmpoe46> [in Bahasa Indonesia]
- Moise IK, Zulu LC, Fuller DO, Beier JC. Persistent barriers to implementing efficacious mosquito control activities in the continental United States: insights from vector control experts, 2018 [cited 2021 Apr 20]. Available

from: URL: <https://cdn.intechopen.com/pdfs/62196.pdf>

Murhandarwati EE, Fuad A, Nugraheni MD, *et al.* Early malaria resurgence in pre-elimination areas in Kokap Subdistrict, Kulon Progo, Indonesia. *Malar J* 2014; 13: 130.

Murhandarwati EE, Fuad A, Sulistyawati, *et al.* Change of strategy is required for malaria elimination: a case study in Purworejo District, Central Java Province, Indonesia. *Malar J* 2015; 14: 318.

Prasetyowati H, Widawati M, Fuadzy H, *et al.* Evaluation of epidemiological investigation 1-2-5 implementation program in Sukabumi. *Indones J Trop Infect Dis* 2021; 9: 160-71.

Sunguya BF, Mlunde LB, Ayer R, Jimba M. Towards eliminating malaria in high endemic countries: the roles of community health workers and related cadres and their challenges in integrated community case management for malaria: a systematic review. *Malar J* 2017; 16: 10.

West Java Provincial Health Office. West Java Health Profile of 2016, 2017 [cited 2021 Apr 20]. Available from: URL: <https://pdfcoffee.com/qdownload/profil-kesehatan-jabar-2016-pdf-free.html> [in Bahasa Indonesia]

Williams HA, Durrheim D, Shretta R. The process of changing national malaria treatment policy: lessons from country-level studies. *Health Policy Plan* 2004; 19: 356-70.

World Health Organization (WHO). Global technical strategy for malaria 2016-2030, 2015 [cited 2021 Apr 20]. Available from: URL: <https://www.who.int/docs/default-source/documents/global-technical-strategy-for-malaria-2016-2030.pdf>

World Health Organization (WHO). Guidelines for malaria vector control, 2019 [cited 2021 Apr 20]. Available from: URL: <https://apps.who.int/iris/bitstream/handle/10665/310862/9789241550499-eng.pdf?sequence=1&isAllowed=y>

Xia Z, Zhang L, Feng J, *et al.* Lessons from malaria control to elimination: case study in Hainan and Yunnan provinces. *Adv Parasitol* 2014; 86: 47-79.