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Overview of the Malaria Surveillance System at the Sei Berombang Community Health Center, Labuhanbatu District

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ABSTRACT

Malaria continues to be a public health concern in several areas of Indonesia and requires a well-functioning surveillance system to enable early case detection and timely response, particularly at the primary health care level. Community health centers have a crucial role in implementing malaria surveillance as part of malaria control and elimination strategies. This study aimed to describe the implementation of the malaria surveillance system at the Sei Berombang Community Health Center in Labuhanbatu District. A qualitative descriptive design was applied, using primary data obtained from malaria surveillance officers selected purposively based on their involvement in surveillance activities. Data collection was conducted through in-depth interviews carried out online via WhatsApp calls using a semi-structured interview guide that explored surveillance inputs, processes, outputs, and implementation challenges. Data were analyzed descriptively through the stages of data reduction, data presentation, and conclusion formulation. The results indicated that malaria surveillance activities at the Sei Berombang Community Health Center were conducted through passive and active surveillance, case investigation, vector monitoring, cross-program and cross-sector collaboration, and routine reporting using the Malaria Surveillance Information System. Nevertheless, several obstacles were identified, including limited numbers and capacity of surveillance personnel, absence of specific malaria surveillance training, high workload, and limited analysis and utilization of surveillance data at the health center level. Surveillance data were primarily used for reporting and had not been optimally utilized to support local planning and evaluation of malaria control efforts. In conclusion, improving human resource capacity and strengthening the use of surveillance data are necessary to enhance the effectiveness of malaria surveillance and support sustainable malaria control at the Sei Berombang Community Health Center.

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1. INTRODUCTION

Malaria is an acute fever that can be life-threatening and is commonly found in tropical regions that are still endemic areas. The disease is caused by the Plasmodium parasite, which is transmitted by Anopheles mosquitoes, the vectors of malaria. If prevention efforts are not maintained, malaria can re-emerge(1). Malaria in humans can be caused by five different types of parasites, with Plasmodium falciparum and Plasmodium vivax being the two most dangerous types(2). Malaria remains one of the infectious diseases that poses a public health challenge in various regions of the world, including Indonesia. Indonesia is one of the countries endemic for malaria, with an uneven distribution of cases across regions. Several provinces and districts still report local transmission and imported cases, which have the potential to trigger extraordinary events if not detected and treated quickly. The Indonesian government has set a national malaria elimination target and developed various strategic policies, including strengthening the malaria surveillance system based on primary health care facilities. However, the achievement of elimination is highly dependent on the ability of community health centers to record, report, analyze, and follow up on malaria case data in a timely and accurate manner(3). Although Indonesia has committed to eliminating malaria, several endemic areas still show local cases and an increase in imported cases that have the potential to trigger re-transmission(4). The success of malaria control and elimination depends heavily on a surveillance system that can detect cases early, accurately, and continuously(5).

The malaria surveillance system in Indonesia is implemented in stages, starting from community health centers to the national level through the Malaria Surveillance Information System (SISMAL), which has now been developed in electronic form (e-SISMAL). Community health centers, as primary health care facilities, play a strategic role in recording, reporting, investigating cases, and responding to malaria cases found in their working areas(6)However, several studies indicate that the implementation of malaria surveillance at the community health center level still faces various obstacles, such as limited human resources, low reporting timeliness, and suboptimal use of data for decision-making(7).

Labuhanbatu Regency is one of the regions in North Sumatra Province that has a potential risk of malaria, especially in coastal areas and areas with high population mobility(8). The Sei Berombang Community Health Center, as an inpatient health center, has a major responsibility in supporting malaria control efforts through an effective surveillance system. However, to date, there has been little research specifically describing how the malaria surveillance system is implemented at the Sei Berombang Community Health Center, in terms of inputs, processes, and outputs(9). Several studies in Indonesia emphasize the importance of evaluating malaria surveillance systems to identify weaknesses in case recording and reporting flows. Other research also shows that integrating surveillance data with spatial mapping can help identify clusters of cases and areas at high risk for malaria. In addition, the use of mobile-based technology has been reported to improve the efficiency of data collection and the timeliness of malaria surveillance reporting at the primary care level(10).

Based on these issues, this study proposes a descriptive approach to describe the malaria surveillance system at the Sei Berombang Community Health Center through an analysis of the input, process, and output components of surveillance. This approach is expected to provide a realistic picture of the implementation of malaria surveillance and serve as a basis for formulating recommendations for system improvements. The results of this study are also expected to support improvements in the quality of surveillance data as a basis for decision-making in malaria control programs at the health center and district levels.

Therefore, this study aims to describe the malaria surveillance system at the Sei Berombang Community Health Center, Labuhanbatu District. This study is expected to provide a realistic picture of the implementation of malaria surveillance at the community health center level and identify aspects that need to be strengthened. The novelty of this study lies in the presentation of data and analysis of the malaria surveillance system specific to primary health facilities in the Labuhanbatu District, which has been limited in scientific literature. The results of this study are expected to serve as a basis for policy makers at the health center and health office levels in improving the malaria surveillance system and supporting sustainable malaria elimination efforts.

2. METHOD

This study is a qualitative study with a descriptive approach that aims to describe the malaria surveillance system at the Sei Berombang Community Health Center, Labuhanbatu District. The data sources in this study were primary data obtained from malaria surveillance officers who were directly involved in the implementation of surveillance at the health center. Informants were selected purposively, based on their roles and responsibilities in malaria surveillance activities. Data collection was conducted through in-depth interviews indirectly, without conducting field visits. Interviews were conducted via WhatsApp calls using a semi-structured interview guide. The interview questions focused on the implementation of the malaria surveillance system, including the process of data collection, case processing and reporting, utilization of surveillance data, obstacles encountered in the implementation of surveillance, and improvement efforts that have been or are being carried out at the health center. The data obtained from the interviews were recorded in the form of interview notes and then analyzed using qualitative descriptive analysis through the stages of data reduction, data presentation, and conclusion drawing. The entire research process was carried out in accordance with research ethics principles, whereby the informants' consent was obtained before the interviews were conducted and the confidentiality of the informants' identities was maintained.

3. RESULTS AND DISCUSSION

3.1 Overview of Malaria Surveillance Implementation

Malaria surveillance is an important component of the public health system that plays a role in early detection, monitoring disease trends, and determining rapid responses to malaria transmission in the working area of community health centers(11). Effective surveillance is expected to provide accurate, timely epidemiological data and information that can be used as a basis for decision-making in disease control programs. Based on interviews with surveillance officers, it was found that malaria surveillance activities at the Sei Berombang Community Health Center have been carried out in accordance with their basic functions, but still face various obstacles that affect their optimal implementation.

3.2 Malaria Surveillance Human Resources

Interviews with surveillance officers at the Sei Berombang Community Health Center revealed that their main tasks are to monitor, collect, process, and report disease data so that health problems can be detected and treated as early as possible. Malaria surveillance at the Sei Berombang Community Health Center is handled by only one officer who also serves as the surveillance team. This situation causes a high workload for the officer, especially when there is an increase in malaria cases in the community health center's working area. In addition to limited personnel, the surveillance officer also said that there is no formal training specifically related to malaria surveillance, so officers learn independently. This lack of training has the potential to affect the staff's ability to fully understand the concept of epidemiological surveillance, especially in terms of data analysis and interpretation. This finding is in line with the research by Desita et al. (2024), which states that limited human resources and staff capacity are still the main obstacles in implementing malaria surveillance in endemic areas in Indonesia(12).

3.3 Malaria Surveillance Input Components

Malaria surveillance activities are shaped by a system of inputs, processes, and outputs that support the objectives of the activities(13) Type Data collected in malaria surveillance activities includes epidemiological case data, clinical and laboratory data, treatment data, and environmental data obtained through epidemiological investigations. Malaria testing is carried out through community health center laboratory services, including blood smear testing of patients with fever symptoms. Support facilities such as recording forms, computers, and reporting information systems are available and used in surveillance activities. However, limited human resources remain a major challenge in terms of input. This condition has the potential to impact

the quality of data management and the effectiveness of malaria control program implementation, as also reported by Syahruddin et al. (2023)(14).

3.4 Data Collection Process and Types of Surveys

Public health surveillance is an important element of the health system, enabling it to detect, analyze, and respond to disease outbreaks quickly and accurately(15). Malaria surveillance data collection was carried out through case recording from routine health services at the health center and through epidemiological investigations in the patients' areas of residence when positive malaria cases were found. This pattern shows that malaria surveillance at the Sei Berombang Health Center includes passive and active surveillance mechanisms. In 2023, there was an increase in malaria cases in the working area of the Sei Berombang Community Health Center, prompting surveillance officers to conduct direct checks in the affected areas. This activity resulted in more malaria cases being identified during that period. The implementation of malaria surveillance also involved support from the health office in collecting epidemiological, clinical, laboratory, treatment, and environmental data. These results show that active surveillance plays an important role in increasing the detection of malaria cases that were previously undetected through passive surveillance, in line with the research by Andika et al. (2025) (16).

3.5 Case Tracking, Vector Surveys, and Risk Area Mapping

Malaria case tracking is conducted through direct interviews with communities around the case location to trace travel history and possible sources of transmission. However, this activity has not been fully implemented with standardized case investigation guidelines, so the quality of information obtained still varies between officers. This situation is in line with the findings of Ocvanirista et al. (2021), who stated that the implementation of malaria case tracking at the community health center level still faces limitations in terms of instrument standardization, thus requiring the use of standardized tracking forms to ensure more consistent data and support the surveillance system(17). In addition to case tracking, community health centers conduct vector surveys by monitoring the Larvae-Free Index (LFI) and mosquito larvae density as indicators of transmission risk. Research by Zafirah and Yamani (2024) shows that variations in larval density in the health center's working area reflect differences in the potential for malaria transmission, making the implementation of routine and structured vector surveys an important component of vector control(18).

Mapping of case locations and risk areas was conducted using a Geographic Information System (GIS) to identify case clusters and areas with high transmission potential. This spatial approach is in line with the research by Elieser et al. (2025), which emphasizes the importance of spatial analysis in understanding the distribution of malaria cases based on health center working areas, and is supported by the findings of Sunarsih (2022), which show the relationship between the distribution of malaria cases and geographical and environmental factors that support the existence of vectors(19,20).

3.6 Cross-Program and Cross-Sector Coordination

Coordination with vector control officers and health services is carried out through regular meetings to plan control activities, such as larval surveys and mosquito breeding site eradication. In addition, the Sei Berombang Community Health Center also collaborates with health cadres, integrated health service posts, neighborhood associations, and private clinics in reporting and detecting malaria cases in the community. Other health facilities in the health center's working area refer malaria cases to hospitals that have the capacity to treat malaria, so that continuity of service and case control is maintained. The importance of this cross-sectoral coordination is also emphasized by Syahruddin et al. (2023)(14).

3.7 Processing, Reporting, and Utilization of Surveillance Data

Malaria surveillance data collected is then reported monthly through the Malaria Surveillance Information System (SISMAL) application. However, data processing and analysis have

not been carried out in depth at the community health center level because the verification and validation processes are carried out entirely by the district/city health office. Community health center staff do not receive detailed information regarding the verification mechanism. This situation limits the feedback received by health center staff in evaluating data quality and the effectiveness of surveillance implementation. Malaria case reports are submitted regularly every month to the health office through the SISMAL application(21). The information generated includes the number of malaria cases and the results of field investigations into confirmed cases. Investigations into positive malaria cases are conducted immediately after diagnosis as part of a rapid response mechanism to prevent further transmission.

3.8 Rapid Response and Investigation of Extraordinary Events (KLB)

Based on the interview results, surveillance officers reported that a rapid response mechanism is also implemented when there is an increase in malaria cases leading to an Extraordinary Event (KLB). After one case is confirmed, the health system targets the implementation of rapid and scheduled actions to prevent further transmission and identify the source of transmission. The malaria EID investigation process is carried out by the surveillance team immediately after detecting an increase in cases that exceeds normal conditions in an area. The investigation aims to determine the source of transmission, the extent of the spread of cases, and the control measures needed to stop malaria transmission in the health center's working area. However, the limited number and competence of surveillance officers pose challenges in conducting comprehensive investigations in the field. These findings are in line with the results of a study by Aesum et al. (2024), which explains that rapid response and malaria outbreak investigation are key components of epidemiological surveillance, but their implementation at the primary care level is often hampered by limitations in human resources and the technical capacity of personnel(22). Another study by Enjelia et al. (2024) also shows that delays and incomplete investigations of outbreaks can occur when the number of surveillance personnel is not proportional to the workload in malaria-endemic areas(23).

3.9 Surveillance Output and Challenges in Information Utilization

During the investigation, surveillance officers treated patients and conducted epidemiological investigations by collecting information on the onset of symptoms, travel history to high-risk areas, and the environmental conditions of the patient's place of residence. Family members and the surrounding community were also examined using rapid tests to detect possible further transmission. In line with the research by Yuniarti et al. (2025), which shows that the accuracy of case management and the use of antimalarial drugs are important factors in supporting the success of malaria control(24). Although surveillance output has supported rapid response implementation, the information generated has not been optimally utilized for malaria control program planning and evaluation. Surveillance information has not been presented in detail based on characteristics of people, places, and time, so it does not fully describe the epidemiological patterns of malaria in the health center's working area. In addition, the dissemination of surveillance information to cross-sectors and the community is still limited, which has an impact on low community participation in malaria control efforts. This condition is in line with the findings of Andika et al. (2025), which emphasize the importance of community involvement in supporting the effectiveness of community-based malaria surveillance(25).

3.10 Problem Identification and Improvement Efforts

The final interview results show that surveillance officers still face various challenges in implementing malaria surveillance. One of the main obstacles is the difficulty of obtaining complete and timely data from health care facilities. Case reports are often late or incomplete, resulting in information received by surveillance officers and forwarded to higher levels being inaccurate and inconsistent with conditions in the field. These delays and incomplete data have the potential to hamper the process of analyzing the situation and determining a rapid response to malaria transmission. In addition to data issues, the limited number and capacity of surveillance personnel also pose a significant challenge. Surveillance officers at community health centers must handle large volumes of data with limited human resources, while at the same time they are also

burdened with other tasks outside of surveillance activities. This condition causes officers to be prone to work fatigue and overwhelm in managing data, especially during periods of increased malaria cases. Similar challenges were also identified by Desita et al. (2021), who stated that insufficient personnel and limited staff competence are major obstacles to strengthening the malaria surveillance system at the primary care level (12).

The ability of officers to operate online reporting systems and perform epidemiological data analysis is also uneven. Some officers still have difficulty in optimally utilizing the surveillance information system, so that the surveillance function as an early warning tool is not yet fully effective. This situation is in line with the findings of Syahruddin et al. (2023), which confirm that the success of malaria control policy implementation is greatly influenced by the technical capacity and ongoing support of field officers(14).

Solutions to the challenges of implementing malaria surveillance are not only related to improving regulations or reporting systems, but also concern aspects of support and appreciation for surveillance officers. Efforts to increase capacity through continuous training, a more proportional distribution of workloads, and the provision of adequate work facilities can help create a more conducive working environment. When surveillance officers feel supported, understood, and valued, their work motivation and the quality of surveillance implementation tend to improve. This approach is in line with the views of Andika et al. (2025), who emphasize that strengthening the role of human resources is key to the sustainability of disease surveillance systems at the community health center level (25). Support for these findings is also demonstrated in research published by researchers within the Ministry of Health through the Health Research Bulletin, which states that the quality of malaria surveillance is greatly influenced by the timeliness of reporting, data completeness, and the capacity of officers to utilize health information systems. The study confirms that improving the competence of officers and simplifying the reporting process contributes to increased data accuracy and the effectiveness of malaria control responses (26).

4. CONCLUSION

In accordance with the community health center's function as a primary health care facility in assisting early detection, recording, reporting, and initial response to malaria cases, the Sei Berombang Community Health Center in Labuhanbatu District has implemented its malaria surveillance system. Cross-program and cross-sector coordination, risk area mapping, vector surveys, epidemiological case investigations, and passive and active surveillance are all examples of surveillance implementation. However, the implementation of surveillance has not been as effective as it could be due to constraints in the quantity and capacity of human resources, the high workload of officials, the health center level's subpar data processing and analysis, and the underutilization of surveillance data as a foundation for planning and assessing malaria control initiatives. As a result, ongoing policy assistance is necessary to improve the skills of surveillance officials, deliver specialized training, improve the data feedback system, and increase the overall use of surveillance data to support long-term malaria control and eradication initiatives in the Labuhanbatu District.

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