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RESEARCH ARTICLE

Stakeholder Insights on Malaria Elimination Strategies in Pangandaran, West Java: a Qualitative Analysis

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Abstract

Indonesia has launched a determined effort to eliminate malaria by 2023, focusing on Java and Bali. Despite these efforts, Pangandaran in Java still faces malaria cases. This study aims to meticulously delve into the intricacies of the malaria elimination program's implementation while conducting a comprehensive evaluation of its effectiveness. Structured interviews were conducted with key stakeholders responsible for the malaria program in Pangandaran to extract invaluable insights. The study, carried out in November 2022, followed qualitative research with narrative analysis to reveal nuanced narratives from the participants. Findings from this rigorous analysis revealed a harmonious alignment between the malaria control program in Pangandaran and the Indonesian Ministry of Health guidelines. The strategy to combat malaria vectors in Pangandaran included mosquito net distribution, strategic larvicide application, and educational campaigns like Malaria Awareness Society (MASAMA). The expectation is that the current effective control program will resonate within the Pangandaran community, ultimately leading to the realization of the 2023 elimination target.

Keywords: Elimination, malaria, Pangandaran, qualitative

Introduction

Malaria is an acute infectious disease caused by the *Plasmodium* parasite, transmitted to humans through the bites of female *Anopheles* mosquitoes. There are 400 species of *Anopheles* mosquitoes, and 30 of them act as vectors for malaria. Malaria transmission is intricately linked to environmental factors, where climate, temperature, and suitable breeding sites play pivotal roles. *Anopheles* mosquitoes, the primary vectors for malaria, thrive in warm, humid conditions and breed in stagnant water, such as ponds and swamps. Altitude, vegetation, and human activities further influence transmission dynamics. Climate-related changes, urbanization, and land use alterations can impact malaria's distribution and intensity. Mosquitoes undergo a four-stage life cycle comprising the egg, larva, pupa, and adult stages, varying durations for each stage across species. Typically, eggs are laid in water and hatch within days, influenced by environmental factors like temperature and humidity. Larvae, or wrigglers, reside in water, feeding on organic matter, and undergo molting over one to two weeks. Pupae, or tumblers, represent a non-feeding stage lasting one to four days, during which larvae transform into adult mosquitoes. The adult stage, with varying lengths of life depending on the species, commences as pupae emerge as winged mosquitoes, breaking the water's surface. A comprehensive understanding of the mosquito life cycle is imperative for effective prevention measures, including eliminating or treating standing water where mosquitoes breed.[1]

According to the World Malaria Report, there were 229 million reported cases of malaria and 409,000 deaths in 2019, compared to 228 million cases and 411,000 deaths in 2018. Children under the age of five were the most vulnerable group, accounting for 67% of all malaria-related deaths worldwide in 2019. The burden of malaria remains exceptionally high in the African region, where 94% of all malaria-related deaths occurred

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in 2019. Six countries, namely Nigeria (23%), the Democratic Republic of Congo (11%), the Republic of Tanzania (5%), Burkina Faso (4%), Mozambique (4%), and Niger (4%), accounted for approximately half of all global malaria-related deaths.[2]

While regions in the Eastern Mediterranean, West Pacific, Americas, and Southeast Asia also reported cases and deaths due to malaria, Southeast Asia has witnessed a remarkable 74% reduction in malaria cases over the past two decades, from 23 million cases in 2000 to 6.3 million in 2019. Incidence and mortality have declined by 78% and 74%, respectively. India has played a significant role in this reduction. Sri Lanka reported zero cases in 2015, and Timor Leste achieved the same in 2018 and 2019. Indonesia has also made progress, with malaria cases dropping from 1.1 million in 2015 to 658,000 in 2019.[1]

Despite these improvements, malaria remains a significant concern in Indonesia, particularly in regions with tropical and sub-tropical climates. Efforts to eliminate malaria continue, even amid the COVID-19 pandemic. While several districts and cities in Indonesia have achieved malaria-free status, specific areas, including Pangandaran, Garut, Sukabumi, and Tasikmalaya in West Java,[3] continue to grapple with endemic malaria. Numerous factors contribute to this ongoing challenge, such as geographical conditions, budget constraints, infrastructure limitations, insufficient workforce capacity in quantity and quality, coordination across sectors, community empowerment, and limited public awareness.[4]

Based on reported cases as of December 2022, seven individuals were identified as *P. vivax* malaria sufferers. Epidemiological investigations conducted by the Pangandaran Health Office indicated that these cases were imported. In contrast to 2021, when no malaria cases were reported, malaria resurfaced in the Pangandaran area in 2022, primarily due to factors related to malaria transmission risks. Hence, continuous evaluation of malaria elimination efforts is essential in malaria-endemic regions. The Indonesian government has instituted a malaria elimination program outlined in the Minister of Health of the Republic of Indonesia's Decree No. 293/MENKES/SK/IV/2009, dated April 28, 2009, to achieve a malaria-free and healthy society by 2030. This study aims to conduct an in-depth examination of the complexity of the implementation and evaluate the efficacy of the malaria elimination program. This undertaking is significant for Indonesia, a nation facing persistent challenges related to endemic malaria. In 2023, Indonesia initiated a comprehensive malaria elimination program, specifically emphasizing West Java's regions. The success of the existing control program, accepted by the Pangandaran community, is expected to lead to the realization of the 2023 elimination target.

Methods

In our research, a qualitative approach was adopted for distinct reasons. This methodology was selected because it facilitates a thorough exploration and understanding of complex phenomena, specifically those associated with malaria control and elimination initiatives. The qualitative approach is particularly adept at capturing participants' perspectives, experiences, and narratives, making it well-suited for generating context-specific and rich data that can significantly contribute to the evaluation of malaria control programs.[5]

This research framework combines program evaluation, policy analysis, and qualitative research to assess the malaria elimination program in Pangandaran comprehensively. In the triangulation process, the entire research team's involvement is fundamental for ensuring a rigorous and reliable analysis. Every research team member actively participates in the data analysis, and each individual's contribution is precious. The collaborative effort ensures that diverse perspectives and knowledge from each team member are integrated into the analysis, enriching the overall understanding of the data.

The evaluation of malaria control and elimination activities in the Pangandaran district was conducted following the Activity Stages Elimination of Malaria indicators outlined in the Republic of Indonesia Decree of the Minister of Health No. 293/MENKES/SK/IV/2009. Participants were selected meticulously using a purposeful sampling technique, which deliberately targets individuals who meet specific criteria deemed relevant to the research. In this instance, the requirements centered around individuals associated with malaria control and elimination programs within the Pangandaran regency area.

The selected informants met the stipulated

criteria for the Pangandaran regency area, ensuring that the information acquired was characterized by clarity, detail, and communicability. The study is an in-depth interview with two informants with different categories of participants: (1) the program manager responsible for the health program at the district level and (2) the implementer operating at the sub-district. The first informant is a male and works at the Health Office as a sub-coordinator for the prevention and control program of infectious diseases in Pangandaran. The second informant is a male at the Health Office of Pangandaran Sub-district. Before the interviews, explicit informed consent was obtained from each participant, following a thorough explanation of the purpose and significance of the interview activity. Detailed records were maintained throughout these interviews, ensuring the accuracy of the data and functioning as a mechanism for validating the evaluation of malaria control and elimination program activities.

The study was executed in the Pangandaran district, within the West Java province, in November 2022. The perspectives shared by the informants guided data interpretation, offering insights into the concepts and theories that could best elucidate the findings obtained from the field. This systematic approach facilitated the identification of challenges present in the area, thereby making a substantial contribution to the comprehensive assessment of the efficacy of malaria control efforts. The interviews were recorded, transcribed, and coded to facilitate a thorough data analysis.

Results

Malaria remains a prevailing health concern within the Pangandaran district as the region continues to grapple with its classification as a malaria-endemic area. In the year 2019, data from the Province of West Java, encompassing districts including Pangandaran, Tasikmalaya, Garut, and Sukabumi, revealed that these areas exhibited a low prevalence of malaria, characterized by an annual parasite index (API) of less than 1. However, this favorable overall status only extends uniformly to Pangandaran, which still faces significant challenges associated with malaria transmission.

Official health records from the Pangandaran region emphasize the persistent presence of malaria within its borders. This data identifies five villages in the district categorized as having a low endemicity for malaria and one with a medium endemicity. These classifications offer crucial insights into the region's enduring complexities of malaria transmission and endemicity. It is imperative to recognize the gravity of these findings, as they underscore the imperative for ongoing efforts in malaria control and prevention within Pangandaran. Despite strides made in some areas of West Java, Pangandaran's distinct challenges necessitate the implementation of tailored strategies and interventions to address the enduring issue of malaria endemicity effectively. This comprehensive analysis establishes a pivotal groundwork for the formulation and execution of targeted public health initiatives designed to mitigate the impact of malaria within the district.

"Various species of the sundaicus *mosquito are highly prevalent in the area. In the past, stagnant swamps posed significant challenges, particularly at night. However, this situation has improved, and stagnant swamps are no longer the primary concern. Instead, our principal issue pertains to land excavation. Whenever issues related to land excavation arise, we diligently report them to the relevant village and district authorities. It is essential to note that the concept of land ownership concerning excavation has evolved. Historically, many excavation sites were left abandoned, resulting in unclear or unclaimed ownership." (Informant)*

"Certainly, for accurate identification, we must examine mature mosquitoes. Attempting to identify them during their larval stage can be quite challenging. It becomes problematic when trying to distinguish one Anopheles *species from another, especially when they belong to different species. However, it's worth mentioning that the public health center in the Kalipucang area has made significant strides in mosquito identification. They have identified several species, including* Anopheles birostris, barbirostris, sundaicus, javanicus, *and* maculatus. *Among these, the most prevalent* Anopheles *species in Pangandaran is the* sundaicus, *primarily because it thrives in brackish water habitats." (Informant)*

In the Pangandaran area, it should be noted that there are numerous abandoned fish ponds.

These ponds are acknowledged as potential breeding grounds for mosquitoes, as explained by one of the informants:

"Even if there are fish ponds with closed surfaces, the possibility of mosquito breeding remains high. In areas like Kalipucang, Cibuluh, Banjarharja, and Tunggilis, numerous abandoned fish ponds belong to the local community but are often far from residential areas. For instance, an individual may own a pond in Hamlet A while residing in Hamlet B, leading to neglect. Consequently, these ponds are left unused, becoming breeding grounds for mosquitoes. As a result, such incidents are prevalent, causing ponds to become overgrown with moss and algae." (Informant)

The management of malaria in the Pangandaran district has been effectively carried out, encompassing program implementation, innovative measures, and community empowerment in malaria treatment. As one informant stated:

"If it comes to malaria, we must eliminate it because we aim for a certification. We have introduced an innovative approach known as 'Waiter Beautiful and Gorgeous Gogon' to control the vector.' This approach involves a community movement called 'Germas Gogon,' where we collectively clean and clear lagoons. The 'Waiter Beautiful' part involves strategically releasing fish, such as mujair and head fish, into these lagoons." (Informant)

Lagoons are potential habitats for developing vector mosquitoes within the Pangandaran area, where malaria cases have been documented. Sustaining control measures, including larvicide applications, documentation of lagoon ownership, and facilitating fish donations from various regions, is imperative. The informant provided this information.

"Every month, larvicides are applied to these lagoons, resulting in a noticeable decrease in the larvae population due to the larvicide treatments conducted in the previous month. This practice has proven effective, especially considering these lagoons were previously not under any ownership management. Comprehensive data on lagoon ownership is now available. Historically, the fish introduced into these lagoons originated from Pamotan before being donated by various organizations, including the KKP, Fisheries Regency Pangandaran, and PPKL Jakarta." (Informant)

"Indeed, larvicides are applied monthly as a preventive measure due to the persistent presence of malaria cases in the area. The nature of these breeding sites tends to change with the seasons; during dry periods, the breeding sites become more confined, whereas during the rainy season, they expand. NA conveyed this information from public health center." (Informant)

Additionally, malaria elimination is actively pursued through various programs initiated by several public health centers, which demonstrate a diligent effort. Nonetheless, there are challenges in sustaining this elimination, which continue to result in significant malaria cases. This insight is based on information provided by informants from the Department of Health and public health centers.

*"No, the "*Si Cantik dan Gogon*" program is an innovative initiative introduced by the public health center in Kalipucang. Currently, the program at the* puskesmas *level is highly active. The challenge we face is that we have yet to achieve malaria elimination; therefore, we do not hold the certification for elimination. Maintaining this certification is particularly challenging because elimination efforts are not solely focused on vector control or targeting endemic areas; instead, elimination involves addressing specific cases. All vectors pose significant obstacles to this endeavor."*

"Furthermore, maintaining the elimination status is complex due to the need for inter-sectoral coordination. Nevertheless, we are grateful that Kalipucang is taking prompt action, and we are working on existing regulations and directives from the district, including perbup, perda, and perdes, to address this issue." (Informant)

"In reality, we must acknowledge that due to the endemic nature of malaria, the residents in this area have developed a level of immunity, and they tend to consider malaria as a common occurrence. This perception has been formed because, for several years, there were no

reported cases of malaria. However, some cases have been reported again this year, indicating that the threat of malaria is still present." (Informant)

The *puskesmas* and the local health office in the Pangandaran district have intensified malaria elimination programs. Their goal is to elicit a more substantial response from the community and anticipate the implementation of another health program to achieve 100% malaria elimination.

"We are fortunate that the community's cooperation extends beyond just addressing malaria; it includes other diseases like dengue. The community is now prepared for the PSN (a movement to eradicate mosquito breeding sites by practicing 3M Plus), and this heightened awareness is crucial. If malaria cases resurge, the community must be well-informed about the measures and challenges." (Informant)

The community must understand how to manage malaria effectively. However, control measures must continue to be enforced to eliminate malaria successfully, particularly in Pangandaran. The community is encouraged to remain vigilant even if malaria cases have decreased and are urged not to let their guard down.

"Furthermore, it's worth noting that people tend to become more complacent when a disease re-emerges. It presents a challenge for us as we strive to educate the community. While people may want to understand, getting them to act accordingly can still be challenging." (Informant)

The evaluation activities are ongoing and are conducted by the *puskesmas* and the health office. These activities involve monitoring reported cases and coordinating with healthcare services. Presently, surveillance is primarily passive, meaning that health officers respond when the community reports a case. From 2015 to 2019, malaria cases were endemic in this district. However, from 2020 to 2022, there has been a decreasing trend in imported and indigenous cases in this region.

"So, if there is any disease, it is rapidly brought to the nearest healthcare facility from their home." (Informant)

In addition to monitoring cases, some districts in the Pangandaran region have engaged cadre members' support in monitoring and evaluation activities. With the assistance of cadre members, reports of persistent malaria cases have been effectively managed.

"It's true that not all villages are fully prepared. For instance, there is one village with four hamlets. Have all four hamlets been thoroughly checked? Not yet, but we rely on cadre members to provide information for our visits and inspections. Cadre members play a crucial role in making this process more efficient. It would be quite challenging without cadre members as we would need to navigate through various complexities. Information is readily available when cadre members are involved, making the inspection process smoother." (Informant)

"Furthermore, cadre members in the community show greater dedication, which significantly contributes to our efforts." (Informant)

Furthermore, a map indicating deployment locations in this region is accessible at each health center.

"Yes, the map can be obtained at the Kalipucang Health Center, and they are more than willing to share it." (Informant)

Discussion

The successful elimination of malaria in the District of Pangandaran faces ongoing challenges in reducing cases, particularly in health centers within the district. Despite progressing to a stage of low endemicity with no local transmission recorded in 2022, comprehensive efforts related to malaria control are still in the process of full implementation. As outlined in the Republic of Indonesia Minister of Health Decree No. 293/MENKES/SK/IV/2009, critical indicators for malaria elimination include the discovery and management of cases, prevention and control of risk factors, epidemiological surveillance, communication and education, and the enhancement of human resources.[5] Observational endeavors are concentrated on ensuring that locations with ongoing malaria transmission

are identified, along with pinpointing at-risk populations. It includes monitoring vectors and assessing their vulnerabilities to devise targeted interventions.[6]

According to the World Health Organization (WHO), several inhibiting factors in malaria elimination include a lack of supervision, regulation, and community knowledge.[7] This is substantiated by data from the 2013 *Riskesdas*, which underscores the necessity for enhanced monitoring, evaluation, and the bolstering of cross-sector participation in malaria treatment—additionally, identified various factors related to elimination activities, encompassing community knowledge, engagement, and participation, particularly in the private sector.[8] The support of technology information utilization in managing standardized drug supply at primary healthcare facilities is another crucial aspect. In the Pangandaran district, multiple vector control activities have been undertaken and continue to improve. These include distributing mosquito nets, using larvicides, ongoing community education, and establishing the *Masyarakat* Awareness of Malaria (MASAMA) program to minimize the resurgence of malaria transmission in the region. Furthermore, based on interviews with informants, the health service, in collaboration with health centers in the Pangandaran area, routinely conducts monitoring activities in lagoons, which serve as transmission sites for malaria. Specific endemic target areas have been identified with the elimination program in the Republic of Tanzania. An approach targeting communities at higher risk of malaria transmission is encouraged, involving interventions such as the distribution of mosquito nets, mosquito vector control through indoor residual spraying (IRS), and the management of malaria cases through the provision of appropriate medication doses.[4,9]

The management of malaria programs, including coordination among provinces, districts, and health centers, must be integrated with the Ministry of Health's program, with support from UNICEF and WHO. The role of both public and private sector organizations becomes crucial in the malaria elimination efforts.[10] Policy development in the health sector can be effective when it is well-structured and supported by valid and comprehensive evidence.[11] Kader Maideen et al.,[12] adopting a "one health" approach, which involves collaboration between the health sector and other fields, is believed to be one of the strategies for accelerating malaria elimination efforts. Furthermore, Marhaban et al.[13] assert that malaria management involves the treatment of patients and vector control. It is because various factors, such as changes in ecosystem areas, the consequences of deforestation, shifting climates, and the development of settlements or urban areas influence malaria.

The prevention of malaria in Pangandaran district involves coordination among the Department of Health, health centers, and various community stakeholders. Educating the public about malaria is crucial, enabling them to distinguish it from other vector-borne diseases and learn how to handle it properly. Reports from Columbia have shown that knowledge and practices related to malaria prevention have improved after implementing interventions like counseling and distributing educational materials such as books, booklets, t-shirts, and audio-visual media.[14–16] Nevertheless, it is crucial to acknowledge that the understanding of malaria among the general population may vary from that of individuals who have personally experienced the disease. Typically, those who have suffered from malaria have a better understanding of how to manage and treat the disease.[17] Additionally, the basic health research (*riset kesehatan dasar, Riskesdas*) results conducted in 2013 in various regions of Indonesia indicate that effective treatment has yet to be widely achieved due to inappropriate treatment-seeking behavior. In six malaria-endemic provinces (Bengkulu, Maluku, North Maluku, East Nusa Tenggara, Papua, and West Papua), people still obtain malaria treatment from stalls and pharmacies.[18]

Similar to Indonesia, the country of Zanzibar is also actively engaged in malaria prevention efforts. These efforts include the use of mosquito nets treated with insecticides, indoor residual spraying (IRS), and health promotion campaigns.[19] These activities are driven by concerns and fears within the public regarding the potential resurgence of malaria within their territory, especially during the rainy season, and the introduction of cases from other regions or through imports. Successful implementation of these programs has led to the City of Sabang becoming a prosperous city with significant progress in eliminating malaria. Several key factors have contributed to this success, including the accurate discovery and management of valid malaria cases, mitigating

risk factors, effectively monitoring malaria epidemiology and outbreak control, improved cross-sector communication and cooperation, enhanced public information and education, and increased human capacity.[13] Furthermore, a decline in malaria cases has also been observed in the village of Tetel in Purbalingga regency, where implementing village regulations has played a crucial role in educating the local community about malaria elimination. These educational activities encompass health village meetings, group recitations at mosques, community gatherings, and integrated health service posts (*pos pelayanan terpadu*, *posyandu*). Public participation, with active individuals serving as team supervisors, has been instrumental in reporting individuals with malaria symptoms.[20–24] This participatory approach is consistent with the routine practices in Pangandaran involving local cadres. Ultimately, with efficient control measures and the active involvement of the community, the malaria elimination program in various areas of Pangandaran holds promise for success. As long as these efforts are relevant to local malaria vectors and accepted by the community, the goal of eliminating malaria in West Java can be realized.

Conclusions

Activity surveillance in the district area Pangandaran already properly proven in malaria cases in 2019 to 2022 decreased. Cooperation cross-sector did, but the role of the public in activity elimination must be improved. The successful elimination of malaria not only from society; therefore, an increase in HR quality must continue with the enhancement of the quality of human resources in the Pangandaran district and cooperation between the public, and the giver policy expected the following regions to become a region with success elimination of malaria.

Conflict of Interest

The authors declare that they have no competing interests.

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