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A Narrative Review: Quintuple Helixs Model for Malaria Elimination in Indonesia

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ABSTRACT

Malaria continues to impact the health and economies of people around the world. Further steps need to be taken in accordance with the Global Technical Strategy for malaria to prevent malaria transmission. Quintuple helix model is an integrated effort that involves cross-sector in controlling malaria cases in an area. The implementation of the quintuple helix model is expected to be used as consideration and input for policy makers in an effort to achieve malaria elimination in Indonesia by 2030. The purpose of this study is to eliminate malaria in Indonesia with the quintuple helix model. This study uses a systematic review narrative method that is used to identify study topics selectively on interesting and recent issues. Malaria control in Indonesia is carried out using the national resilience approach. The results obtained from the academic aspect for malaria control must be met, both in terms of educational background qualifications, from the industrial aspect of the economic system included in the quintuple helix model, from the government aspect the control program must be compiled under the Ministry of Health, from the media aspect where the media is one of the an important index in the management of malaria in an area, and from an environmental aspect that aims to prevent, limit vector breeding and reduce mosquito contact with humans. The quintuple helix model is expected to be an innovation in malaria control in Indonesia. By involving academia and social community, industry, government, environmental engineering, and the media. It is hoped that each sector can provide roles that are in accordance with their duties and functions.

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INTRODUCTION

Malaria continues to impact the health and economies of people around the world. There were 229 million malaria cases in 2019 spread across 87 malaria endemic countries. Countries that account for 51% of malaria cases in the world are Nigeria (27%), Democratic Republic of Congo (12%), Uganda (5%), Mozambique (4%) and Niger (3%)(Organization, 2020). Malaria elimination is an effort to stop local transmission of malaria-causing parasites in certain areas. Further steps need to be taken in accordance with the Global Technical Strategy (GTS) for malaria to prevent malaria transmission(Organization, 2021).

One of the principles in the GTS is that all countries can accelerate efforts towards elimination through a combination of interventions that are tailored to the local context and involve multiple sectors. The quintuple helix model is an integrated effort that involves cross-sectoral control of malaria cases in an area. The quintuple helix model is continuously promoted in critical decision making for managing malaria vectors and reducing chemical-based controls(Organization, 2015).

The quintuple helix model requires a holistic approach with an ecological strategy for vector control that does not harm the environment. The Quintuple helix model also involves local communities through existing social communities to convey information on matters related to malaria. In the quintuple helix model, capacity building of health resources is carried out with training and support to participate effectively in malaria prevention programs(Africa P, Germany P, 2013). Good implementation of the quintuple helix model will be integrated into national and local health systems and with national malaria control programs.

The trend of malaria in Indonesia tends to decrease with the API indicator. The annual parasite incidence (API) of malaria in Indonesia in 2010 reached 1.96, while in 2020 it was 0.87 per 1,000 population(Indonesia, 2021). Indonesia is the second country with the highest number of cases in the WHO Southeast Asia region after India. However, the number of cases remains at a high rate, especially in the last 3 years, namely 202,176 cases (2018), 250,628 cases (2019), and 226,364 cases (2020)(RI, 2019a)(RI, 2019b)(Indonesia, 2020).

Special eliminations for eastern Indonesia, such as the provinces of Papua, West Papua, East Nusa Tenggara (NTT) are targeted to be achieved by 2030(Keputusan Menteri Kesehatan Republik Indonesia Nomor 1405/Menkes/SK/XI/2002 tentang Persyaratan Kesehatan Lingkungan Kerja Perkantoran dan Industri, 2002). The achievement of district or city-level malaria elimination in Indonesia is 318 districts in 2020 with a target of 345 city districts in 2021(Kementerian Kesehatan Republik Indonesia, 2021). Synergy in malaria control must still be the focus of the government during the current COVID-19 pandemic in order to achieve complete elimination by 2030.

Comprehensive intervention combining the distribution of bed nets, public-private partnerships with chemists, training in effective medicine to reduce the prevalence of malaria and the likelihood of developing fever in children under five years of age(Abegunde D, Orobaton N, Bassi A, Oguntunde O, Bamidele M, 2016). Community case management of malaria (CCMm) using CHW-trained volunteers with RDT and ACT-based diagnostics in southern Congo is proving to be an acceptable approach to detect and treat malaria infection(Swana EK, Makan GY, Mukeng CK, Mupumba HI, Kalaba GM, 2016).

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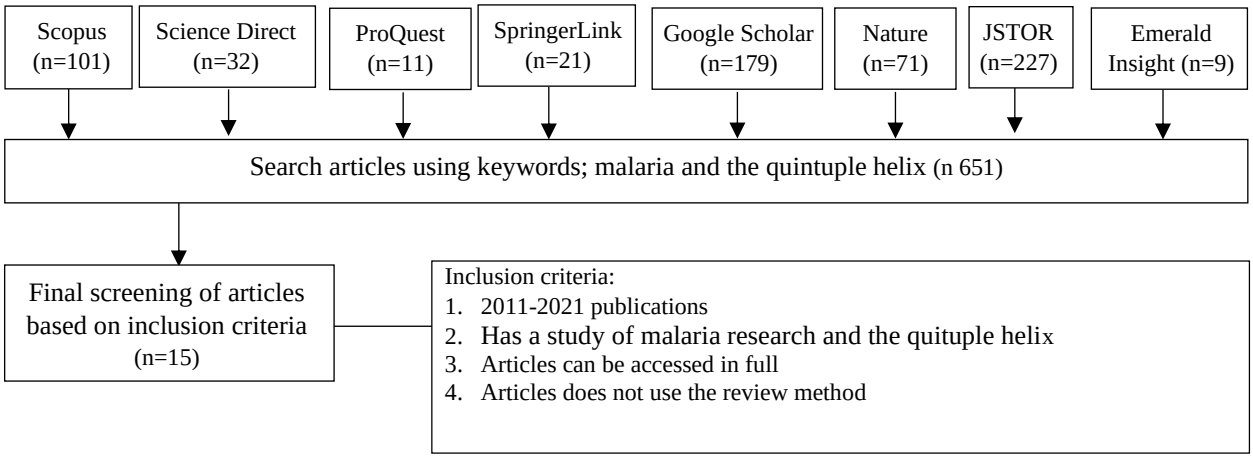
The eastern region of Indonesia has a very high API, namely the provinces of Papua (64.03), West Papua (7.38) and East Nusa Tenggara (2.37) per 1,000 population. Most of the provinces, namely 31 provinces (91.2%) had malaria API < 1 per 1000 population. The causes of high malaria in the case study in West Papua are the difficulty of detecting the weather by the BMKG, the symptoms of malaria are similar to mild illness, the difficulty of identifying the source of the infection, the community environment favored by the Anopheles sp. (a lot of puddles of water), and prevention of the lack of community so that recovered people can be infected again(Astin N, Alim A, 2020). The implementation of IVM is expected to be used as material for consideration and input for policy makers in an effort to achieve malaria elimination in Indonesia by 2030.

METHODS

This research is a systematic review research with the type of systematic review narrative, a systematic review narrative is used to identify research topics selectively on interesting and current issues. The purpose of a systematic review is to obtain literacy studies that can be used as a literature review or reference in descriptive or explanatory based studies. The articles used in this study amounted to 15 articles with article filtering as below,



Picture 1. Flow Chart Screening Article

RESULTS AND DISCUSSION

Academic and Social Community

The ability of available human resources for malaria control must be met, both in terms of academic qualifications and educational background. Several planned programs and activities have been prepared by these human resources. All programs are relevant. Klambunization is a program that originates from community development(Tynan et al., 2011). Decision making based on the facts of the case studies has been well done. This case study is used in the treatment and eradication of malaria. An important fact that has not been used as a basis for action is the ecological data on malaria vectors. Ecological data can be used for malaria control(Campbell et al., 2015). An.aconitus, An. balabacensis, An. maculatus dan An.aitkeni. through the provision of types and densities of vectors that have the potential to cause malaria infection. Four species in the study area were positive as vectors of An.aconitus, An.

balabacensis, An. maculatus and An.aitkeni. The greater the diversity of species as vectors, the higher the potential for malaria infection(Beier et al., 2008).

The degree of success lies in the use of available and newly created 'knowledge' according to the Quintuple Helix Model(Keiser et al., 2005). Quintuple Helix is an innovation model that can overcome existing malaria cases through the application of knowledge and knowledge because it focuses on social exchange (society) and knowledge transfer within a particular country or nation-state subsystem (Michael et al., 2018). Quintuple Helix's 'nonlinear' innovation model, which combines knowledge, know-how and natural-environment systems together into one 'interdisciplinary' and 'transdisciplinary' framework, can provide a step-by-step model for understanding quality-based effective development management, restoring balance with nature, and enable future generations to live in plurality and diversity on earth (Gu et al., 2006).

The quintuple helix model includes the relationship between the academic community, industry, the public sector, civil society, and the natural environment. In the quintuple helix model, it is emphasized that the natural environment is the main habitat, so that cross-sectoral collaborative efforts are needed to support vector eradication in the environment. The achievement of sustainable development is a must in the era of globalization, digitalization, and rapid technological advances. A dynamic balance is needed that will ensure the process of interaction between the population and the carrying capacity of its environment.

Industry

The economic system belongs to the quintuple helix model. The economic system, as the second subsystem, consists of industry, companies, services, and banks. This helix concentrates and focuses the economic capital (e.g.: entrepreneurship, machines, products, technology, money, etc.) of a country (nation-state). This explains the need for collaboration between the public sector, industry, and the academic sector to align the education system with the needs of the labor market, but also to encourage innovation. The peculiarity of this concept is that it shifts the position of stakeholders, from isolated or bilateral, even trilateral forms of cooperation to the multilateral spiral dimension of collaborative relationships.

Considering that environmental-based malaria is quite complex and locally specific, its control is unlikely to be successful if only carried out by a health approach. Therefore, it is necessary to apply integrated control, namely a combination of several methods that are synergized and integrated in the malaria control program. This is because malaria transmission is a series of events caused by the presence of parasites, mosquitoes as vectors, the physical environment, and humans as hosts. With this method, stakeholders, namely the industry concerned, the community must actively take part through partnerships to help the industry to prevent malaria. This component is a chain of transmission of malaria, so that efforts to prevent and control malaria through breaking the chain of transmission are very effective.

The HR factor is very large in regulating the entry and exit of goods, maintaining the quality of goods and controlling whether there are areas that run out of logistics. In addition to paying attention to the HR factor, another important thing in logistics is the existence of a proper warehouse, both a drug warehouse and an insecticide warehouse. Malaria Center has its own warehouse for medicines, tools and insecticides (Harijanto, n.d.).

Government

Many control programs are structured under the Ministry of Health, with no organizational links to other

government ministries (e.g., environment, education, agriculture, and tourism), municipal entities (e.g., engineering, sanitation, and water resources) or relationships with stakeholders in the community (e.g., business, educators, community groups and NGOs). Various techniques are being used to control mosquitoes, but programmatic approaches are generally not concerned with mosquito surveillance, basic information on the ecology and behavior of vector species, or health system data on disease. In addition, a common problem is the lack of stable funding for mosquito control operations and the lack of initiatives to exert influence in supporting mosquito control by government and other community entities. In this review, it is hoped that the quintuple helix model can replace the less effective IVM by evaluating the failure of the IVM.

Progress in implementing IVM continues to be slow. In the Institute of Medicine's review of Vector Infectious Diseases, it hinders our ability to find realistic solutions to the problems of vector-borne diseases: deterioration of public health infrastructure, lack of adequate funding, lack of adequate training and training models, over-specialization in biomedical sciences, driven by the advent of technology and emphasis on basic sciences, and bureaucratization. If IVM is to be successfully integrated into national malaria control programs, these shortcomings must be overcome. The lack of an integrated malaria management program is caused by a government system that does not allow cross-agency programs and budgeting. It is hoped that the evaluation of IVM can be improved for new program proposals on the quintuple helix model, especially from the government side.

Each institution has its own program and performance indicators. Financial responsibility and program success are sectoral (Smith et al., 2015). It is not easy to develop an integrated program, which means that malaria control cannot be carried out effectively(Gilroy and Chwatt, 1945). Community involvement is always ongoing but has not become part of the culture to free the community from mosquito bites. People are often not alert, so they are bitten by Anopheles mosquitoes. The social and economic conditions related to the construction of houses are the main obstacles in isolating the spread of mosquitoes. The community has sufficient knowledge to understand the benefits of mosquito nets, but they prefer to feel comfortable than using the mosquito nets. Local wisdom dictates isolating patients with bed nets until they are completely cured; It is effective in controlling the spread of malaria between humans.

The application of the quintuple helix model for malaria elimination is expected to work well. Collaboration between sectors to run effectively. There is an assumption that malaria is the responsibility of the government, especially the ministry of health, while other sectors only support malaria control. HR capabilities are in accordance with the health sector. Other available human resources are not suitable for malaria management. Frequent job mutations cause inconsistency in malaria control. Malaria control based on case data is going well, but the observation of malaria vectors is not carried out continuously so that the early warning system is not effective.(Gyapong et al., 2005),(Breman et al., 2006)

Media

Media-based publics and culture-based publics are the fourth subsystem, media-based publics and culture-based publics, integrating and combining two forms of capital. On the one hand, this helix, through culture-based publics (eg: traditions, values, etc.), has social capital. On the other hand, media-based public helices (e.g.: television, internet, newspapers, etc.) also contain 'information capital' (e.g.: news, communication, social networks).

Media is an important index in handling malaria in an area because not all people fully understand malaria. In a different context but still in the realm of health promotion, Dwilaksono once said the same thing that information media within the scope of communication in the form of social networking media is very effective for disseminating information targeting teenagers and productive ages. Although in terms of age, the people who became respondents in this study were not in their teens but were still of productive age, in general it can be said that the communication media, namely television, had a good influence on their knowledge of the concept of malaria.

The information conveyed and received well by the community was able to influence the level of public knowledge about the concept of malaria where malaria is a curable disease. In general, it can be said that the communication media that have been used by the public as entertainment media can be used as information media by agencies related to health to promote or convey information on health programs in controlling malaria and other diseases.

The output of the natural environment is followed by the input of new knowledge about nature and a green (greener) lifestyle for media-based and culture-based public subsystems. In this helix it is very important to communicate and lead a green lifestyle. Here, the media-based public receives a new and important function (namely, information capital), which spreads through the media information about the new green consciousness and new human lifestyle. This capital should provide incentives for how green lifestyles can be implemented in a simple, affordable, and conscious way (i.e., knowledge creation).

This knowledge creation promotes the necessary social capital of a culture-based society, on which society depends for sustainable development. Therefore, this social capital must convey information about the wants, needs, problems, or satisfaction of citizens as an output into politics or the political system. The output of knowledge from the media-based and culture-based public is something new.(Goodman et al., 2000)

Environment

Gilroy and colleagues reported a reduction in malaria incidence and sporozoite prevalence rates in Nigeria using a variety of environmental management techniques, including source reduction and drainage25. Utzinger and colleagues reviewed environmental management (EM) activities in suburban habitat, cities and disturbed land areas, around the Zambian Copper mine; Significant reductions in malaria transmission were achieved over a three-to-five-year period, using a combination of drainage, larval habitat filling, and bed netting. Keizer and colleagues conducted a meta-analysis of EM studies globally and concluded that EM can have a significant impact on clinical malaria if EM is compatible with eco-epidemiological settings. EM was also used with available larvicides to control malaria in the coastal city of Mombasa(Goodman et al., 1999; Partz et al., 2000; Raharjo, 2015).

A combination of water drainage techniques and larvicides reduced the number of malaria cases by 98% from 1969 to 1970 in the coastal floodplains of Haiti. In India, Sharma and colleagues reported a more than 95% reduction in malaria incidence over a four-year period for communities receiving a combination of water resource reduction activities and biological control in larval habitats. Collectively, these studies suggest that several vector control strategies may be beneficial when used in combination. Further evaluation is needed to test the effectiveness of IVM for reducing malaria in Africa. The absence of evaluation of IVM, as well as evaluation of intervention packages, has been noted recently by several investigators.(Campbell et al., 2015; Metcalf and Novak, 1994; Morens, 2008; Protopopoff et al., 2007)

Implementation of the quintuple helix model requires assessing the need for vector control capabilities through policy requirements, reforms and adjustments to the policy framework that provides an enabling environment for vector control; Institutional development needs: strengthening of existing institutions and arrangements between them aimed at facilitating vector control.(Sharma and Sharma, 1986; W and Novak, 2005)

Managerial development needs: establishment of clear criteria and decision-making procedures for managing vector control programs; Technical strengthening: development of technical facilities to support vector control programs; Human resource development needs: formation and training of employees in relevant disciplines and skills. Community participation; this will ensure the sustainability of the control approach.(IPPC, 2013)

Apart from implementing the quintuple helix model, environmental management can also be carried out in order to maximize malaria prevention. Environmental management includes activities to modify and manipulate the environment or its interaction with humans, which aims to prevent, limit vector reproduction, and reduce mosquito-human contact. Environmental modification is an environmental management effort that includes permanent physical changes to water and plants, which aims to prevent, eliminate, or reduce vector habitat without disturbing the quality of the environment for human life. These activities can be in the form of drainage and stockpiling of bloodstock ponds, changes in salinity, regulation of reservoir water levels, cleaning of plants, shading and drying of swamps.

CONCLUSION

Quintuple Helix Model (five-step flow analysis), it should be clear that all systems in the quintuple helix perform important functions, influencing each other. If more sustainable development is being considered (and demanded) at the national level, as a result of malaria cases, and if, for example, more targeted investments in helices.

A certain quintuple helix begins to flow, so there will be a positive impact. on all other subsystems and on society as a whole. The quintuple helix model suggests that investment in knowledge and promotion of knowledge production brings a new and important impetus to innovation, knowledge, and the advancement of society.

By taking small steps towards sustainability, a long-term and leading knowledge society can emerge, one that will live in balance with nature and ultimately, perhaps, lead to a green economy miracle. Mastering and balancing issues such as malaria are often portrayed and presented as a theme of survival for humanity in a global format. As a result.

The quintuple helix innovation model bridges social ecology with knowledge production and innovation. Here, the natural environment of society and the economy is not only a challenge, but also encourages and inspires knowledge production and innovation. In the quintuple helix innovation model approach, the natural environment of society is identified as an opportunity to push further and excel in sustainable development and the coevolution of the knowledge economy, knowledge society, and knowledge democracy.

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