The Effectiveness in Integrated Vector Management (IVM) in Eliminating Malaria in Indonesia : a Case Study in the Purworejo District, Central Java Province, Indonesia

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The Effectiveness of Integrated Vector Management (IVM) in Eliminating Malaria in Indonesia: A Case Study in the Purworejo District, Central Java Province, Indonesia

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Abstract

The third objective of Sustainable Development Goals (SDGs) is a good level of health, including healthy from Malaria. Malaria still becomes a health in Indonesia with API of 0,99 in 2014 that decreases into 0,85 in 2015. Malaria becomes a target for elimination in Indonesia in 2030. Purworejo District still becomes an area for an endemic Malaria with API of 1,8 (2015), with 1.364 cases. IVM is a new approach to improve the elimination management of Malaria. This research is an analytical descriptive research with cross-sectional survey approach. It is used to conduct the analysis of IVM effectiveness. The Bionomic survey of temperature with the vector density is conducted to observe 12 villages for 12 hours. It is conducted by using the Manual on Practical Entomology in Malaria, WHO Division of Malaria and Other Parasitic Diseases, Part I,II for vector identification. Nine species are found: *Anopheles balabacensis, An. aconitus, An. barbirostris, An. vagus, An. anullaris, An. kochi, An. maculatus, An. indifinitus* and *An. subpictus*. The distribution of species includes 82.35% of reseach area. Three of them become vectors, they are *An. maculatus* and *An. balabasencis*. It shows the ineffectiveness of the application of integrated vector management as the main factor of Malaria elimination. The integration among vectors do not work well. The decision making on the cases is effective only for treatment, but not for controlling. Community empowerment has not become mosquito control as a community culture. Local wisdom is conducted to isolate patients inside mosquito nets. Conclusion: Integrated Vector Management (IVM) has not been effective to control Malaria. Local wisdom by isolating Malaria patients is able to reduce Malaria spread.

Keywords: Integrated Vector Management, Malaria, Purworejo

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1. INTRODUCTION

The third target of Sustainable Development Goals (SDGs) is to enrich a good level of health in 2030 (United Nation Development Program 2015). Infectious diseases still become the main concern of Malaria management in Indonesia. In national scope, the problem of Malaria (API 1.38) still becomes one of the big five of infectious disease that needs to be concerned. In 2014, there were 3.100 cases of Malaria with the mortality rate of 1,4 per 100.000 people [8]. The government of Republic of Indonesia has changed its policy of Malaria management from eradication to elimination. The government has applied the policy to 250 districts that have received the elimination certificate of Malaria [8, 21, 22].

Provinces with the highest number of cases of Malaria are Papua 42.65%, Papua Barat 38.44%, Nusa Tenggara Timur 16.37%, Maluku 8.25%, and Maluku Utara 4.51%. Central Java province (API 0.03) still becomes one of areas of Malaria epidemics [3]. Purworejo district still has a high number of cases of Malaria in 2015. There were 1022 cases of Malaria (API 1.36). There are several factors that causes the high number of cases of Malaria in Purworejo district. The vector density is still very high so that the transmission potential of Malaria is also high. Purworejo district has not considered free of Malaria in 2015 [14].

Mismanagement of the sectoral vector and the ecological system have resulted in the incomplete eradication of malaria in Purworejo [11]. Each area has its own level of susceptibility to the transmission of malaria, with its own dynamic [6]. This led to the hope that Integrated Vector Management (IVM) could be employed to eliminate malaria in this region. So, this study of IVM was conducted to support the elimination of malaria in Purworejo.

2. METHODS

This study comprises analytical descriptive research with a cross-sectional survey approach that was used to analyze the effectiveness of IVM. It included six components: an integrated approach, the ability of human resources, evidence-based on decision-making, related vector collaboration, community guidance, and policy [17, 20]. The study was conducted during transition season, which is a peak time for malaria. A bionomic survey of the malaria vector was established by measuring the temperature of, and density in, 12 villages. Vector identification was aided by the World Health Organization's Manual on Practical Entomology in Malaria. The Elisa

test was used to confirm the species' roles as vectors. The institutional survey was conducted through interviews and questionnaires to produce an integrated survey among different sectors, and to determine the ability of human resources, evidence-based on policy, and collaboration among sectors. Community guidance was examined by conducting social and economic surveys.

The participants in this study were people from villages in Kaligesing district that had been infected by malaria in 2010–2015. The overall sample calculation result with 4 class number, a boundary of error at the 95% confidence level, was taken to be 1. The formula is used to determine the number of samples was: n = (L Σ Ni2. Σi2) / (N2D + Σ Ni. Σi2), D = B2 / 4, with 95% confidence level. The number of samples is in 11.68 locations, (or 12 sampling location). This resulted in 12 groups of analytical units, each of them consisting of several members of the population. Each analytical unit has an ecological overprint. Determining the institutional responsibility was conducted by using evaluation and evaluation criteria.

3. RESULTS AND DISCUSSION

3.1. Performance of Integrated Vector Management (IVM)

3.1.1. Integration among Vectors

There are six agencies involved in the management of malaria: 1) Health; 2) Development Planning; 3) Forestry and Plantation; 4) District Secretary of Community Welfare; 5) Energy, Mineral Resources, and Irrigation; and 6) the Regional House of People's Representatives. Each of them has tasks and obligations. The research result shows that the coordination among sectors is still weak. The routine coordination does not work well. The operational needs for Malaria controlling is not communicated well. The absence of coordinationg fuction made all activities work by themselves sectorally. There is also another perception that health is only the responsibility of health sector. Regional House of People's Representatives and the coordinator of the sectors did not do their functions well. The effectiveness among sectors did not work well.

3.1.2. The Ability of Human Resources

The human resources district to handle Malaria are 4 people who have Master Degree in Public Health as their qualification. Other resources are from undergraduate and bachelor Public Health programs. There are also other undergraduate program

resources who work in another sector, but they are not major in Public Health. In Health Agency, the educational qualification is in accordance with what it needs, that is in Public Health. There is a limited resource in other sectors (Regional House of People's Representatives, Development Planning Agency, Community Welfare), especially from the educational qualification. For the policy decision making, there are under-graduate resources who are not from health major. Job mutation often happens in non-health sector that results in inconsistency of care and ability of human resources in handling Malaria.

3.1.3. Evidence Base Decision Making

The Management of Malaria cases in Purworejo is conducted by doing approaches to the facts of Malaria cases that happend in every area. There is a network among village's infrastructures, village's Malaria expert, Community Health Center, and Health Agency. A curative management in handling Malaria is applied everytime a Malaria case happens. The medicines to cure the Malaria patients are given thoroughly. The preventive action is done by isolating the patients of Malaria inside mosquitoes nets. The Health Agency has records for Malaria cases and their dynamics. Early warning with entomologic observation has not been conducted, so that types and density vectors have not been used as basics of handling Malaria. Ecologically, there is a correlation between the existance of *Anopheles* species with Malaria of Paracite Incidence (MoPi) (Figure 1).

There are four species that should be analyzed, based on the results of the capture of Anopheles species in the 12 research locations—*An. balabacensis, An. barbirostris*, and *An. vagus*. Several Culex species were also caught. The number of species captured was lower than in previous studies, being *An. balabacensis, An. aconitus, An. barbirostris, An. vagus, An. anularis, An. kochi, An. maculatus, An. indifinitus* and *An. subpictus. An. vagus* was found around midnight (11 pm to 3 am). This indicates that the breeding area was more than 100 meters from the house. *A. aitkeni* was also found at night, until dawn. The results from the Elisa test showed that *An. balabacensis* and *An. aitkeni* were positive as vectors.

3.1.4. Related Sector Collaboration

The results showed that the collaboration among sectors are only for coordination meetings, not on implementations. There is a perception that Health Department is

the one that is responsible in handling Malaria. Other sectors are only as supportive sectors. The sectoral understanding becomes an independent activity and there is no collaborative activity to support Malaria elimination. The absence of collaboration is observed from the absence of cross-institutional programs.

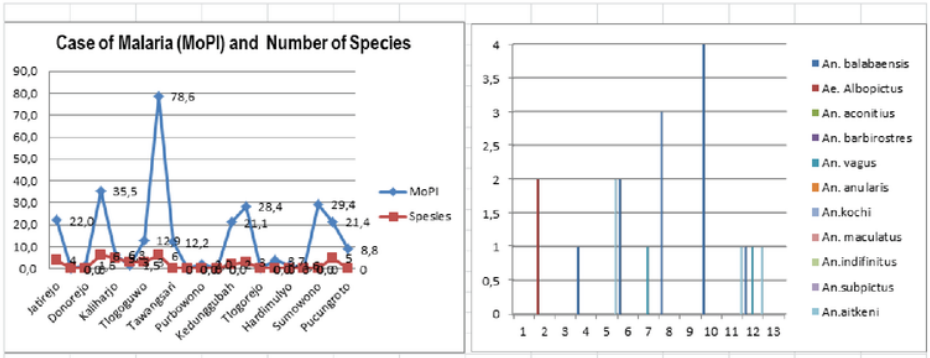
3.1.5. Community Guidance and Policy

This study shows that there are many community guidance that have been conducted. Most activities of the community guidance are for handling Malaria. Mosquitoes nets installment is done along with the counseling and guidance. Community's involvement in handling Malaria has not been daily culture. Mosquitoes control as a infection vector has not been continuously done. The loss of alert in the prevention of mosquitoes bites often becomes the trigger of Malaria infection.

4. DISCUSSION

The spread of malaria involves two cycles, one inside the mosquito and one in the human [2]. *Anopheles* mosquitoes, as transmitters of malaria, have a complete cycle. Malaria control needs to be conducted thoroughly and in an integrated way. Many cases of malaria indicate that malaria management has not been conducted in an integrated way [10]. Integrated Vector Manajemen (IVM) is one approach to controlling malaria [20]; however, this study shows that IVM was not effective in the research area because the institutions charged with controlling malaria were not performing adequately. IVM can only be achieved through coordination between sectoral agencies. No integrated implementation has occurred through sectoral activities in the studied endemic malaria areas. Malaria management is not conducted effectively and integratedly [5, 21, 22].

The ability of the available human resources to control malaria were fulfilled, as far as academic qualifications and educational backgrounds were concerned. Several programs and planned activities had been arranged by these human resources. The programs were all relevant. Klambunisasi (mosquito net installment) is one of the programs that came from community guidance [1]. Making decisions based on facts from study cases has been done well. These case studies are used in the medication and eradication of malaria. The significant fact that has not been used as a basis for action is ecological data about the malaria vector. Ecological data can be used to control malaria [7, 13], through the provision of type and density vectors that can cause



An. balabaensis	0	0	1	0	2	0	3	0	4	0	1	0
Ae. Albopictus	2	0	0	0	0	0	0	0	0	0	0	0
An. aconitius	0	0	0	0	0	0	0	0	0	0	0	0
An. barbirostres	0	0	0	0	0	0	0	0	0	0	0	0
An. vagus	0	0	0	0	0	1	0	0	0	0	1	0
An. anularis	0	0	0	0	0	0	0	0	0	0	0	0
An.kochi	0	0	0	0	0	0	0	0	0	0	0	0
An. maculatus	0	0	0	0	0	0	0	0	0	0	0	0
An.indifinitus	0	0	0	0	0	0	0	0	0	0	0	0
An.subpictus	0	0	0	0	0	0	0	0	0	0	0	0
An.aitkeni	0	0	0	2	0	0	0	0	0	1	1	0
Culex, sp	0	0	0	0	0	0	0	0	0	0	0	0

Figure 1: The dynamic of *Anophleles* species and Malaria cases.

potential for malaria infection. Four species in the study area are positive as vectors *An. aconitus, An. balabacensis, An. maculatus* and *An. aitkeni*. The greater the variety of species as vectors, the higher potential for malaria infection [19].

The lack of an integrated program for handling malaria is caused by a government system that does not allow for cross-institutional programs and budgeting. Every institution has separate programs and performance indicators. Financial responsibility and program success are strictly sectoral [16], and so it is not easy to arrange integrated programs, which means that malaria control cannot be done effectively [15]. Community involvement is always in operation; however, it has not been part of the culture to free the community of mosquito bites. People are often not alert, so they get bitten by *Anopheles* mosquitoes. The social and economic conditions related to house construction are the main barrier to isolating the spread of mosquitoes. Whilst the community has enough knowledge to understand the benefit of mosquito nets, they prefer feeling comfortable over using those mosquito nets. Local wisdom dictates isolating patients with mosquitoes nets until they are completely cured; this is effective in controlling the spreading of malaria between humans.

The application of IVM to eliminate malaria has not worked well. Collaboration among the sectors does not run effectively. There is an assumption that malaria is

the sole responsibility of the health sector, whilst other sectors are only supporting the countermeasures of malaria. The ability of the human resources is already in accordance with the health sector. Other available human resources are not suitable for handling malaria. Job mutation often happens, causing inconsistency in malaria control. Malaria control based on case data works well, but continuous observation of the malaria vector is not done so that the system of early alerts is not effective. A collaborative program related to the IVM is not being effectively conducted. Other links to IVM, such as community involvement, are not part of the culture of handling malaria. The ineffectiveness of all the links to IVM is causing difficulty in eliminating malaria in this area, which is in contrast to the activity of IVM in [20–22].

5. CONCLUSIONS

1. The implementation of Integrated Vektor Manajemen (IVM) has not been effective to control and eliminate Malaria in Purworejo.
2. The main factor of the ineffectiveness of IVM is there no ecological monitoring for early alert system, lack of collaboration among sectors, absence of cross-institutional programs, and there has not been a community culture in handling Malaria vector.

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