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ANALYSIS OF THE RISK FACTORS OF THE ENVIRONMENT AND BEHAVIOR RELATED TO THE GENESIS OF MALARIA IN THE VILLAGE OF KUSURI TOBELO SUB-DISTRICT OF WEST NORTH HALMAHERA

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ABSTRACT

The environment plays have an important role in influencing the health of the group community. One part of the environment that is closely related to disease transmission is a residential area or home environment. Malaria is one disease which caused by the female Anopheles mosquito and become a global health problem. In North Halmahera District, malaria disease is a public health problem and Kusurivillage have malaria cases that never runs in the last four years. Kusuri village is endemic villages with the incidence rate based on a survey of the Head Office in North Halmahera District. This study aimed to analyze the risk factors of environmental and behavioral that correlates with malaria incidence in the Kusuri Village, West Tobelo of North Halmahera District. This analytic observational study type was designed with a case control study. Populations in a total of 220persons are people living in the Kusuri Village, West Tobelo Districts of North Halmahera. The sample was taken by total sampling techniquefrom the total populationof 220 respondents. This number were divided into two groups, case and control, each numbered as many as 110 people. Primary data was collected by interview and observationwhich has been made according to the research objectives. Data is tabulated then calculate by computer program: statistical analysis bivariate through Chi-Square

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calculation and multivariate analysis through logistic regression. The results showed that there was no significant relationship between the pinfold variables with the incidence of malaria, there is a significant relationship between the bushes, trees, puddles of water, mosquito nets and anti mosquito with the incidence of malaria. The most dominant factor associated with the incidence of malaria is a puddle of water. This research can be concluded that environmental risk factors and behaviors related with the malaria incidence in Kusuri Village, West Tobelo of North Halmahera. The water puddle is a factor that is most at risk of malaria incidence. It is suggested for the people to pay attention for the environment around the home, especially puddles and avoiding mosquito bites by way of the use of mosquito nets and the use of anti mosquito drugs.

INTRODUCTION

Malaria is one of the infectious disease caused by the female *Anopheles* mosquito and become health problems world. The disease malaria found in almost all parts of the world, especially in the countries of the tropical weather and sub-tropical and population at risk of contracting malaria amounted to 2.3 billion people or 41 percent of the total population of the world. Each year the case of malaria amounted 300-500 million cases and cause more than 1.1 million deaths. Malaria is the cause of death with occupying the fourth sequence after respiratory tract infections, HIV/AIDS and diarrhea (Sucipto, 2014).

The World Health Organization (WHO) mortality rate of the disease malaria still around 627,000 on 2012, mostly children under the age of five years in Africa. According to the latest data rate of malaria declined 25 percent in the whole world, and a 31 percent in African region.happened down the number of deaths from malaria which is about 42 percent globally and around 49 percent occurred in the region of Africa. Decrease the number of death malaria have begun to slow in the period 2011 and 2012 caused by delays in the delivery of *bednets* (mosquito nets) and *a residual spraying* to endemic areas (Anonymous, 2013).

North Halmahera district is most of the continent is located in the lowlands and partly on the plain. During the last four years (2011-2014) of seventeen puskesmas, improvements and a decline in cases of malaria positive, this can be seen in 2011 the number of positive cases as much as 2277 and decline in 2012 to 531 cases, but in 2013 has increased the patients

as much as 938 cases and on the year 2014back down to 518 cases (Anonymous, 2015).

The working area P uskesmas Kusuri Tobelo Sub-district of West North Halmahera have cases of malaria which has not been consumed in the last four years. Can be seen in 2011 recorded 34 cases of malaria, 2012 annual malaria cases declined to 19 cases, in 2013 the number of malaria increased to 80 cases.and in the year 2014 increased to 116 cases of malaria. The episcopal h puskesmas kusuri there are several villages that still have a high malaria cases and there are also some of the villages which have no. One of the areas in the sub-district, West Tobelo North Halmahera, that there are still cases of malaria is Kusuri Village, B irinoa, S ukamaju, W angongira, on 2011 until 2014 there are cases of malaria. Villages kusuri is endemic villages with numbers genesis based on the results of the surve i from North Halmahera District health office, found patients with malaria positive in the year 2014 110 cases of malaria (Anonymous, 2015).

Based on explanation above then researchers are interested to do research about "Environmental Risk Factor Analysis and behavior related to the Genesis of Malaria in the village of Kusuri Tobelo Sub-district of West North Halmahera".

To analyze the risk factors of the environment and what behavior is related to the genesis of malaria in the village of Kusuri Tobelo Sub-district of West North Halmahera.

METHODS

This research design using *case control* . The research carried out in August 2016 until October 2016. sampling techniques used by the researchers is the *total sampling* all the members of the population of cases selected to be samples. The variables used is variable free namely environment that includes : the bushes and trees, pens cattle, water coverage. The factor p e rilaku population that covers the habit of using mosquito nets and habits uses drugs anti mosquitoes. And this variable is bound namely genesis malaria in the village of Kusuri Tobelo Sub-district of West North Halmahera.

Data collection is done with a visit to the house of respondents at the time of research. The source of the data in this research is the primary data obtained through observation and interview directly on the subject of research using questionnaires, while the secondary data obtained from the local health clinic is a list and addresses of respondents as patients with a positive diagnosis of malaria had visited the health services in the

clinic.

The instrument used in this research is the appliance write write a pen and record book to write the results of malaria positive from the book register the clinic, laptop, *informed consent* (approval sheet), profile of respondents and questionnaire.

RESULTS

The relationship between Semak-Semak with genesis malaria

Processing results for the variables the bushes respondents in the case group and control where from 220 respondents, there are 130 respondents (59.1%) with the distance <50 m there (risky), while in the control groups there are 90 respondents (40,9%) with the distance >50 m no, then the proportion of exposure by environmental risk factors the bushes is higher in the case group compared with the control group.

The results of statistical tests where there is a significant influence of variables the bushes against the genesis malaria, obtained the value $P =$ The lowest infection rate was from $0.00 < 0.05$ it can be concluded that there is a significant relationship between the bushes with genesis malaria (H_0 rejected). From the analysis results obtained nor the value $OR = 5,375$ and value of $95\%CI = 2.974- 9.714$ then the bushes is a risk factor which means that the respondents who have the bushes like grass and gardens with the distance <50 m risk 5.3 times greater risk of malaria compared with respondents who do not have the bushes at the side of their house.

The relationship between the trees with genesis malaria

Variable for processing the bushes respondents in the case group and control where from 220 respondents, there are 132 respondents (60,0%) with the distance <50 m there (risky), while in the control groups there are 88 respondents (40,0%) with the distance >50m no, then the proportion of exposure by environmental risk factor of the trees is higher in the case group compared with the control group.

The results of statistical tests where there is a significant influence of variables the trees of Genesis malaria, obtained the value $P =$ The lowest infection rate was from $0.00 < 0.05$ it can be concluded that there is a significant relationship between the trees with genesis malaria (H_0 rejected). From the analysis results obtained nor the value $OR = 4,173$ and value of $95\%CI = 2.338- 7.447$ then the trees is a risk factor which means that the respondents who have the trees such as coconut trees and banana trees with distance <50m risk

4.1 times greater risk of malaria compared with respondents who do not have the trees on the side of their house.

The relationship between the sheepfolds cattle with genesis malaria

Processing results for cattle stall variable respondents in the case group and control where from 220 respondents, there are 113 respondents (51.4%) with the distance <20 m there (risky), while in the control groups there are 107 respondents (48,6%) with the distance >20m no,

The results of statistical tests where there is no influence of the meaning variables stalls for cattle to genesis malaria, obtained the value $P = 0,059 > 0.05$ and analysis results obtained nor the value $OR = 1,732$ and value of $95\%CI = 1,016- 2,954$. It can be concluded that no significant relationships between the sheepfolds cattle with genesis malaria.

The relationship between the Water Coverage with genesis malaria

Processing results for the variables water coverage of respondents in the case group and control where from 220 respondents, there are 172 respondents (78,2%) with the distance <50 m there (risky), while in the control groups there are 48 respondents ((21.8%) with the distance >50 m no, then the proportion of exposure by environmental risk factors water coverage is higher in the case group compared with the control group.

The results of statistical tests where there are the influence that means a variable water coverage of Genesis malaria, obtained the value $P = 0,000 < 0.05$ it can be concluded that there are significant relationships between water coverage with genesis malaria (H_0 rejected). From the analysis results obtained nor the value $OR = 10,706$ and value of $95\%CI = 4,316- 26,554$ then water coverage is a risk factor which means that the respondents that there is water coverage former quarrying,swamp,trench,water holes with the distance <50 m risk 10.7 times greater risk of malaria compared with respondents who do not have water coverage in addition to their homes.

The relationship between the mosquito nets with genesis malaria

Processing results for the variables mosquito nets respondents in the case group and control where from 220 respondents, there are 42 respondents (19,1 %) that does not use mosquito nets (risky), while in the control groups there are 178 respondents (80.9%) using

mosquito nets, then the proportion of exposure by risk factor for the use of Mosquito nets is lower in cases compared with the control group.

The results of statistical tests where there is a significant influence of variables the use of mosquito nets to genesis malaria, obtained the value $P = 0.04 < 0.05$ it can be concluded that there is a significant relationship between the use of mosquito nets with genesis malaria (H_0 rejected). From the analysis results obtained nor the value OR = 3,063 and value of 95%CI = 1.473, 6.366 then Kelambumerupakan risk factors, it means that the respondents who do not use mosquito nets will be risky 3 times greater risk of malaria compared with respondents who use mosquito nets during sleep .

The relationship between drugs Anti Lice with genesis malaria

Based on the results of the processing to the variables Mosquito nets respondents in the case group and control where from 220 respondents, there are 88 respondents (40,0 %) who did not use drugs anti lice (risky), while in the control groups there are 132 respondents (60%) which uses drugs anti mosquito, then the proportion of exposure by risk factor for the use of anti-drug gnats are higher in the case group compared with the control group.

The results of statistical tests where there is a significant influence drug use variable anti lice on Genesis malaria, obtained the value $P = 0,000 < 0.05$ it can be concluded that there is a significant relationship between the use of drugs anti lice with genesis malaria (H_0 rejected). From the analysis results obtained nor the value OR = 4.173 and value of 95%CI = 7.447 2.338, then the use of drugs anti lice is a risk factor such as drugs anti lice fuel, lotion (sofel or autan) and drugs anti lice the traditional means that respondents who do not use drugs anti lice risk 4.1 times greater risk of malaria compared with respondents who uses drugs anti lice during sleep.

Multivariat Analysis

Multivariat analysis done to know the most dominant independent variables related to the dependent variables, then analyzed using logistic regression test. The variables that were selected bivariat with value $p < 0.25$ considered to be included in the model of multivariat.

Logistic regression analysis is a massive multivariat analysis that influence occur together from some of the free variable with a variable bound. The modeling end shows no variables have $p \text{ value} > 0.05$, so

that the second modeling is the final model where the variables water coverage is the most dominant risk factors related to the genesis of Malaria with the value or $\text{Exp (B)} = 11,165$ (95% CI= 3,829 -12, 32,556).

Risk factors that affect the genesis malaria

Kusuri village selected to become the location of the research because it is an area of endemic malaria, state of the environment around the area of research in the form of the river, outdoor pool or rawah, trench, the bushes and forests.

The behavior of mosquitoes associated with biological symptoms and always there is variation. A variation of behavior will occur in the single species both in the same area or different behavior is very in hikes affect by environmental factors that are known as the stimuli from the outside. This from outside modulated for example, climate change/climate/summer or environmental changes good alamia or because of the side product of human activity (Sumantri, 2015).

The majority of these species bite at twilight and ahead of the night, some vectors have a peak time bite in the middle of the night and by dawn. The transmission of malaria can occur based on the bite namely including the *Exophagic* namely that more happy looking for blood on the outside of the house and *Endophagic* is the gnats are more pleased to find the blood in the house, however in or outside the very depending on the existence of the existing Host (Sucipto, 2015).

The relationship between Semak-Semak with Genesis Malaria

The bushes around the house hold an important role as a rest for the lice on the day. Based on the results of this study found that there is a significant relationship between the bushes with genesis malaria($P =$ The lowest infection rate was from $0.00 < 0.05$) and value OR = 5,375 and value of 95%CI = 2.974- 9.714 then the bushes is a risk factor which means that the respondents who have the bushes like grass and gardens with the distance < 50 m risk 5.3 times greater risk of malaria compared with respondents who do not have the bushes at the side of their house.

The results of this research is also in line with the previous research by Noifke (2014) stated that there is a significant influence the bushes against the genesis malaria, with the value of ($P = 0.001 < 0.05$) and value OR = 2,975 Rupiah which means the bushes around the house at risk 2 times greater risk of malaria than respondents who do not have the bushes around the house. In line with the research done by Hasyim dkk (2014) , *breeding place* around the house of respondents

with *odds ratio* (OR)= 5,034 with 95% CI= 2,65-9,56. Respondents around the house there is a *breeding place* at risk 5.03 times greater to suffer malaria compared with respondents around the house there is no *breeding place*.

The relationship between Pohon-Pohon with Genesis Malaria

The results of statistical tests where there are no significant relationships between the trees with genesis malaria value ($P =$ The lowest infection rate was from $0.00 < 0.05$) and value OR = 4,173 and value of 95%CI = 2.338- 7.447 then the trees is a risk factor which means that the respondents who have the trees around the house will be at risk of 4.1 times greater risk of malaria compared with respondents who do not have the trees on the side of their house.

Other research also conducted previously by Nurfitriana (2013) test results statistics where the bushes is a risk factor for genesis malaria. Due to the results of the ob values ($P =$ The lowest infection rate was from $0.00 < 0.05$) and value OR = 4,173 and value of 95%CI = 2.338- 7.447 then the trees is a risk factor which means that the respondents who have the trees or the bushes around the house will be at risk of 4.1 times greater risk of malaria compared with respondents who do not have the trees on the side of their house. There is the same research done by Suwondo dkk (2013), respondents around his house there is a bush has the risk of 2.3 times suffered malaria compared with respondents who lived in the house without the bushes around the house. The results of statistical analysis bivariat no links the existence of the bushes around the house with the genesis malaria.

The relationship between the sheepfolds cattle with Genesis Malaria

Based on the results of research that where there is no meaningful relationship with Cattle stall variable genesis malaria, obtained value of ($P = 0,059 > 0.05$) and value OR = 1,732 and value of 95% CI = 1,016-2,954. It can be concluded that there is no significant relationships between the sheepfolds cattle with genesis malaria.

The same research done by Saputro (2013) that there is a relationship between the existence of cattle stall around the house with the genesis malaria in the village of Kendaga with *p value* of contributed 0.012, smaller than 0.05 (contributed $0.012 < 0.05$), result calculation of *Odd Ratio* (OR) obtained the value OR=4,343 (95% CI = 1,344-14,030) shows that the existence of cattle stall around the house has the risk of

Genesis malaria 4,343 times than the house that there is no stalls for cattle.

The research done by Noifke (2014) stated that there is a significant relationship between pens of cattle on Genesis malaria obtained the value ($P = 0,014 < 0.05$) and value OR = 2,441 and value of 95%CI = 1,182-4,915. Where the respondents who have cattle stall around the house at risk 2 times greater risk of malaria compared with respondents who do not have the stalls for cattle.

The relationship between the water coverage with Genesis Malaria

The results of statistical tests where there is a relationship which means a variable water coverage with genesis malaria, obtained the value $P = 0,000 < 0.05$ it can be concluded that there are significant relationships between water coverage with genesis malaria (H_0 rejected). From the analysis results obtained nor the value OR = 10,706 and value of 95%CI = 4,316- 26,554 then water coverage is a risk factor which means that the respondents that there is water coverage former quarrying,swamp,trench,water holes with the distance < 50 m risk 10.7 times greater risk of malaria compared with respondents who do not have water coverage in addition to their homes.

The same research done by Saputro (2013) that there is a relationship between the existence of lakes of water around the house with the genesis malaria in the village of Kendaga with *p value* of contributed 0.012, smaller than 0.05 (contributed $0.012 < 0.05$), the results of the calculation of the *Odd Ratio* (OR) obtained the value OR=4,250 (95% CI = 1,332-13,562) shows that the water coverage around the house has the risk of Genesis malaria 4,250 times than the house that there is no water coverage.

While according to Harijanto (2010) rain interspersed with the heat is directly related to the development of the larvae of mosquitoes.because the rain that cause water coverage is an ideal place to perkembangbiakkan mosquitoes *Anopheles* . With increasing the perkembangbiakkan, mosquito *Anopheles population* will grow. Low humidity will shorten the life of the mosquito *Anopheles* , although no effect on the parasites. 60% humidity level is the lowest level that allows for the mosquito life. On the high humidity lice become more active and more often bite, improving the transmission of malaria. The same research done previously by Suwondo dkk (2013),

Respondents under his house there are water coverage have the risk of 2.7 times suffered malaria compared with the respondents that there was no water

coverage under his house. The results of a statistical analysis is the relationship between the existence of water coverage under the house with genesis malaria.

The relationship between the use of Mosquito nets with Genesis Malaria

The results of statistical tests where there is a relationship that means the variables the use of mosquito nets with genesis malaria, obtained the value $P = 0.04 < 0.05$ it can be concluded that there is a significant relationship between the use of mosquito nets with genesis malaria (H_0 rejected). From the analysis results obtained nor the value $OR = 3,063$ and value of $95\%CI = 1.473, 6.366$ and mosquito nets is a risk factor which means that the respondents who do not use Mosquito nets will be risky 3 times greater risk of malaria compared with respondents who use mosquito nets during sleep.

The results of this research in line with the research that has been done before by Santy dkk (2014), there is a relationship between the usage habits mosquito nets with genesis malaria in the village river sifted in 3. With the value of $P = 0.005$ besides, obtained $OR = 3.2$; it means that a person who does not have the habit of wearing mosquito nets at risk 3.2 times greater risk of malaria compared with people who have a habit of wearing mosquito nets. The same research also conducted by Suwondo, dkk (2013), the respondents who have the habit of not using mosquito nets at night have the risk of 2.6 times suffered malaria compared with respondents who use mosquito nets. The results of a statistical analysis no relationship using mosquito nets with genesis malaria.

The purpose of wearing mosquito nets on the night of this day is to reduce contact between humans and mosquitoes. The use of mosquito nets at night for the activity of mosquitoes bite humans is very high by mosquitoes endofagik. The mosquito endofagik is mosquitoes that bite in the house, but when the other noxious insults are not available in the house of some mosquitoes will search for other noxious insults outside the house (Munif, 2010).

The habit of using mosquito nets have been socialized by health workers, but because usually in 1 house only has 1 mosquito nets, while for children who have more than 2 people usually mosquito nets is used only for the children and the house of the mother and this often happens on the respondents equal economic medium down.

The relationship between the use of drugs Anti Lice with Genesis Malaria

The results of statistical tests where there is a relationship that means the drug use variable anti lice with genesis malaria, obtained the value $P = 0,000 < 0.05$ it can be concluded that there is a significant relationship between the use of drugs anti lice with genesis malaria (H_0 rejected). From the analysis results obtained nor the value $OR = 4.173$ and value of $95\% CI = 7.447 2.338$, then the use of drugs anti lice is a risk factor such as drugs anti lice fuel, lotion (sofel or autan) and drugs anti lice the traditional means that respondents who do not use drugs anti lice risk 4.1 times greater risk of malaria compared with respondents who uses drugs anti lice during sleep.

The results of the same research done by Santy, dkk (2014) shows that there is a meaningful relationship between drug consumption anti lice with kerjadian malaria in the village river sifted in 3. In addition, obtained the value $OR = 2.17$. This means that a person who does not have the habit of using drugs anti lice have the risk of 2.17 times greater than the one who has the habit of using drugs anti mosquitoes. But there is another research done by Hasyim dkk (2014) there is no relationship between the use of drugs anti lice with genesis malaria with value $p = 0,291$.

Drugs anti lice fuel this type contain synthetic chemical substances (*allterin, transflutrin, bioalltherin, esbiothrin* and others) which has been formed in such a way that is able to transmit the smoke to kill mosquitoes and other insects. The type of the bulk of the second is the spray type, drugs anti lice liquid that is its use spray. The other type is a type of electric drugs anti lice this type also use active ingredients *such as alletrin, transflutrin or prelethrin*, penstabil material and certain organic chemicals that evaporate if heated. Other types namely drugs anti lice oles, this type using the mixture that make it easy penetrates deep into skin. drugs anti lice this type using a mixture of *diethyltoluamide* (Wahyuningsih YS, 2011).

The habit of not using drugs anti lice found in many cases this is due to the many respondents who did not like the smell of drugs anti lice and the lack of knowledge of the respondents about the dangers of malaria so consider that malaria is not a dangerous disease.

DISCUSSION

The dominant risk factors related to the Genesis Malaria

After using the logistic regression tests on multivariat analysis, found that the most dominant

factors related to the genesis of malaria on the community in the village of Kusuri Tobelo Sub- district of West North Halmahera is the water coverage. Based on the results of these observations in research, researchers found that there are many lakes of water around the house that can be berpengaruh against genesis malaria.

The research done by Saputro (2013) that there is a relationship between the existence of lakes of water around the house with the genesis malaria in the village of Kendaga with *p value* of contributed 0.012, smaller than 0.05 (contributed $0.012 < 0.05$), the results of the calculation of the *Odd Ratio* (OR) obtained the value $OR=4,250$ (95% CI = 1,332-13,562) shows that the water coverage around the house has the risk of Genesis malaria 4,250 times than the house that there is no water coverage.

The research done by Suwondo dkk (2013), respondents under his house there are water coverage have the risk of 2.7 times suffered malaria compared with the respondents that there was no water coverage under his house. The results of a statistical analysis is the relationship between the existence of water coverage under the house with genesis malaria.

CONCLUSION

1. There is a relationship between the bushes with genesis malaria in the village of Kusuri Tobelo Sub-West.
2. There is a relationship between the trees in Genesis malaria in the village of Kusuri Tobelo Sub-West.
3. There is no relationship between the sheepfolds cattle with genesis malaria in the village of Kusuri Tobelo Sub-West.
4. There is a relationship between water coverage with genesis malaria in the village of Kusuri Tobelo Sub-West.
5. There is a relationship between the mosquito nets with genesis malaria in the village of Kusuri Tobelo Sub-West.
6. There is a relationship between the use of drugs anti lice with genesis malaria in the village of Kusuri Tobelo Sub-West.
7. The most dominant factor with genesis malaria in the village of kusuri Tobelo Sub-West lakes of air

Suggestions

1. For Clinic

- a. Do intensive instruction to give the understanding to the people about how to prevent and combat malaria by using mosquito nets and uses drugs anti lice sleep time.
 - b. Strive for community empowerment especially increased community awareness of the importance of environmental management free malaria.
 - c. In order to perform the action management prevention (modification) environment needs to be done to control the genesis malaria in the village of Kusuri Tobelo Sub-West.
2. For the community
 - a. Modify the environment that there are lakes of water around the house with how to make the way of the water so that the water still flows, giving fish eaters jentik or with larvasida. And heap water coverage with the land to prevent the reproduction of the mosquito *Anopheles*.
 - b. The importance of noted the environment around the house to prevent the formation of *breeding places* of mosquitoes, with how to clean the weeds and trees around the house.
 - c. Avoid the teether mosquitoes malaria with how to use mosquito nets and the use of drugs anti mosquitoes malaria on the night of the day.
 3. For the development of science
Can be a research comparison when you want to do the same research, and is expected to do intensive research for other environmental factors that have not examined in this research.

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