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MALARIA AMONG YOUNG CHILDREN IN TWANO- PAPUA: EVIDENCE OF DETERMINING FACTORS IN ENDEMI AREA

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ABSTRACT

Background: Malaria that occurs in children under 5 years has a high risk. Therefore, malaria control is made one of the main priorities in the health program by the Government. It is not yet known what the determining factors related to the incidence of young children in the Twano of Jayapura area. The implications of this research will help guide health policy for the government's efforts to eradicate malaria in 2030, especially in Papua.
Objectives: To identify the factors determinant associated with the incidence of malaria in young children (aged 0-5 years) in the working area of Twano of Jayapura.
Methods: Quantitative research with quantitative descriptive design and cross-sectional study approach. It was held in January 2021 with a sample size of 55 participated out of 61 people total samples. The inclusion criteria were mothers who had children aged 0-5 years. We used non-probability sampling technique. Data were obtained through questionnaires arranged according to the Likert Scale. Each mother participated in face-to-face interviews to assess their knowledge, attitudes, and environment on aspects of malaria. Data were analyzed using SPSS version 25 with Chi-Square statistical test.
Results: The population who participated face to face 55 people (90.2%). There were 3 determinant factors associated with the incidence of malaria in children aged 0-5 years in Twano, Jayapura namely mothers' knowledge(*p-value of* 0.003), attitude (*p-value of* 0.002), and environment (*p-value of* 0.000). While the factors that were not associated with the incidence of malaria in children aged 0-5 years were education mothers (*p-value of* 0.318) and socioeconomic (*p-value of* 0.369).
Conclusion: We found three important issues that influence the occurrence of malaria cases as determining factor in young children in Twano, Jayapura, namely knowledge, attitudes, and the environment.

Keywords: Children under 5 years, malaria, Papua, Twano.

INTRODUCTION

The World Health Organization (WHO) in 2020 estimated 241 million cases of malaria with an annual mortality rate of 627,000 deaths (World Health Organization. 2021). The incidence of malaria decreased from 81 in 2000 to 59 in 2015 and 56 in 2019, before increasing to 59 in 2020 (Konaté et al. 2020). The Ministry of Health recorded that the total malaria cases in Indonesia in 2020 were 254,055 (Ipa, Widawati, et al. 2020). The percentage of malaria suspects with microscopic laboratory confirmation and the Rapid Diagnostic Test (RDT) in 2020 is 97% with a total of 1,823,104 examinations from 1,877,769 suspects with a PR (positivity rate) of 14% (Yang et al. 2020). About one-third of the incidence of malaria occurs in young children, namely children aged 0-5 years (Patriani et al. 2019). The incidence of malaria in children aged 0-5 years will result in impaired growth and stunted pubertal development (Ouédraogo et al. 2018). Based on the achievement of endemicity per province in 2020, 3 provinces have achieved 100% malaria elimination, including DKI Jakarta, East Java, and Bali (Hasyim et al. 2019). Meanwhile, the provinces with areas that have not yet achieved malaria elimination are Maluku, Papua, and West Papua (Dhewantara, Ipa, and Widawati 2019).

Many studies state that malaria control efforts include self-protection against mosquito bites by using insect repellants, protective clothing, mosquito coils, mosquito nets, and insect sprays, and maintaining environmental cleanliness including draining, burying, and closing water storage containers and plants that can repel mosquitoes in the area and home environment (Morakinyo, Balogun, and Fagbamigbe 2018; Tizifa et al. 2018; Hasyim, Nursafingi, et al. 2018). Some of the determining factors are mothers with high knowledge and provision to think before taking action to prevent the incidence of malaria in their children (Ouédraogo et al. 2018). The action or behavior of a clean and healthy life carried out at home or in the home environment is also considered to play a role as a determining factor (Aberese-Ako et al. 2019). Malaria cases in Papua are the highest Annual Parasite Incidence (API), which are 123.00 per 1.000 population with a positive incidence of malaria in as many as 137,265 (31,74%) (Sroyer, Mandowen, and Reba 2022). The incidence of infants and toddlers suffering from malaria in Papua Province is 13,832 (10.05%) (Debora et al. 2018). The number of malaria sufferers in 2018 was 20,119 cases and an increase in 2019 of 22,045 cases and 2,204 (10%) malaria cases occurred in infants and toddlers (Dinas Kesehatan Prov Papua 2020).

This quantitative study with a cross-sectional design approach tried to identify the determinants of malaria that occur in young children in Twano, in Jayapura City. The number of malaria cases in 2018 was 58 cases and in 2019 there were 108 cases (Kemenkes 2018). It is not yet known whether the increase in malaria cases is related to the role of knowledge, attitudes, and the environment pf mothers. Therefore, this study aims to identify the determinant factors associated with the incidence of malaria in children aged 0-5 years in the region.

LITERATURE REVIEW

As part of its global commitment to eliminating malaria, the Indonesian government has issued a Minister of Health Decree to strengthen malaria control efforts from the central level to *Puskesmas* (RI 2019). Elimination refers to efforts to stop the transmission of local (indigenous) malaria in a certain geographic area (Oyibo et al. 2021; Guntur, Kingsley, and Islam 2021; Ipa, Widawati, et al. 2020). Therefore, vigilance is still needed to prevent re-infection in areas that are considered

malaria-free, including malaria in children under the age of 5 years. The biggest obstacles to eliminating malaria, according to the 2017 World Malaria Report, are the emergence of parasite resistance to antimalarial drugs, mosquito resistance to insecticides, and inadequate health system performance (Tizifa et al. 2018; Morakinyo, Balogun, and Fagbamigbe 2018). The results of further analysis of the 2013 Basic Health Research with household analysis units in 6 malaria-endemic provinces in Indonesia showed that most of the anti-malarial drugs were obtained by households from pharmacies and formal health services (Roosihermiatie et al. 2017). However, there are not a few studies that discuss other determining factors such as the role of mothers, education, nutrition, and the household environment. The government targets Indonesia to be free of malaria by 2030 (Guntur, Kingsley, and Islam 2021). One of the efforts to achieve this target is determined by not only the effectiveness of treatment but also the integral role of various sectors (Oyibo et al. 2021; Wanzira et al. 2017; Hasyim et al. 2019). Malaria in Indonesia remains difficult to eradicate even though the cause is known, there is control, and the cure has been given to patients because the complexity of an archipelagic country with diverse access to health services contributes to the progress of achieving malaria elimination (Ipa, Laksono, et al. 2020). In Papua, there are four districts/cities experiencing malaria endemic, namely Jayapura City, Jayapura Regency, Merauke, and Timika (Patriani et al. 2019; Sroyer, Mandow and Reba 2022). There are many obstacles to achieving Malaria-Free Indonesia 2030, including people who think that malaria is a common disease, so they don't pay much attention (Oyibo et al. 2021). Research on the role of mothers in the occurrence of malaria in children under the age of 5 years in endemic areas has not been widely studied in Papua. The gap in this research is what distinguishes it from previous studies which are expected to contribute new ideas for the management of malaria in Papua in particular and endemic areas in general.

METHODS

This quantitative research used a cross-sectional approach with a descriptive design. The research location is in Twano, one of the endemic areas in Jayapura, eastern Indonesia. The study population was mothers with children under the age of 5 years (young children). The number of samples was 61 people. Those who participated in the study were 55 people (90.2%) who according to WHO had met the requirements because they were more than 85% (Guntur, Kingsley, and Islam 2021). We used a questionnaire validated with 4 parts of the list of questions (Guntur, Kingsley, and Islam 2021). The first part is about demographic data which contains information on gender, age, education level, occupation, family size, and household socioeconomic. The second part is about general knowledge of mothers about malaria including symptoms, causes, and prevention. Our third section collects information on when, and where to take treatment for malaria, and the protection of children under 5 years of age. The fourth section is about the environment, the main parts of the house, access to drinking water, the closest health facility, and the distance to the nearest health facility. The research variables included the independent (education, knowledge, attitude, socioeconomic and environmental) and the dependent variable (the incidence of malaria in young children). Descriptive analysis was conducted to show the distribution of the characteristics of different respondents. The data were analyzed using SPSS and to evaluate the relationship between sociodemographic and environmental characteristics, we applied the chi-square test. We complied with the Declaration of Helsinki to ensure the protection of the rights, integrity, and confidentiality of respondents. All

respondents signed the consent form before the interview.

RESULTS

Demographics

Table 1: Mothers' ge and Employment Status

age	Σ	%	Employment	Σ	%
18-25	20	36.4	Employed	32	58.2
26-35	28	50.9	Unemployed	23	41.8
>35	7	12.7			
Total	55	100		55	100

Table 4.1 shows that of the 55 mothers, most of them were 26-35 years old, as many as 28 people (50.9%), and a few aged <20 years as many as 3 people (5.5%). Their employment status is mostly not working as many as 32 people (58.2%).

Education and knowledge

Table 2: Mothers' Education Status and Knowledge on Malaria

Education	Σ	%	Knowledge on Malaria	Σ	%
Lower	19	34.5	Less	21	38.2
High	36	64.5	good	34	61.8
Total	55	100		55	100

Table 2 shows that of the 55 mothers, most of them have higher education as many as 36 people (65.5%) and 34 people (61.8%) have good knowledge of malaria.

Attitude, social economy, and environmental conditions

Table 3: Mothers' Attitude towards Malaria, social economic status, and environmental condition

Attitude	Σ	%	Social-economy status	Σ	%	Environment condition	Σ	%
negative	12	21.8	Low	29	52.7	Bad	20	36.4
High	43	78.2	Medium	26	47.3	good	35	63.6
Total	55	100		55	100	Total	55	100

Table 3 shows that most of the mothers have a positive attitude (43 people or 78.2%) with poor socioeconomic status (29 people or 52.7%). Good environmental conditions for 35 people (63.6%) and poor environmental conditions for as many as 20 people (36.4%).

Bivariate Analysis

Table 4: Correlation between mothers' education and Malaria among young children

Education	Malaria cases among young children				Total		*p-value*
	Positive		negative		N	%	
	n	%	n	%			
Low	8	42.1	11	57.9	19	100	0.318
High	9	25	27	75	36	100	

Total	17	30.9	38	69.1	55	100

Table 4 shows the results of the chi-square statistical test at a significance value of 95% (α= 0.05) obtained a p-value of 0.318 or p> (0.05). Thus, there is no significant relationship between education and the incidence of malaria in young children in Twano, Jayapura City.

Table 5: Correlation between mothers' knowledge and malaria among young children

Knowledge	Malaria cases among young children				Total		*p-value*
	Positive		Negative		N	%	
	n	%	n	%			
Less	12	57.1	9	42.9	21	100	0.003
good	5	14.7	29	85.3	34	100	
Total	17	30.9	38	69.1	55	100	

Table 5 shows the results of the chi-square statistical test at a significance value of 95% (α= 0.05) obtained a *p*-value of 0.003 or $p < (0.05)$. Thus, there is a significant relationship between knowledge and the incidence of malaria among young children in Twano, Jayapura City.

Table 6: Correlation between mothers' attitude and Malaria among young children

Attitude	Malaria cases among young children				Total		*p-value*
	Positive		negative		N	%	
	n	%	n	%			
negative	8	66.7	4	33.3	12	100	0.005
Positive	9	20.7	34	79.1	43	100	
Total	17	30.9	38	69.1	55	100	

Table 6 show the results of the chi-square statistical test at a significance value of 95% (α= 0.05) obtained a p-value of 0.005 or $p < (0.05)$. Thus, there is a significant relationship between attitudes and the incidence of malaria in young children in Twano, Jayapura City.

Table 7: Correlation between social economic status and Malaria among young children

Social economy status	Malaria cases among young children				Total		*p-value*
	Positive		Negative		N	%	
	n	%	n	%			
Low	11	37.9	18	62.1	29	100	0.369
Medium	6	23.1	20	76.9	26	100	
Total	17	30.9	38	69.1	55	100	

Table 7 show the results of the chi-square statistical test at a significance value of 95% (α= 0.05) obtained with a *p*-value of

0.369 or p > (0.05), thus there is no significant socio-economic relationship with the incidence of malaria in young children in Twano, Jayapura City.

Table 8: Correlation between environmental conditions and Malaria among young children

Environment conditions	Malaria cases among young children				Total		*p-value*
	Positive		Negative		N	%	
	n	%	n	%			
Bad	13	65	7	35	20	100	0.000
good	4	11.4	31	88.6	35	100	
Total	17	30.9	38	69.1	55	100	

Table 8 show the results of the chi-square statistical test at a significance value of 95% (0.05) obtained with a *p*-value of 0.000 or $p < (0.05)$, thus there is a significant environmental relationship with the incidence of malaria in children aged 0-5 years at the Twano, Jayapura City.

DISCUSSION

We found three important issues that influence the occurrence of malaria cases as a determinant factor in young children in Twano, Jayapura, namely knowledge, attitude, and environment.

Knowledge

The results of the study were 12 people (57.1%). Our analysis obtained a *p*-value of 0.003 or $p <$ (0.05), thus there is a significant correlation between knowledge and the incidence of malaria in children aged 0-5 years at Twano of Jayapura City. Knowledge is something that exists or is considered to exist, something that is the result of conforming the subject with the object, the result of human nature wanting to know, the result of the compatibility between induction and deduction, as a picture of external objects that are present in the human mind and something present and materialized (Sembiring and Lubis 2019). Mothers' knowledge is very influential on the actions taken in preventing malaria in their children (Olubiyi, Folami 2018). Knowledge can include how to prevent malaria in their children, for example at the time of biting malaria and how malaria transmission occurs in their children. Lack of knowledge of mothers is found especially in mothers who have low education and lack of experience about malaria which has an impact on malaria prevention actions taken by mothers to their children (Yasuoka et al. 2018). Lack of knowledge has an impact on maternal actions in preventing malaria.

Attitude

The results of our study on mothers who have a negative attitude with a positive incidence of malaria in young children we found 8 people (66.7%). Research results obtained *a p-value* of 0.005 or $p < (0.05)$, thus there is a significant correlation between attitudes and the incidence of malaria in young children in Twano, Jayapura City. This shows that a negative attitude causes mothers to be less able prevent malaria because malaria is a disease that often occurs in the community (Oyibo et al. 2021). Attitude is a person's closed

response to a stimulus or object, both internal and external, so that its manifestation cannot be directly seen, but can only be interpreted beforehand from the closed behavior (Orhan and Serin 2021). Attitudes, in reality, indicate the suitability of the response to a particular stimulus (Susilaningrum et al. 2020). A lot of research revealed attitudes that had less impact on the mother's lack of action in preventing malaria because she consider that malaria is an endemic disease that often occurred in her area (Saha et al. 2019). The level of public awareness of the dangers of malaria can affect the public's willingness to take preventive measures to overcome the possibility of contracting malaria (Padonou et al. 2018). Public awareness can be seen in the preventive measures taken such as the habit of being out of the house until late at night, carrying out environmental health activities, and using mosquito nets (Rahmasari et al. 2021).

Mothers who have a negative attitude toward the negative incidence of malaria in young children in this study were 4 people (33.3%). This is because even though the mother has a poor attitude, in prevention, they practices good prevention methods for their child (Patriani et al. 2019). For example, in the afternoon, the children are bathed and prohibited from going out to play. In addition, mothers who have good socio-economic conditions can fulfill good home sanitation facilities in preventing mosquitoes from entering the house. However attitudes cannot be automatically manifested in everyday actions. The existence of supporting factors such as facilities and support is needed to turn attitudes into real actions.

On the other hand, there were 34 mothers (79.1%) who had a positive attitude with a negative incidence of malaria. This means that the level of a good mother's attitude tends to be good and eventually behaves well in preventing the incidence of malaria in her child. A good mother's attitude are shown by keeping her home environment clean, installing rough wires, and preventing mosquito bites on her child when going out at night by wearing long sleeves. A good attitude will affect the incidence of malaria because it will have an impact on the health of the family if they do not do good prevention (Roosihermiatie et al. 2017). Other studies have shown that an individual's health status is also influenced by behavioral factors, namely the attitude of a person who has a major impact on a person's health status (Yasuoka et al. 2018; Afoakwah, Deng, and Onur 2018).

Environment

The results of this study indicate mothers who have a poor environment with a positive incidence of malaria in children aged 0-5 years are 13 people (65%). The analysis obtained a *p-value* of 0.000 or $p < (0.05)$, thus there is a significant environmental relationship with the incidence of malaria in young children in Twano, Jayapura. Environmental factors that are risk factors for malaria transmission are the presence of stagnant water which can be a breeding habitat for Anopheles mosquitoes, the presence of dense bushes around people's residences and close to the Anopheles breeding habitat, house ventilation is not covered with

gauze, does not have a house ceiling, and the walls of the house are not tight (Wanzira et al. 2017). Environmental conditions affect the breeding of mosquitoes so that children are susceptible to the incidence of malaria (Aberese-Ako et al. 2019). An unfavorable residential environment poses an increased risk of malaria transmission because there are still many Anopheles mosquito breeding sites (Tizifa et al. 2018; Abossie et al. 2020). This is due to the environment of the mother who lives around the swamp area in the Hamadi and Entrop areas, Jayaura which is a breeding ground for mosquitoes and mothers who are not paying attention to their home environment such as installing wire screens, no damaged ceilings or ceilings, lack of lighting causes mosquitoes can easily enter the house (Roosihermiatie et al. 2017). Residents who are not healthy have a higher chance of malaria incidence compared to healthy settlements (Hasyim, Dhimal, et al. 2018). Other aspects cannot be fulfilled by the mother's family, such as having a good ceiling, but mothers can take precautions by diligently cleaning the inside and outside of the house and draining and closing the water reservoir so that mosquitoes cannot breed in the house. Healthy environmental conditions can be realized by the existence of healthy community behavior so that it can reduce the presence of disease vectors in the house (Tizifa et al. 2018). Healthy environmental conditions can be realized by the existence of healthy community behavior.

Study Limits

The limitation of this study is that the results cannot be used for clause analysis, considering that research and assessment in clause analysis require a clear time sequence between exposure and disease, i.e. exposure precedes disease. This research also only took place at a certain point in time, was not followed up, and did not involve variable manipulation. Many malaria studies have been carried out in Papua, but no malaria cases have been reported among young children there as a malaria-prone area of Twano. This gap is what distinguishes it from previous studies that contributed novelty to research on malaria in Papua (Ipa, Widawati, et al. 2020; Dhewantara, Ipa, and Widawati 2019; Inriyanti et al. 2021).

CONCLUSION

The purpose of this study was to identify the determinant factors associated with the incidence of malaria in children aged 0-5 years in the Twano area, Jayapura City. After identifying cases in the field. We found three important issues that influence the occurrence of malaria cases as a determinant factor in young children in Twano, Jayapura, namely knowledge, attitude, and environment. The solution requires a structured approach, not only intensive individual health education but also a multi-sector approach, from the local government, health workers, social services, and sanitation. Everything is mutually supportive and integrated. Therefore, in the future, we recommend further research involving multi-professionals in the management of malaria in Twano in particular and Papua in general.

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