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Literature Review: Risk Factors Affecting the Incidence of Malaria Infectious Disease and Preventive Measures in Indonesia.

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ABSTRACT

Some areas in Indonesia are still endemic areas for malaria, including Papua, Maluku, Nusa Tenggara, Sulawesi, Kalimantan and the island of Sumatra such as Bengkulu and Riau. Malaria is still a major cause of morbidity and mortality in Indonesia. Based on data from the total number of malaria cases in 2019, there were 250,644 cases, and the highest case of around 86% occurred in Papua with a total of 216,380 cases occurring. Malaria is an infectious disease caused by the Plasmodium parasite contained in the female Anopheles mosquito. The Anopheles mosquito can spread because it is influenced by several factors, namely the environment, knowledge and attitude factors, behavioral factors and others. The purpose of this study was to analyze the risk factors for malaria and its prevention measures in Indonesia. The method used is a literature review, by searching for reference literature using Google Scholar, and Research Gate. Literature articles used in the last five years (2017-2022). The results of this study indicate that the dominant risk factors for malaria transmission are the use of mosquito nets, the use of mosquito repellent, the habit of being outside the house at night, and malaria prevention measures.

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1. INTRODUCTION

Residents in tropical areas such as Malaysia, Cambodia, Myanmar, Thailand and Indonesia often encounter major health problems, one of which is malaria. Some areas in Indonesia are still endemic areas for malaria, including Papua, Maluku, Nusa Tenggara, Sulawesi, Kalimantan and areas of the island of Sumatra, such as Bengkulu and Riau. Malaria is still a major cause of morbidity and mortality in Indonesia.

The number of malaria cases at the district and city levels in Indonesia is still quite high. The five provinces in Indonesia with the highest incidence of malaria are Papua (39.93%), West Papua (10.20%), East Nusa Tenggara (5.17%), Maluku (3.83%), and North Maluku (2.44%). In 2013 the number of malaria cases decreased by 1.30% from the previous year, in 2014 it became 0.69%, in 2015 it decreased to 0.49% and in 2016 it became 0.25%. Based on data on all cases of malaria in 2019, there were 250,644 cases, and the highest cases of around 86% occurred in Papua with a total of 216,380 cases [1].

Malaria is an infectious disease caused by parasites such as Plasmodium which is said to be the causative agent of malaria. Plasmodium falciparum and vivax species are the species that cause the most infections in cases of malaria [2]. Malaria is divided into several types, namely Malaria Falciparum, Malaria Vivax, Malaria Ovale, Malaria knowlesi[3]. The vector of the cause of malaria is the Anopheles mosquito infected with plasmodium [4].

Plasmodium is a single-celled organism that belongs to the protozoa group, plasmodium is contained in the female Anopheles mosquito which later transmits malaria through the mosquito's bite. Plasmodium which is transmitted from the bite will live and reproduce in the body, especially in human red blood cells. After plasmodium enters the human body, plasmodium replication occurs in two phases,

namely the exoerythrocytic phase which takes place in liver cells and the erythrocytic phase which takes place in erythrocytes [5].

Patients affected by malaria will experience initial symptoms such as fever, chills, anorexia, lethargy, headaches, nausea, or vomiting. If you feel these symptoms, the patient must do a laboratory test to confirm the positive status of malaria [6].

Anopheles mosquitoes can spread and reproduce because they are influenced by several factors, namely environmental factors, knowledge and attitude factors and behavioral factors. Environmental changes can occur in climate change such as temperature and wind patterns which have a direct impact on vector reproduction, vector development, age, and parasite development in vector bodies. The environment is one of the important factors for the spread of malaria [7]. The environment plays a role in the development of vectors that mediate malaria. Anopheles Sp. mosquitoes. able to adapt to environmental conditions so that they can survive.

In addition to environmental factors that are risk factors for the spread of Malaria, there are also behavioral factors that can influence the spread of the disease. Behavior is one of the factors that influence a person's health. A person's behavior can be seen in responding to conditions when exposed to disease as a form of closed or open response. A closed response is at the level of attention, perception, knowledge or awareness and attitude. While the open response is manifested in the form of real actions that can be observed.

Among these factors, there are factors that have a major impact on a person's health condition, namely environmental factors (45%) and behavioral factors (30%). These two factors have a very close relationship. Healthy environmental conditions can be realized by the existence of healthy community behavior. The spread of malaria is largely determined by environmental factors, biology, and people's behavior in the form of malaria prevention measures [8]

The level of public awareness of the dangers of malaria can influence the willingness of the community to take preventive measures to tackle the spread of malaria. There are several problems related to the continued increase in the spread of malaria, including breeding places for anopheles mosquitoes that spread and locations that are difficult to reach, environmental conditions that do not meet health requirements (inadequate ventilation, roof ceilings, house walls), and the behavior of people who do not pay more attention to the surrounding environment. In addition, there are several journals which state that there are demographic, socio-economic and environmental hygiene factors that can affect malaria transmission in Indonesia. Therefore the researchers used literature studies in the last five years (2017-2022).

2. METHOD

The method used in this research is literature review. Literature review is a description of theories, findings and other research materials obtained from reference materials to be used as the basis for a study [9]. Search for reference literature using academic databases, namely Google Scholar, and Research Gate. Search for articles using the keywords "risk factors for malaria in Indonesia, behavioral and environmental factors that influence the incidence of malaria, behavioral and environmental relationships that influence the incidence of malaria, measures to prevent and control malaria in Indonesia". The article literature included in the research sample is within the last five years (2017-2022). Based on the article search, many articles were found which could be said to be sufficient to support this research.

3. RESULTS AND DISCUSSION

Table 1. Article Literature Review Results

No.	Author	Method	Sample	Variable	Results
1.	W. Trapsilowati, A. Pujiyanti, And K. S. Negari [10]	This research is a cross sectional. The research	The number of samples was 101 respondents	Community behavior variables which include knowledge, attitudes	There is a relationship between sleeping habits using mosquito nets

		sample was taken by simple random sampling.	with 24 male respondents (23.8%) and 77 female respondents (76.2%).	and actions/practices, as well as environmental variables which include house conditions, distance between houses and breeding places, distance between houses and resting places and the presence of livestock in the transmission of malaria in the Sebatik Island region.	(P=0.010), using mosquito repellent (P=0.008), houses near breeding places (p=0.002), houses near plantations (p=0.021), and the incidence of malaria on Sebatik Island
2.	A. R. Sarjatno, A. L. Rantetampang, S. Makaba, And A. Mallongi, [11]	The type and research design used an observational research design, the approach used was a case control study design in the Work Area of the Yapen Islands Dawai Health Center..	The number of samples is 30 respondents with cases and 60 respondents with controls.	Variables include work, education, house walls, income, breeding places, mosquito repellents, activities at night, mosquito nets, pools of water, wire mesh ventilation.	There is a relationship between the use of ventilation wires (p=0.021), the walls of houses (p=0.021), the use of mosquito rackets (p=0.009), activities at night without protection against mosquitoes (p=0.030) and the incidence of malaria.
3.	Sepriyani, Andoko, And A. A. Perdana [12]	Quantitative research with an observational approach at the Biha Inpatient Health Center in Pesisir Barat District	The number of samples was 246 people with a case group of 123 people and a control group of 123 people.	The variables in this study were livestock pens, mosquito breeding places, ceilings, walls, screens, and mosquito nets.	There is a relationship between the ceiling (p value 0.000. OR 8.04), walls (p value 0.000. OR 3.9), wire gauze (p value 0.000 OR 4.05), mosquito nets (p value 0.000. OR 16, 6) with the incidence of malaria.
4.	P. A. Siregar And I. D. Saragih, [13]	This research is an observational study with a case control approach in Pantai Cermin District, Serdang	The number of samples is 72 respondents with a case group of 36 people and a control group of 36 people.	The variables in this study were ventilation screens, types of house walls, activities going out at night, and using insecticide-treated mosquito nets while sleeping.	There is a relationship between the type of house wall (p=0.035), individual activities going out at night (p=0.009), and the use of insecticide-treated nets while

		Bedagai Regency.			sleeping (p<0.001) with the incidence of malaria.
5.	N. Hamdani, Kartini, And M. Mira, [14]	This research is an observational analytic study with a case control research design conducted at the Wandai Public Health Center, Intan Jaya Regency.	A total of 96 samples were used in this study with a 1:1 ratio for the case and control groups.	The variables in this study were the presence of livestock pens, breeding places, mosquito nets, and the habit of going out at night.	There is a relationship between the presence of breeding places (p=0.005), the habit of leaving the house at night (p=0.000) and the incidence of malaria.
6.	A. Prastiawan, [15]	This research is an observational study with a case control design which was conducted in Watulimo District, Trenggalek Regency	The number of samples is 42 people with cases: control (1: 1).	The variables in this study are mobility including frequency and duration of stay, as well as behavioral variables including knowledge, attitudes, and actions.	There is a relationship between the frequency of high mobility (p=0.023), duration of stay in malaria endemic areas (p=0.014), knowledge (p=0.022) and action (p=0.010) on the incidence of imported malaria in Watulimo District, Trenggalek Regency.
7.	U. B. M. G. Talombo, M. A. Munir, And G. Lintin, [16]	This research is an observational analysis research with a cross-sectional approach conducted at the Kampung Baru Health Center, Luwuk.	The number of samples was 130 people who met the inclusion criteria.	The variables in this study are education, work, knowledge, attitudes and precautions.	There is a significant relationship between the level of education (p = 0.000 , OR: 6.11), and preventive measures (p = 0.004 , OR: 4.04) with the incidence of malaria in the Kampong Baru Luwuk Health Center.
8.	R. Nababan And S. R. Umniyati [17]	This research is an observational study with a case control design conducted at the Winong	The number of samples in this study were 120 people with a case group of 40 people and a control group of 80 people.	The variables used in this study were the existence of breeding places, farm animals, house walls, habit of going out at night, mosquito nets, anti-	There is a significant relationship between the presence of breeding places (p=0.02), the walls of the house (p=0.004), and the habit of going out at night (p=0.01) with

		Health Center, Purworejo.		mosquitoes, wire netting.	the incidence of malaria.
9.	W. Nurmaulina, B. Kurniawan, And H. Fakhruddin, [18]	This research is an observational analysis research with a cross-sectional approach conducted in Hanura District, Pesawaran Regency.	A total sample of 50 people was obtained using the total sampling technique.	The variables used in this study were knowledge, attitude, behavior, and degree of infection.	There was a relationship between attitude (p=0.04) and behavior (p=0.04) with degree infection in the work area of the Hanura Health Center.
10.	Y. Supranefly And R. Oktarina, [19]	This research is a descriptive analytic study with a cross sectional design conducted in South Sumatra Province.	The number of samples was 33,556 people in 17 districts/cities South Sumatra.	The variables used in the study were the characteristics of the respondents and the use of insecticide-treated nets.	The results of this study indicate that the people of South Sumatra Province took the most preventive measures, namely sleeping using mosquito nets without insecticides (46.3%) or insecticides (2.5%), using repellents (48.3%), and electric mosquito repellents (5.9%).
11.	D. A. Putri, H. Hasyim, H. Zulkifli, A. Ghiffari, And C. Anwar, [20]	This research is a study using qualitative methods with a case control approach which was carried out in the endemic area of the Lahat area, South Sumatra.	The number of samples is 150 people with 50 people in the case group and 100 people in the control group.	The variables used in this study regarding preventive measures were the use of mosquito nets, the use of repellents, and the habit of going out at night.	The results showed that the habit of using repellents had an influence on malaria prevention.
12.	Darmawansyah, [21]	This study used a quantitative approach with a descriptive study design in the working area of the Padang Ulak Tanding	The number of samples is 175 people who are people who are in the Puskesmas area.	The variables in this study were gender, age and incidence of malaria.	The research results obtained from 175 respondents who were positive for malaria as many as 39 cases, of which 32 respondents (82%) were male and 20 respondents (51%) occurred at

		Community Health Center, Rejang Lebong Regency.			the age of 15-64 years. It is assumed that this age group has a higher probability for contracting malaria through mosquito bites while outside the home, where the majority of the respondents' work is gardening in rubber fields.
13.	D. Noerjoedianto, [22]	This is a cross-sectional study conducted at the Koni Community Health Center, Jambi City.	The number of samples was 95 people who fit the inclusion criteria.	The variables used in the research are knowledge, attitudes, and efforts to prevent malaria.	The results showed that the respondents' knowledge and attitudes towards malaria prevention had an influence which can be seen from the value of both (p=0.000).

Based on the research results from several journals that have been described in table 1 as a whole there are several variables related to the incidence of malaria in Indonesia. These related variables are seen based on the results of statistical tests on each article such as resting places, breeding places such as puddles, and ditches. physical condition of the house such as ceilings, house walls and wire screens, use of long clothes, habit of leaving the house at night, use of mosquito nets, demographics such as age, education, occupation, gender, and socioeconomic status, use of mosquito repellents, level knowledge, attitudes, behavior, environmental clean activities, precautions, physical environment such as humidity, temperature, rainfall, water and land, presence of cattle pens, mobility, duration of stay in endemic areas, habit of not using repellents when outside activities at night, accumulation and draining of stagnant water.

Of all the variables, there are several factors that most dominantly influence the incidence of malaria transmission based on the similarity of research results between researchers. Use of mosquito nets, use of mosquito repellents, and the habit of being outside the house at night.

Use of Mosquito Nets

The use of mosquito nets is a risk factor for the spread of malarial disease. Based on the research that has been reviewed, there are several studies that make bed nets have a significant relationship with risk factors for malaria. This makes the use of mosquito nets a dominant factor affecting the incidence of malarial disease.

The use of mosquito nets is one way to reduce contact between mosquitoes and humans as a precaution against malaria transmission. Types of mosquito nets can be divided into insecticide-treated and non-insecticide-treated nets. The Ministry of Health of the Republic of Indonesia in order to reduce morbidity and mortality due to malaria is by recommending the use of insecticide-treated nets. According to WHO, the use of insecticide-treated nets in several countries, especially in Africa, has succeeded in reducing the rate of malaria transmission by 50%, and with the use of nets covering over 80% of people in these countries. Several studies have stated that the use of mosquito nets, especially insecticide-treated nets, can reduce the risk of malaria transmission [10].

Insecticidal mosquito nets are mosquito nets that are given insecticides to the material through the process of mixing the netting yarn fibers carried out at the factory. Insecticidal mosquito nets provide

better protection because mosquito nets can kill or weaken Anopheles spp mosquitoes when the mosquito comes in direct contact with the mosquito net [12].

In several studies there were research results where respondents suffering from malaria did not use mosquito nets while sleeping at night. The reasons used were feeling uncomfortable when sleeping using a mosquito net, and making sleep feel hot or hot. Therefore, the use of mosquito nets is only used at certain times. In addition, there is research which states that insecticide-treated mosquito nets can have an impact on users, including heat, shortness of breath, itching and others as well as poor maintenance of mosquito nets. This is the reason for people not to use mosquito nets while sleeping.

Nonetheless, several studies have shown that in certain areas the use of both insecticide-treated and non-insecticide-treated nets has an insignificant relationship. So the use of insecticide-treated and non-insecticide-treated nets is not a risk of malaria transmission [10].

The habit of using mosquito nets while sleeping is an effective measure to prevent and avoid contact between Anopheles spp mosquitoes and humans while sleeping at night, in addition to using mosquito repellents. It is hoped that public awareness in using nets can increase the scope of using nets, especially at risk groups (children and pregnant women), so as to reduce morbidity and mortality due to malaria.

Use of Anti Mosquito Drugs

The use of anti-mosquito drugs has been carried out well by the respondents. The most widely used types of anti-mosquito drugs are in the form of anti-mosquito coils, sprays and also topical or lotion. The use of mosquito repellents is also an action to reduce human contact with mosquitoes. The use of topical repellents or mosquito repellents is considered practical for use when carrying out activities outside the home [1]. Research conducted in Lagos Nigeria, showed that the use of mosquito repellent sprays can significantly reduce the risk of contracting malaria in pregnant women [10].

Respondents who have used mosquito repellents properly indicate that these respondents are aware of the dangers of malaria transmission, so that their understanding and knowledge of the dangers of malaria is manifested in preventive measures, one of which is to protect themselves from mosquitoes by using mosquito repellents, especially at night. However, there were still a number of respondents who did not use mosquito repellents, due to smoke problems and causing an unpleasant odor to the mosquito coils. In addition, topical or lotion-type anti-mosquitoes feel uncomfortable after being applied to the skin or feel less effective because the application is only applied to certain parts, while there are still areas where it is still possible to be bitten by the Anopheles mosquito that causes malaria.

The Habit of Being Outside The House at Night

In the study it was found that respondents tended to do activities outside the home at night such as going to work, religious activities, greeting activities, gathering or playing around the house. The habit of leaving the house at night is a risk factor in the form of behavior because it will cause contact with Anopheles mosquitoes that cause malaria. The habit of being outside the house at night can facilitate contact with mosquitoes, especially mosquitoes prefer to rest and bite in the outdoor environment.

These precautions can be taken if you want to leave the house at night such as using mosquito repellent before leaving the house, wearing long clothes and it is advisable not to be outside the house for too long to avoid the risk of malaria transmission.

Measures to Prevent the Occurrence of Malaria Communicable Disease

Based on the research that has been analyzed, there are many variables that are used as a measuring tool to determine the risk factors for the occurrence of malaria communicable disease. These risk factors have the potential to determine how preventive measures can be taken to prevent the risk of malaria transmission, so that morbidity and mortality rates for malaria can be reduced.

These preventive actions can be in the form of education by health workers to the community, through seminars or visits to the community. It aims to broaden people's knowledge about malarial infectious disease so that people can improve attitudes and behavior in taking action to prevent malaria.

4. CONCLUSION

This study concluded that environmental factors, behavior, attitudes, knowledge, demographics, and prevention measures are related to the incidence of malaria. From several articles that have been studied, there are dominant risk factors that cause malaria transmission in Indonesia, including the use of mosquito nets, use of mosquito repellents, the habit of leaving the house at night, and prevention of malaria. It is hoped that based on this literature review, people in endemic areas or people who will visit endemic areas will be able to take malaria prevention measures such as cleaning standing water, avoiding leaving the house at night, wearing long clothes, wearing mosquito repellent and using mosquito nets when sleeping at night. days to avoid the risk of contracting malaria from the bite of Anopheles spp.

REFERENCES

[1] Kemenkes, *Pedoman Manajemen Malaria.* . Jakarta: Kementrian Kesehatan Republik Indonesia, 2014.
[2] Who., "World Malaria Report 2019," *Https://Doi.Org/9789241565721* , 2019.
[3] Kemenkes, *Pedoman Teknis Pemeriksaan Parasite Malaria*. Jakrat: Kementrian Kesehatan Republik Indonesia, 2017.
[4] Margaret A. Phillips Et Al, "Malaria", Nat Rev Dis Primers. Available At: ," In *E-Book*, Https://Www.Nature.Com/Articles/Nrdp201750 , 2017.
[5] A. S. Liwan, "Diagnosis Dan Penatalaksanaan Malaria Tanpa Komplikasi Pada Anak. Cdk-229," *Cermin Dunia Kedokteran*, Vol. 42, No. 6, Pp. 425–429, 2015.
[6] Infodatin Kemenkes, *Malaria*. Jakarta: Kementrian Kesehatan Republik Indonesia , 2016.
[7] D. Agustina And P. A. Siregar, "Environmental And Behavioral Factors Analysis Of Malaria Incidents," *Jurnal Ilmiah Permas*, Vol. 11, No. 2, Pp. 423–432, 2021.
[8] D. T. , R. M. , & Nurjazuli. Puspaningrum, "Analisis Spasial Pengaruh Faktor Lingkungan Terhadap Persebaran Kasus Malaria Di Kecamatan Punggelan Kabupaten Banjarnegara," *Jurnal Kesehatan Masyarakat*, Vol. 6, Pp. 882–891, 2016.
[9] N. Mardiyantoro, "Literatur Review. ," *Metodologi Penelitian1*, Pp. 1–18, 2019.
[10] W. Trapsilowati, A. Pujiyanti, And K. S. Negari, "Faktor Risiko Perilaku Dan Lingkungan Dalam Penularan Malaria Di Pulau Sebatik, Kabupaten Nunukan, Kalimantan Timur," *Balaba: Jurnal Litbang Pengendalian Penyakit Bersumber Binatang Banjarnegara*, Pp. 99–110, Aug. 2018, Doi: 10.22435/Blb.V12i2.208.
[11] A. R. Sarjatno, A. L. Rantetampang, S. Makaba, And A. Mallongi, "Risk Factors Of Malaria Incidence In Working Areas Puskesmas Dawai District East Yapen Sub Province Kepulauan Yapen," *International Journal Of Service And Healthcare Research*, Vol. 3, No. 4, Pp. 34–45, 2018.
[12] Sepriyani, Andoko, And A. A. Perdana, "Analisis Faktor Risiko Kejadian Malaria Di Wilayah Kerja Puskesmas Biha Kabupaten Pesisir Barat," *Jkmk: Jurnal Kesmas (Kesehatan Masyarakat) Khatulistiwa* , Pp. 77–87, 2018.
[13] P. A. Siregar And I. D. Saragih, "Faktor Risiko Malaria Masyarakat Pesisir Di Kecamatan Pantai Cermin Kabupaten Serdang Bedagai," *Trophico: Tropical Public Health Journal*, Pp. 50–57, 2020.
[14] N. Hamdani, Kartini, And M. Mira, "Faktor-Faktor Yang Berhubungan Dengan Kejadian Malaria Di Wilayah Kerja Puskesmas Wandai Distrik Wandai Kabupaten Intan Jaya Papua," *Jurnal Promotif Preventif*, Vol. 2, No. 2, Pp. 1–7, 2020.
[15] A. Prastiawan, "Pengaruh Faktor Mobilitas Dan Perilaku Terhadap Kejadian Malaria Impor Di Kecamatan Watulimo, Kabupaten Trenggalek," *Jurnal Kesehatan Lingkungan*, Vol. 11, No. 2, Pp. 91–98, 2019.
[16] U. B. M. G. Talombo, M. A. Munir, And G. Lintin, "Analisis Faktor Risiko Utama Terhadap Kejadian Malaria Di Wilayah Puskesmas Kampung Baru Luwuk Tahun 2013-2015," *Medika Tadulako: Jurnal Ilmiah Kedokteran*, Vol. 5, No. 2, Pp. 1–13, 2018.

[17] R. Nababan And S. R. Umniyati, "Faktor Lingkungan Dan Malaria Yang Memengaruhi Kasus Malaria Di Daerah Endemis Tertinggi Di Jawa Tengah: Analisis Sistem Informasi Geografis," *Berita Kedokteran Masyarakat* , Vol. 34, No. 1, Pp. 11–18, 2018.
[18] W. Nurmaulina, B. Kurniawan, And H. Fakhruddin, "Hubungan Pengetahuan, Sikap Dan Perilaku Penderita Malaria Falciparum Dengan Derajat Infeksi Di Wilayah Kerja Puskesmas Hanura Kecamatan Teluk Pandan Kabupaten Pesawaran Provinsi Lampung," *Majority*, Vol. 7, No. 3, Pp. 34–40, 2018.
[19] Y. Supranefly And R. Oktarina, "Gambaran Perilaku Pencegahan Penyakit Malaria Di Sumatera Selatan (Analisis Lanjut Riskesdas 2018)," *Balaba*, Vol. 17, No. 1, Pp. 19–28, 2021.
[20] D. A. Putri, H. Hasyim, H. Zulkifli, A. Ghiffari, And C. Anwar, "Relationship Between Preventive Behavioral Factors And Malaria Incidence In Endemic Areas Of Lahat Regency In 2021," *Bioscientia Medicina*, Pp. 1111–1116, 2022.
[21] Darmawansyah, "Deteksi Dini Kasus Malaria Di Daerah Kejadian Luar Biasa," Ponorogo, 2019.
[22] D. Noerjoedianto, "Analisis Pengetahuan Dan Sikap Masyarakat Terhadap Perilaku Upaya Pencegahan Penyakit Malaria Di Puskesmas Koni Kota Jambi," *Jurnal Kesmas Jambi*, Vol. 1, No. 2, Pp. 1–14, 2017.