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The Prevalence And Causes Of Malaria In Children

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ABSTRACT

Background: Malaria is an acute or chronic disease caused by protozoa of the genus Plasmodium with manifestations of fever, anemia, and enlarged spleen. The global incidence of malaria reached 228 million in 2019 with an estimated number of deaths reaching 405,000. Global mitigation of the problem of malaria has been agreed upon at the World Health Assembly 60 (WHA60) conference on 18 May 209 to eliminate malaria. These regulations are contained in the Global Malaria Program by the World Health Organization (WHO), namely eliminating malaria that still exists in every country. **Method**: This study used the literature review method by searching for articles related to the prevalence and causes of malaria in children. The database used Google Scholar and Crossref. The search was carried out using some keywords such as prevalence, and causes of malaria in children. **Results**: Based on the reviewed articles, the prevalence and causes of malaria in children covered plasmodium parasites, plasmodium species, and plasmodium vivax. A total of 4 articles are related to plasmodium parasites, 2 articles related to plasmodium species, and 1 article related to plasmodium vivax. **Conclusion**: Of all the articles reviewed, the most specific cause related to the prevalence and causes of malaria in children is the plasmodium parasite, plasmodium species, and plasmodium vivax caused by the bite of the Aedes aegypti mosquitos.

1. Introduction

Malaria is an acute or chronic disease caused by protozoa of the genus Plasmodium with manifestations of fever, anemia, and enlarged spleen [1]. Other experts define malaria as an acute and chronic infectious disease caused by Plasmodium infection in erythrocytes which are characterized by an asexual form in the blood with symptoms of fever, chills, anemia, and enlarged spleen [2]. Malaria becomes a serious health problem in subtropical and tropical regions [3]. The global incidence of malaria reached 228 million in 2019 with an estimated number of deaths reaching 405,000. Mitigation of the problem of malaria has reached a global agreement at the World Health Assembly 60 (WHA60) conference on 18 May 20i9 to eliminate malaria disease. The agreement is written in the Global Malaria Program by the World Health Organization (WHO), namely eliminating malaria in every country [4]. Malaria still becomes a public health problem that can cause death, especially in high-risk groups such as infants, toddlers, and pregnant women [5]. Besides, malaria directly causes anemia and can reduce work productivity [6].

The incidence of malaria is more common in children aged younger than 12 years and around 1.5-2.7 million people die each year due to this disease, especially in children [7]. In Indonesia, the morbidity and mortality rates of malaria are still high, especially in the eastern region such as Papua, West Papua, NTT, Maluku, and North Maluku [8]. The morbidity of malaria in an area is determined through Annual Parasite Incidence (API) per year. API is the number of positive malaria cases per 1000 people in one year. The

API in West Papua Province decreased from 31.29 in 2017 to 7.75 in 2019. Although it has decreased, this figure still shows a high endemicity value and is included in the High Case Incidence (HCI) category > 5 [4]. Children with malaria often have nonspecific symptoms, for example, fever (over 40°C), headache, drowsiness, anorexia, nausea, vomiting, and diarrhea. The classic feature of malaria is paroxysmal fever [9]. Fever is characterized by high fever, sweating, headache, myalgia, back pain, abdominal pain, nausea, vomiting, diarrhea, pale and yellow. Malaria infection is one of the most common infections in children. The most common sign associated with malaria is fever with respiratory symptoms. Plasmodium falciparum infection predominates children aged 1-5 years [10].

Malaria is caused by protozoa of the genus Plasmodium. Female Anopheles mosquitos are the main media to spread this disease [11]. These mosquitos are infected with the plasmodium parasite due to biting someone who is already infected with the parasite [12]. The cause of malaria is caused by activities carried out outside the home at night and is related to the habits of some types of mosquitoes which are active at night [13]. Exophagic mosquitoes bite a lot outside and they also can enter the house if humans are the preferred target [14]. Many swamps allow mosquitoes that cause malaria to breed. Besides, public awareness about environmental hygiene is still low so swamps around the house are rarely cleaned [10].

The central government has initiated various programs to reduce malaria [15]. The Ministry of Health of the Republic of Indonesia initiated a program called Malaria Elimination Program by stopping local transmission of malaria in a certain geographical area, although there may still be cases of imported malaria in that area [16]. West Papua Province tries to reduce malaria cases by implementing programs launched by the Ministry of Health in the Malaria Elimination Program [17]. The main goal is to eliminate the main points and end infecting local locations in at least a district/city until getting zero local (indigenous) transmission or no longer cases found [18]. Therefore, this study aims to find out the causes of malaria in children.

2. Materials and Method

This study used a literature study method or literature review to collect data related to the prevalence and causes of malaria in children. Data were obtained from the results of reviewing relevant studies. Sources of data are in the form of related articles or papers with the topics of "prevalence of malaria," causes of malaria in children, and occurrence of malaria in children taken from some databases, both national and international such as Google Scholar and Semantic. The article search used the keywords of the prevalence of malaria and the cause of malaria in children. Besides, the researcher also carried out the advance search by searching articles using the keywords "prevalence of malaria, "causes of malaria in children," and “occurrence of malaria in children” with the words (AND, OR NOT or AND NOT.

The search obtained around 6,050 articles from Google Scholar and 37 articles from PubMed. The articles were sorted based on certain criteria, such as published in 2018-2023 (IC2) with a total of 687 journals, using the same research method (IC3), duplicates, not complete, and not matching the issue (IC4). After specific selection according to the topic and the problem of this study, the researcher obtained a total of 102 articles. Further identification was carried out in more detail to determine relevant articles that meet the inclusion criteria in this literature review. The articles that meet the IC1-IC4 criteria were then identified with IC5 to select suitable articles based on the titles and abstracts with the aim of this review literature, namely to have the main content related to the prevalence and causes of malaria in children. This identification resulted in 10 articles for further review. The process of article identification is presented in Figure 1

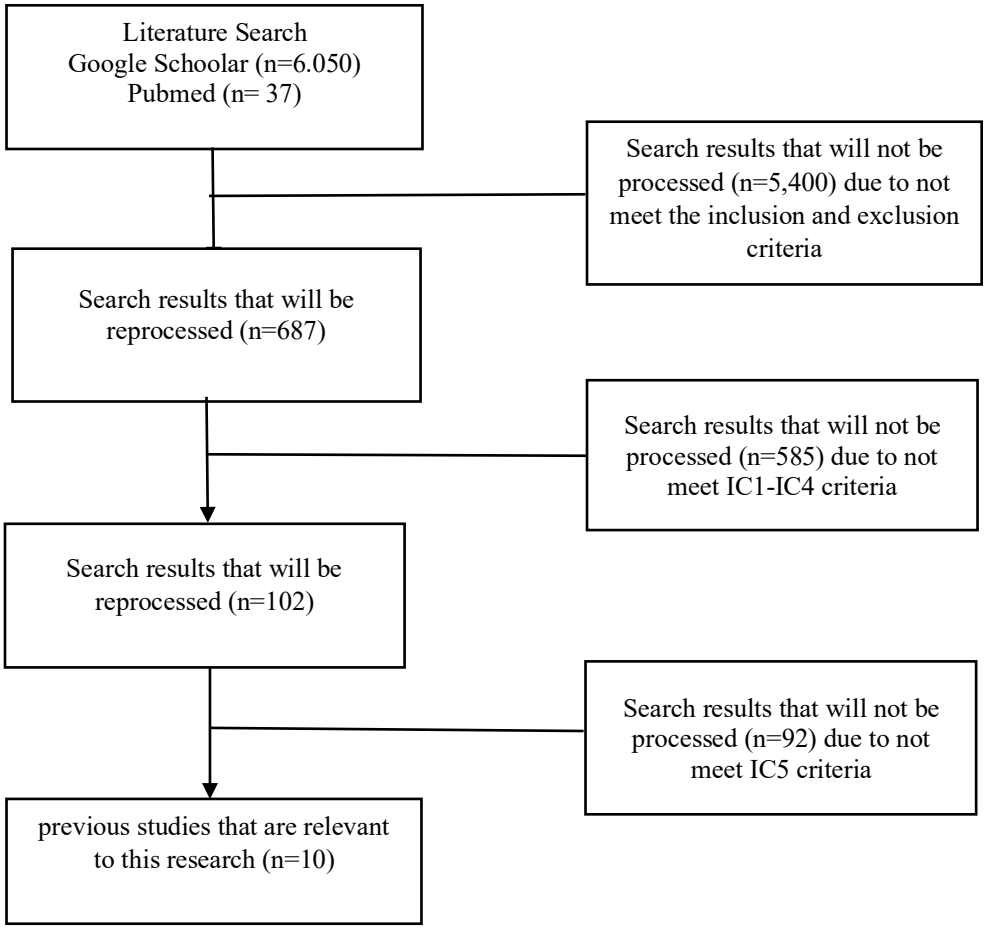

Figure 1. Literature Review Flow

3. Results and Discussion

This literature review involved 10 articles consisting of 9 national articles and 1 international article. A summary of the articles reviewed in this study can be seen in Table 1 below:

Table 1. Table of Article Analysis Results

No.	Author	Title	Method	Sample	Results
1.	SharkyD. Daysema Sarah M.Warouw Johnny Rompis	The description of Malaria prevalence in children in elementary school YAPIS 2 in Maro Village, Merauke Sub-district, Merauke District, Papua	Descriptive method	Simple Random Sampling	The results showed that Elementary School Yapis 2 is a medium prevalent area with a prevalence of 15%. The type of Plasmodium found is P. falciparum which infected children by 15%.

No.	Author	Title	Method	Sample	Results
2.	Deasy Erawati1, Ferbriza Dwiranti, Rina A. Mogea	The Prevalence of malaria at Puskesmas Sanggeng, Manokwari District from November to December 2019	Descriptive method	All patients in Puskesmas Sanggeng from November to December 2019 with all clinical symptoms of malaria.	The results showed that out of 730 patients, 35 blood samples are positive for malaria. The highest prevalence of malaria is at the age of ≥ 15 years (51.42%). Most malaria sufferers based on sex are women (51.43%) and the types of plasmodium found are Plasmodium falciparum (20%) and Plasmodium vivax (80%).
3.	Hotnida Sitorus, Reni Oktarina, Lasbudi P. Ambarita	Causes of malaria in children in Pagar Village (Settlement of Suku Anak Dalam) in Musi Banyuasin District, South Sumatra Province	Descriptive method	Children aged 0-9 years with their parent's consent for taking the blood sample	17 out of the 114 blood samples show positive microscopic for malaria. Around 85.1% of the children examined have below normal hemoglobin and 13.2% are categorized as splenomegaly. There is a statistically significant correlation between malaria cases in children and spleen enlargement. The results suggest a critical need to increase maternal knowledge about the relationship between malaria and its risk factors.
4.	Benyamin Dimi1 , Arlin Adam , Andi Alim	The Prevalence of Malaria Based on Socio-demographic Characteristics	Descriptive method	642 respondents	The results showed that malaria sufferers are dominated by people aged 24-35 years, namely 264 sufferers (41.1%); female sufferers dominate, namely 323 people (50.3%); and working as private employees with 410 people (63.9%). More malaria sufferers were found living in urban areas, namely 447 people (69.6%). The Dogiyai District Health Office is suggested to look at the malaria problem at the Puskesmas Denemani.
5.	Meistvin Welembuntu, Ferdinand Gansalangi	The prevalence of malaria in the Kepulauan Sangihe District, North Sulawesi Province	Descriptive method	Samples from a population and secondary data in the District Health Office and PUSKESMAS in Kepulauan Sangihe District	The results of this study indicated that the prevalence of malaria has declined from year to year with 1933 patients in 2012, 690 patients in 2013, and 602 patients in 2014. Most sufferers are adults aged 15-23 years. Patients with the highest malaria in the malaria data record in 2012 are balanced between males and females. There were more male patients

No.	Author	Title	Method	Sample	Results
					(54%) in 2013 and more female patients (51%) in 2014.
6.	Musparlin Halid	The prevalence of malaria and its relationship with the level of knowledge in the community in South Baturinggit	Descriptive method	148 children	The results showed that the gender factor does not have a significant relationship with the incidence of malaria with a p-value of >0.05. The high prevalence of malaria in South Baturinggit is caused by environmental management factors and the low level of community knowledge.
7.	Tya Palpera Utami , Hamzah Hasyim ,Ummi Kaltsum ,Uthu Dwifitri , Yanti Meriwati Yuniwarti ,Yusro Paridah ,Zulaiha	Risk factors for malaria in Indonesia: A literature review	Descriptive method	194 respondents	The cause of malaria is mosquito bites (99.5%) and ignorance about the type of mosquito that causes malaria (68%). Respondents' knowledge about the mosquito's biting time to transmit malaria at night reaches 57.7%. Respondents' knowledge about the location of mosquitoes that cause malaria the signs and symptoms of malaria and the prevention of malaria reach 99.5%, 99.5%, and 99.5% respectively.
8.	Selvia	The Prevalence of Malaria in School-Age Children in Waigete, Sikka, Indonesia	Descriptive method	All samples with positive malaria without complaint or clinical symptoms	A total of 29 (5.88%) out of the 493 children examined suffered from Plasmodium falciparum malaria consisting of 17 boys and 12 girls. There are 29 positive blood samples and all of them come from SD Blidit; 4 samples of gametes, 16 samples of parasite density +, 8 samples of parasite density ++, and 1 sample of parasite density +++. Most of the sufferers aged 9-14 years
9.	Josephine Debora, Hanggoro Tri Rinonce, Maria Fransiska Pudjohartono,Pritania Astari, Monica Gisela Winata, dan Fadli Kasim	The prevalence of malaria in Asmat, Papua: An overview of the current situation in highly endemic areas	Descriptive method	17 respondents	The results of this study indicate that the management of malaria in Asmat still becomes a big challenge for health workers and the government. Future studies are expected to determine the exact causal factors for the high incidence of malaria to be able to take more appropriate policies.
10.	T. Maulana, Said Devi Elvin, Sofyan Sufri	The contribution of environmental determinants to the prevalence of malaria	Descriptive method	Cluster random sampling with	The results showed that the physical environment (P=0.0001), biological environment (P=0.021) and

No.	Author	Title	Method	Sample	Results
		cases in Sabang City, Aceh Province		a total of 100 houses	chemical environment (P=0.011) are significantly related to malaria cases. The physical environment is the most influential predictor of malaria cases (OR: 11.096).

3.2. Discussion

THE PREVALENCE AND CAUSES OF MALARIA IN CHILDREN

Malaria is a public health problem that can affect the mortality and morbidity of infants, children under five, and pregnant women and even can reduce work productivity. Globally, around 300-500 million people suffer from malaria each year and 23 million of whom live in highly endemic areas on the African continent [19]. A total of 1.5-2.7 million people die each year, especially children and pregnant women [20]. Malaria is caused by the Plasmodium parasite. Plasmodium species in humans are Plasmodium falciparum, the cause of tropical malaria; Plasmodium vivax, the cause of tertian malaria; Plasmodium malariae, the cause of malaria malariae (quartana); Plasmodium ovale, the cause of malaria ovale [21]. The cause of malaria caused by plasmodium has 2 life cycles. The first cycle is the human cycle when the infective Anopheles mosquito sucks human blood, then the sporozoites in the mosquito's salivary glands will enter the bloodstream for approximately ½ hour [22].

After that, the sporozoites will enter the liver cells and become liver trophozoites. Then, it develops into a liver schizont consisting of 10,000-30,000 liver merozoites (depending on the species) [23]. This cycle is called the exoerythrocytic cycle which lasts for approximately 2 weeks. The next cycle is in anopheles mosquitoes in which the zygote develops into an ookinete and then penetrates the mosquito's stomach wall. On the outer wall of the stomach of the ookinete, mosquitos will become an oocyst [24]The incubation period for malaria then becomes sporozoites which are infective and ready to be transmitted to humans [24]. A house without wire netting installation will make it easier for mosquitoes to enter the house. Wire netting can be a mosquito barrier if the wire is in good condition [25]. Then, technical problems such as development that does not care about environmental health, population mobility from malaria endemic areas, remote areas with unfavorable environmental conditions and minimal access to health services, and low economic conditions of the community can also cause malaria [26].

Besides, climate change can affect the spread of malaria. The spread of malaria is limited by temperature. Temperatures that are too dry cause a decrease in the distribution of malaria due to a lack of mosquito populations as vectors [26]. This disease infects humans in endemic areas because the geographical environment supports the Anopheles sp mosquito to grow and develop well. Therefore, every region in Indonesia needs to control it with a comprehensive approach, not only focusing on the disease but also considering environmental aspects [27]. The continuous problem of malaria in Indonesia is closely related to the weak efforts to reduce the incidence of malaria such as the existence of breeding places for anopheles mosquitoes and locations that are difficult to reach, home environment that does not meet health requirements (ventilation, roof ceilings), and the behavior of people doing activities out of the house at night and before dawn (tapping rubber) [28].

The efforts to prevent malaria:

a) Using mosquito nets

Mosquito nets are effective to prevent and avoid contact between Anopheles sp. with healthy people while sleeping at night. Anopheles sp. is active at night. Using a good mosquito net can prevent or protect against Anopheles sp mosquito bites [29].

b) Using mosquito repellents

One of the reasons why people use mosquito repellents is due to the lack of mosquito nets distributed. The most widely used type of mosquito repellent is mosquito coils. The use of mosquito repellents is only temporary because over time, mosquitoes can be resistant to mosquito repellents and even mosquito repellents can affect health [30].

4. Conclusion

Of all the articles reviewed, the most specific cause related to the prevalence and causes of malaria in children is the plasmodium parasite, plasmodium species, and plasmodium vivax caused by the bite of the Aedes aegypti mosquitos.

References

[1] N. A. Banyal, "PENYEBAB PENYAKIT MALARIA DALAM SEL DARAH MERAH MANUSIA DENGAN MENGGUNAKAN SUPPORT VECTOR MACHINE," vol. 10, no. April, pp. 28–32, 2018.

[2] T. pancreatic beta-cell-specific transcription factor P.-4 inhibits glucagon gene expression through Pax-6 *et al.*,

[3] N. A. Banyal and A. R. Dayat, "KLASIFIKASI CITRA PLASMODIUM PENYEBAB PENYAKIT MALARIA DALAM SEL DARAH MERAH MANUSIA DENGAN MENGGUNAKAN METODE MULTI CLASS SUPPORT VECTOR MACHINE (SVM)," vol. 8, no. Agustus, pp. 111–118, 2016.

[4] D. Erawati, F. Dwiranti, and R. A. Mogea, "Prevalensi Malaria di Puskesmas Sanggeng Kabupaten Manokwari Periode November sampai Desember 2019 Prevalence of Malaria in Sanggeng Public Health Center, Manokwari Regency on November to Desember 2019 Period," vol. 6, pp. 72–77, 2021.

[5] P. Parasit and P. Penyebab, "REVIEW: PERAN NANOPARTIKEL DALAM MENGHAMBAT PERTUMBUHAN PARASIT Plasmodium PENYEBAB MALARIA," vol. 8, no. February, pp. 124–136, 2021.

[6] M. Welembuntu, F. Gansalangi, J. Kesehatan, P. Negeri, N. Utara, and H. J. Ada, "SANGIHE PROPINSI SULAWESI UTARA," pp. 1–4, 2014.

[7] P. Moru, K. Alor, B. Daya, and K. A. Ntt, "PENGARUH FAKTOR DEMOGRAFI DAN RIWAYAT MALARIA TERHADAP KEJADIAN MALARIA," no. December 2016, pp. 338–348, 2015, doi: 10.20473/jbe.v4i3.

[8] Y. Purwatiningsih, S. D. Lestyoningrum, and D. Puspita, "Systematic Review : Prevalensi dan Dampak Infeksi Malaria pada Wanita Hamil dan Neonatal Systematic Review : Prevalence and Outcome of Malaria Infection in Pregnant Women and Neonatal," pp. 119–128, 2022.

[9] S. M. Warouw and J. Rompis, "Gambaran prevalensi malaria pada anak SD YAPIS 2 di Desa Maro Kecamatan Merauke Kabupaten Merauke Papua," vol. 4, pp. 2–6, 2016.

[10] G. Ayu, N. Yulia, S. Dewi, and I. W. Gustawan, "Karakteristik infeksi malaria pada anak di RSUD Dekai Papua April-Juni 2018," vol. 50, no. 3, pp. 488–492, 2019, doi: 10.15562/Medicina.v50i3.711.

[11] A. Deribew, T. Dejene, B. Kebede, G. A. Tessema, and Y. A. Melaku, "Incidence , prevalence and mortality rates of malaria in Ethiopia from 1990 to 2015 : analysis of the global burden of diseases 2015," *Malar. J.*, pp. 1–7, 2017, doi: 10.1186/s12936-017-1919-4.

[12] D. Roberts and G. Matthews, "Risk factors of malaria in children under the age of five years old in Uganda," *Malar. J.*, pp. 1–11, 2016, doi: 10.1186/s12936-016-1290-x.

[13] F. Camponovo, C. A. Bever, K. Galactionova, T. Smith, and M. A. Penny, "Incidence and admission rates for severe malaria and their impact on mortality in Africa," *Malar. J.*, pp. 1–12, 2017, doi: 10.1186/s12936-016-1650-6.

[14] T. P. Utami, "FAKTOR RISIKO PENYEBAB TERJADINYA MALARIA DI INDONESIA : LITERATURE REVIEW Risk Factors Causing Malaria in Indonesia : Literature Review Abstrak."

[15] A. H. P. Mawuntu, D. Neuroinfeksi, and S. Utara, "MALARIA SEREBRAL," vol. 1, no. 3, pp. 1–21, 2018.

[16] H. Penelitian, "Prevalensi Malaria pada Anak Usia Sekolah," vol. 41, no. 12, pp. 887–890, 2014.

[17] J. Recht, A. M. Siqueira, W. M. Monteiro, S. M. Herrera, S. Herrera, and M. V. G. Lacerda, "Malaria in Brazil , Colombia , Peru and Venezuela : current challenges in malaria control and elimination," *Malar. J.*, pp. 1–18, 2017, doi: 10.1186/s12936-017-1925-6.

[18] J. Cook *et al.*, "Trends in parasite prevalence following 13 years of malaria interventions on Bioko island , Equatorial Guinea : 2004 – 2016," *Malar. J.*, pp. 1–13, 2018, doi: 10.1186/s12936-018-2213-9.

[19] S. Selatan, T. B. Purnama, R. Ciptaningtyas, and R. K. Wardani, "PENELITIAN Epidemiologi Kasus

Malaria di Kota Lubuk," vol. 06, no. 04, pp. 164–170, 2017.
[20] T. Romi and I. Putra, "Malaria dan Permasalahannya," vol. 11, pp. 103–114, 2011.
[21] J. Kesmas, K. Masyarakat, P. Biha, and K. Pesisir, "JURNAL KESMAS (KESEHATAN MASYARAKAT) KHATULISTIWA http://openjurnal.unmuhpnk.ac.id/index.php/JKMK ANALISIS FAKTOR RISIKO KEJADIAN MALARIA DI WILAYAH KERJA PUSKESMAS BIHA KABUPATEN PESISIR BARAT," pp. 77–87, 2018.
[22] M. Y. Lewinsca and M. Raharjo, "Faktor Risiko yang Mempengaruhi Kejadian Malaria Di Indonesia : Review Literatur 2016-2020 Risk Factors Affecting the Incidence of Malaria in Indonesia : A Literature Review," vol. 11, no. 1, pp. 16–28, 2021, doi: 10.47718/jkl.v10i2.1168.
[23] J. Debora *et al.*, "Prevalensi malaria di Asmat , Papua : Gambaran situasi terkini di daerah endemik tinggi," vol. 1, no. November, pp. 11–19, 2018, doi: 10.22146/jcoemph.38309.
[24] M. Pada, A. Di, D. Pagar, and P. S. Selatan, "Malaria pada anak di desa pagar desa (pemukiman suku anak dalam) di kabupaten musi banyuasin propinsi sumatera selatan*," vol. 21, pp. 10–17, 2011.
[25] S. Lts, M. Y. Matdoan, M. W. Talakua, and M. S. N. Van Delsen, "ANU," vol. 7, no. 2, pp. 77–85.
[26] S. Sulasmi *et al.*, "prevalensi Malaria di Kabupaten Tanah Bumbu Kalimantan Selatan The effect of rainfall , humidity , and temperature on malaria prevalence in Tanah Bumbu District South Kalimantan," vol. 3, no. 1, pp. 22–27, 2017.
[27] E. F. Rosa, N. Rustati, and P. K. Palembang, "SARANG NYAMUK PENYEBAB MALARIA," 2022.
[28] D. I. P. Sentani, (Yayank Lewinsca et al ., 2021). Berdasarkan data Riset Kesehatan Dasar tahun 2018 diperoleh data Pemberantasan Sarang Nyamuk (PSN) untuk Hal ini memprihatinkan karena provinsi Papua justru…," pp. 111–121, 2019.
[29] D. A. Rokhayati, R. C. Putri, N. A. Said, D. Sarwani, and S. Rejeki, "Analisis Faktor Risiko Malaria di Asia Tenggara Analysis of Malaria Risk Factors in Southeast Asia," pp. 79–86, 2022.
[30] T. Maulana, S. D. Elvin, and S. Sufri, "AKU," vol. 22, no. 3, pp. 60–72, 2022, doi: 10.24815/jks.v22i3.26379.