



MALARIA RISK ANALYSIS ON STUNTING INCIDENCE IN TODDLERS

Marlin Mayling Jarona*, Ellen R.V Purba, Lilys Irianty Natalia Purba

Poltekkes Kemenkes Jayapura, Jln Masuk Poltekkes Padang Bulan No.2, Hedam, Heram, Jayapura, Papua
99351, Indonesia

*jrmaysa77@gmail.com

ABSTRACT

Papua recorded the highest number of malaria cases in Indonesia in 2021, with 275,243 individuals affected. Keerom Regency ranked second with 17,901 cases in 2020. Recurrent malaria infections in toddlers can lead to chronic nutritional disorders, anemia, and immune system impairments, which disrupt growth and increase the risk of stunting. Objective: To analyze the risk of malaria on stunting incidence among toddlers based on gender, age, history of fever, maternal knowledge, and malaria prevention practices in Keerom Regency. Method: This was a quantitative analytic study with a cross-sectional design. The study population consisted of toddlers aged 0–59 months who lived in Keerom Regency and had been diagnosed with clinical malaria, with or without stunting. A purposive sampling technique was applied. Data were collected through structured interviews using validated questionnaires administered to mothers, and anthropometric measurements of toddlers were taken to determine nutritional status based on height-for-age indicators. Data were analyzed using the chi-square test. Results: Showed that a history of fever, maternal knowledge of breastfeeding and supplemental feeding, and malaria prevention practices were significantly associated with stunting ($p < 0.05$). Conclusions: Children with fever had a 90.6% stunting rate. Improving maternal knowledge and malaria prevention is essential to reduce stunting.

Keywords: characteristics; knowledge; malaria; toddlers; stunting

How to cite (in APA style)

Jarona, M. M., Purba, E. R., & Purba, L. I. N. (2025). Malaria Risk Analysis on Stunting Incidence in Toddlers. *Indonesian Journal of Global Health Research*, 7(4), 131-136. <https://doi.org/10.37287/ijghr.v7i4.6322>.

INTRODUCTION

Malaria is an infectious disease caused by the Plasmodium parasite, with the main transmission through the mosquito vector Anopheles. Data from the Ministry of Health of the Republic of Indonesia in 2024 shows a significant increase in malaria cases from 304,607 cases in 2021 to 418,546 cases in 2023, with a rise of 37.41% and an Annual Parasite Incidence of 1.5 per 1,000 population (Kementrian Kesehatan RI, 2024). The increase in malaria cases has the potential to increase mortality and morbidity, especially in vulnerable groups such as toddlers and pregnant women. This condition can exacerbate malnutrition levels, increase the risk of stunting, and reduce the quality of life and overall productivity of the community over a long period (Kemenkes RI., 2022).

Papua Province is recorded as the region with the highest incidence of malaria in Indonesia, where in 2023, there were 369,119 cases recorded (Kementrian Kesehatan RI, 2024). Keerom Regency has a relatively high prevalence of malaria which based on the Annual Parasite Incidence (API) in Keerom Regency in 2022 reached a figure of 431 per 1000 population which explains that 431 positive cases of malaria were found in every 1000 residents and indicates that the endemic of malaria is very high in the region. It was recorded that from 2018 to 2022, in Keerom Regency, there were 325 malaria in pregnant women and toddlers, which can cause serious problems in the organization and development of children (Lestari et al., 2024).

Recurrent malaria infection in children under five will cause chronic anemia due to the Plasmodium parasite that attacks red blood cells, lowering hemoglobin levels in the blood (Popang et al., 2024). Chronic anemia contributes to impaired nutrient metabolism and disruption of oxygen supply to body tissues, crucial in the child's growth process (Pincelli et al., 2021). Counihan's research explains that the body's inflammatory response to malaria infection can interfere with the absorption of nutrients in the intestines, inhibit appetite, and increase the body's metabolic needs, so nutrient intake becomes insufficient (Counihan et al., 2021). This condition inhibits children's physical growth, which is reflected in low height according to age (stunting). Data from the 2022 Indonesian Nutrition Status Survey (SSGI) shows that the prevalence of stunting nationally has decreased, from 24.4% in 2021 to 21.5% in 2023 (Kementrian Kesehatan RI, 2024). However, the prevalence of stunting in Keerom Regency is still relatively high, reaching 25.9%. This figure places Keerom Regency in the 22nd position out of 29 districts in Papua that experience stunting problems.

The high prevalence of stunting in the Keerom Regency area is suspected to be related to the high incidence of malaria, where recurrent malaria in toddlers causes chronic anemia and impaired nutrient absorption, which has a direct impact on the inhibition of children's physical growth. In addition, the incidence of stunting is also closely related to several individual characteristic factors such as the age of the child who is still in the growth period, gender, which affects the risk of infection and health conditions, and the child's history of heat, which indicates exposure to repeated infections (Hatijar, 2023). Another factor is the mother's knowledge of the importance of exclusive breastfeeding, proper MP-ASI, and understanding of malaria prevention efforts, contributing to the risk of stunting. Based on this, the researcher wants to conduct a study to analyze the risk of malaria and the incidence of stunting in toddlers based on the characteristics and knowledge of mothers in Keerom Regency.

METHOD

The type of research is quantitative analytics with a cross-sectional design. The research will be conducted in 2024 in Keerom Regency, Papua Province. The study population was toddlers (0 months- 59 months). The study sample was a toddler aged 0 months- 59 months who met the criteria of domicile in Keerom district and had been diagnosed with a clinical malaria case and experienced stunting or did not experience stunting, which was taken by a purposive sampling technique. Based on standard WHO growth, children are categorized as stunted if height or body length is below -2 standard deviation (SD). The variables in this study were the child's gender, age, health history, mother's knowledge of breast milk, dietary supplements, and mother's knowledge of malaria prevention. Data were collected through structured interviews with mothers or primary caregivers using validated questionnaires, and anthropometric measurements (height or length) were taken using standardized tools to assess the nutritional status of children. Univariate analysis uses frequency distribution, and bivariate analysis uses the chi-square test to see the relationships between variables

RESULT

Table 1.
Respondent characteristics (n= 100)

Respondent characteristics	f	%
Age		
0-12 Months	7	7
13-36 Months	40	40
37-59 Months	53	53
Gender		
Male	44	44
Female	56	56
History of fever		
Ever	85	85
Never	15	15

Respondent characteristics	f	%
Knowledge of Breastfeeding		
Mothers	79	79
Good	21	21
Not Enough		
Knowledge of Complementary Feeding Mothers		
Good	78	78
Not Enough	22	22
Knowledge of Malaria Prevention Mothers		
Good	78	78
Not Enough	22	22

Table 1 shows that most of the child respondents in this study were between 37 and 59 months old (53%), with the number of girls (56%) being more than boys (44%). Most children (85%) have experienced a history of heat. Most mothers have a good level of knowledge about breastfeeding (79%), supplementary feeding (78%), and malaria prevention (78%), but there are still maternal respondents who are in the sufficient category.

Table 2.
Characteristic Relationship with Stunting Incidence (n= 100)

Variabel	Category	Stunting Incidence		P Value
		Stunting	Not Stunting	
Gender	Male	38	6	0.086
		86.40%	13.60%	
	Female	49	7	
		87.50%	12.50%	
History of fever	Yes	77	8	0.011
		90.60%	9.40%	
	No	10	5	
		66.70%	33.30%	
Knowledge of Breastfeeding	Not Enough	21	0	0.046
		100%	0%	
	Good	66	13	
		83.50%	16.50%	
Knowledge of Complementary Feeding Mothers	Not Enough	22	0	0.04
		100%	0%	
	Good	65	13	
		83.30%	16.70%	
Knowledge of Malaria Prevention Mothers	Not Enough	22	0	0.04
		100%	0%	
	Good	65	13	
		83.30%	16.70%	

The results of the analysis in Table 2 show that gender does not have a significant relationship with the incidence of stunting (p-value 0.086), although the percentage of stunting in girls (87.5%) is higher than in boys (86.4%). Heat history has a significant relationship with the incidence of stunting (p-value 0.011), with a higher percentage occurring in children who have experienced heat (90.6%). Maternal knowledge of breastfeeding, supplemental feeding, and malaria prevention also showed a significant association with the incidence of stunting (p-values 0.046, 0.04, and 0.04), in which children of mothers with sufficient knowledge had a higher percentage of stunting (100%) than children of mothers with good knowledge (about 83%).

DISCUSSION

The incidence of stunting shows a relatively high prevalence in the group of children who have experienced heat (90.6%). This condition confirms that infectious diseases, such as heat, contribute significantly to children's growth disorders, which can be caused by decreased appetite, impaired absorption of nutrients, and increased energy needs when sick. The analysis

also showed that the child's health history was significantly related to the incidence of stunting ($p = 0.011$). The percentage of stunting in children who have experienced heat is much higher than in children who have never experienced heat. This is in line with previous research that stated that a history of recurrent infectious diseases such as high heat in childhood can negatively impact a child's growth due to metabolic disorders and lack of nutritional intake during periods of illness (Sahiddin et al., 2024). Research conducted by Ateba also explains that children who experience malaria have a higher risk of stunting because it can cause metabolic disorders and a direct or indirect decline in nutritional status (Ateba et al., 2021). Malaria infection triggers a systemic inflammatory reaction in the body that increases energy and nutrient needs, and can decrease appetite and the body's ability to absorb nutrients such as protein, iron, and other micronutrients (Counihan et al., 2021). Malaria or the occurrence of recurrent heat in children can cause chronic anemia and weaken the child's immune system, making children more susceptible to other infections and at risk of long-term growth disorders (Jebiwott et al., 2024).

The results of the study also showed that the level of knowledge of mothers about breastfeeding (breast milk), supplemental foods, and malaria prevention was significantly related to the incidence of stunting ($p < 0.05$). Mothers with sufficient knowledge in these three aspects show a higher incidence rate of stunting than mothers with good knowledge. This explains that a good understanding of proper breastfeeding practices, appropriate timing in supplemental feeding, and knowledge of malaria prevention efforts are fundamental in efforts to reduce the risk of stunting in children who are susceptible to infections such as malaria. In this study, it was found that mothers with good knowledge about breastfeeding had children with a lower prevalence of stunting than mothers with sufficient knowledge. Breast milk contains essential nutrients babies need in the first 6 months of life. Exclusive breastfeeding has been proven to increase immunity and support optimal growth of children (Komang Ayu Resiyanthi & Yanti, 2021; Yi & Kim, 2021). Research conducted by Asoba explains that children who experience malaria need optimal nutritional intake so that breast milk plays a role as the primary source of nutrition as well as natural immunity, because it contains antibodies, enzymes, and essential nutrients that support the child's immune (Asoba et al., 2019). Adequate maternal knowledge allows breastfeeding practices to continue when the child is sick, so that the child continues to get nutrition even though the appetite for solid food decreases. In the case of malaria, children often experience high fever, weakness, and loss of appetite, so the sustainability of breastfeeding can be a determining factor in preventing stunting due to a prolonged recovery period and lack of nutritional intake.

Mother's knowledge about supplemental feeding is also a key factor in preventing stunting, especially in children with malaria infections. The results showed that children of mothers with good knowledge of dietary supplements had lower stunting rates. Providing the right additional food in terms of timing, texture, and nutritional content after 6 months is essential in meeting children's dietary needs that can no longer be met from breast milk (Bancin et al., 2024). Malaria can worsen a child's nutritional status because it decreases appetite, causes indigestion, and increases the need for energy for the healing process. Nutritional, balanced, and age-appropriate supplements are essential to help a child's recovery and maintain growth. Research conducted by Kajjura explains that mothers with good knowledge of supplements tend to be able to choose the right food that is highly nutritious, as well as pay attention to the frequency and method of feeding children who are recovering from infection (Kajjura et al., 2019). The analysis also showed that mothers with less knowledge about supplementary feeding tended to give food that was not appropriate for the child's nutritional needs, both in terms of quality and quantity. This will worsen the condition of children who are experiencing malaria, because their dietary needs are not optimally met. Children in this condition are prone to experiencing deficits in energy and essential nutrients such as protein, iron, and vitamin A, which are urgently needed during growth and healing. The combination of malaria

infection and inadequate dietary intake has the potential to accelerate the occurrence of stunting (Gari et al., 2018).

Mothers' knowledge about malaria prevention has a significant influence on the incidence of stunting, especially in children who have experienced malaria. Mothers who know how to prevent malaria, such as using mosquito nets, maintaining environmental cleanliness, and recognizing early disease symptoms, can better protect their children from repeated exposure to malaria infection. Effective prevention reduces the likelihood of children experiencing malaria relapse, which can impair nutritional status and slow growth (Oladimeji et al., 2019). Meanwhile, mothers with limited knowledge about malaria prevention have poor preventive measures to protect their children. Children are more often exposed to infections that can lead to complications such as chronic anemia, loss of appetite, and metabolic disorders that affect physical growth. Malaria infection is not only a direct cause of the disease, but also a trigger for chronic malnutrition that can lead to stunting. Increasing maternal knowledge about malaria prevention is not only essential to avoid infectious diseases, but also plays a strategic role in reducing the incidence of stunting in malaria-endemic areas (Keats et al., 2022).

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that there is a significant relationship between child characteristics and maternal knowledge with the incidence of stunting in children who experience malaria. A history of heat in children significantly influences the incidence of stunting, where children who have experienced heat show a higher proportion of stunting. In addition, maternal knowledge about breastfeeding, supplemental feeding, and malaria prevention was also significantly related to the incidence of stunting. Children of mothers who have sufficient knowledge in these three aspects have a higher proportion of stunting compared to children of mothers who have good knowledge. The importance of educational interventions for mothers regarding nutrition practices and disease prevention, especially in areas with a prevalence of infectious diseases such as malaria. Increasing mothers' knowledge about exclusive breastfeeding, appropriate supplements, and ways to prevent communicable diseases can be strategies in reducing the incidence of stunting. Therefore, public health programs should be focused on empowering mothers through counseling and mentoring to support healthy and nutritious child care practices.

REFERENCES

- Asoba, G. N., Sumbele, I. U. N., Anchang-Kimbi, J. K., Metuge, S., & Teh, R. N. (2019). Influence of infant feeding practices on the occurrence of malnutrition, malaria and anaemia in children 5 years in the Mount Cameroon area: A cross sectional study. *PLoS ONE*, 14(7), 1–17. <https://doi.org/10.1371/journal.pone.0219386>
- Ateba, F. F., Doumbia, S., Ter Kuile, F. O., Terlouw, D. J., Lefebvre, G., Kariuki, S., & Small, D. S. (2021). The effect of malaria on stunting: An instrumental variables approach. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 115(9), 1094–1098. <https://doi.org/10.1093/trstmh/traa183>
- Bancin, A., Aidha, Z., & Ashar, Y. K. (2024). The Relationship Between Mothers' Knowledge and Behavior about Nutritional Status with the Incidence of Stunting. *Indonesian Journal of Global Health Research*, 6(3), 1747–1758. <https://doi.org/https://doi.org/10.37287/ijghr.v6i3.3382>
- Counihan, N. A., Modak, J. K., & de Koning-Ward, T. F. (2021). How Malaria Parasites Acquire Nutrients From Their Host. *Frontiers in Cell and Developmental Biology*, 9(March), 1–10. <https://doi.org/10.3389/fcell.2021.649184>
- Gari, T., Loha, E., Deressa, W., Solomon, T., & Lindtjørn, B. (2018). Malaria increased the risk of stunting and wasting among young children in Ethiopia: Results of a cohort study. *PLoS ONE*, 13(1), 1–16. <https://doi.org/10.1371/journal.pone.0190983>

- Hatijar, H. (2023). The Incidence of Stunting in Infants and Toddlers. *Jurnal Ilmiah Kesehatan Sandi Husada*, 12(1), 224–229. <https://doi.org/10.35816/jiskh.v12i1.1019>
- Jebiwott, S., Gutapaka, N., Sumari, D., Loss, G., Athuman, T., Nyandele, J. P., Cummins, H., Chemba, M., Benjamin-Chung, J., Gangar, P., Wu, X., Smith, J., Chen, I., Dorsey, G., Fink, G., Olotu, A., & Hsiang, M. (2024). Child Health and Infection with Low Density (CHILD) malaria: a protocol for a randomised controlled trial to assess the long-term health and socioeconomic impacts of testing and treating low-density malaria infection among children in Tanzania. *BMJ Open*, 14(3), 1–13. <https://doi.org/10.1136/bmjopen-2023-082227>
- Kajjura, R. B., Veldman, F. J., & Kassier, S. M. (2019). Effect of Nutrition Education on Knowledge, Complementary Feeding, and Hygiene Practices of Mothers With Moderate Acutely Malnourished Children in Uganda. *Food and Nutrition Bulletin*, 40(2), 221–230. <https://doi.org/10.1177/0379572119840214>
- Keats, E. C., Kajjura, R. B., Ataullahjan, A., Islam, M., Cheng, B., Somaskandan, A., Charbonneau, K. D., Confreda, E., Jardine, R., Oh, C., Waiswa, P., & Bhutta, Z. A. (2022). Malaria reduction drives childhood stunting decline in Uganda: A mixed-methods country case study. *American Journal of Clinical Nutrition*, 115(6), 1559–1568. <https://doi.org/10.1093/ajcn/nqac038>
- Kemendes RI. (2022). Petunjuk Teknis Pengendalian Faktor Risiko Malaria. Direktorat Pencegahan dan Pengendalian Penyakit Menular (P2PM).
- Kementerian Kesehatan RI. (2024). Profil Kesehatan Indonesia Tahun 2023. Kementerian Kesehatan RI. <https://www.kemkes.go.id/id/profil-kesehatan-indonesia-2023>
- Komang Ayu Resiyanthi, N., & Yanti, N. L. G. P. (2021). Relationship Between Exclusive Breastfeeding and Basic Immunization Status Related With Stunting in Toddlers Aged 12- 24 Months. *Indonesian Journal of Global Health Research*, 3(4), 563–570. <https://doi.org/https://doi.org/10.37287/ijghr.v3i4.666>
- Lestari, M., Wahyuni, S., & Suci, E. S. (2024). Pemberdayaan Kader Dalam Upaya Pencegahan Malaria Pada Ibu Hamil Di Puskesmas Arso Kota Kabupaten Keerom. *Health Care*, 2(3), 240–246. <https://doi.org/https://doi.org/10.62354/1xg51219>
- Oladimeji, K. E., Tsoka-Gwegweni, J. M., Ojewole, E., & Yunga, S. T. (2019). Knowledge of malaria prevention among pregnant women and non-pregnant mothers of children aged under 5 years in Ibadan, South West Nigeria. *Malaria Journal*, 18(1), 1–12. <https://doi.org/10.1186/s12936-019-2706-1>
- Pincelli, A., Cardoso, M. A., Malta, M. B., Johansen, I. C., Corder, R. M., Nicolette, V. C., Soares, I. S., Castro, M. C., & Ferreira, M. U. (2021). Low-level plasmodium vivax exposure, maternal antibodies, and anemia in early childhood: Population-based birth cohort study in amazonian brazil. *PLoS Neglected Tropical Diseases*, 15(7), 1–22. <https://doi.org/10.1371/journal.pntd.0009568>
- Popang, C. T., Isnaini, Y. S., Mulyanti, & Ester. (2024). Analysis of Nutritional Status in Toddlers and Malaria Incidence. *Indonesian Journal of Global Health Research*, 6(S6), 197–206. <https://doi.org/https://doi.org/10.37287/ijghr.v6iS6.4826>
- Sahiddin, M., Ishak, H., Arsin, A. A., & Pramestiyani, M. (2024). Impact of early-life malaria exposure on childhood stunting: A case-control study in high endemic malaria area, Papua, Indonesia. *Narra Journal*, 4(4), 1–11. <https://doi.org/https://doi.org/10.52225/narra.v4i3.1451>
- Yi, D. Y., & Kim, S. Y. (2021). Human breast milk composition and function in human health: From nutritional components to microbiome and micrnas. *Nutrients*, 13(9). <https://doi.org/10.3390/nu13093094>