PROCEEDING
4th International Conference of Health Polytechnic of Jambi 2024
icon@poltekkesjambi.ac.id
http://journal.poltekkesjambi.ac.id/index.php/ICoHPJ
doi.org/10.35910/icohpj.v4i0

THE RELATIONSHIP BETWEEN HEMOGLOBIN LEVELS AND LEUKOCYTE COUNT ON STUNTING INCIDENCE IN TANJUNG AGUNG PUSKESMAS, MUARA ENIM 2024

Elsi Indah Putri[1], James P Simanjuntak[1,2*], Vina Novianty Tampubolon[1]
[1] Medical Laboratory Technology Department, Politeknik Kesehatan Kementerian Kesehatan Jambi, Jambi, Indonesia
[2]PUI-PK, Politeknik Kesehatan Kementerian Kesehatan Jambi, Jambi, Indonesia
Corresponding author: james.p.simanjuntak@poltekkesjambi.ac.id

ABSTRACT

Background: Stunting, defined as a condition where a child's height is significantly below the average for their age due to chronic malnutrition or recurring infections, remains a critical public health issue in Indonesia. This condition can lead to long-term cognitive and physical development challenges. This study explores the relationship between hemoglobin levels and leukocyte counts with stunting in the working area of Puskesmas Tanjung Agung, Muara Enim, in 2024.
Method: This study was conducted an observational analytic study with a cross-sectional design. Data on hemoglobin levels, leukocyte counts, and stunting incidence were collected from a sample of 79 children aged 24-60 months. Statistical analysis used the chi-square test to determine significant associations between variables.
Result: The study found that 64% of children with low hemoglobin levels and 66% of those with high leukocyte counts experienced stunting. The chi-square test indicated significant associations between low hemoglobin levels (p=0.003) and high leukocyte counts (p=0.001) with stunting.
Conclusion: The findings suggest a strong relationship between low hemoglobin levels, high leukocyte counts, and stunting incidence. These results highlight the need for integrated nutrition and health interventions to reduce stunting in rural areas.

Keywords: Stunting, Hemoglobin, Leukocytes, Nutrition, Indonesia

INTRODUCTION

Stunting is a critical global health issue, particularly in low- and middle-income countries. It is characterized by impaired growth and development in children under five years old, resulting from chronic malnutrition and repeated infections (World Health Organization, 2020). Stunting not only affects physical growth but also impairs cognitive development, leading to long-term consequences in adulthood, including a higher risk of chronic diseases. In Indonesia, stunting remains a significant concern, with the country ranking among those with the highest prevalence of stunting in Southeast Asia. The 2021 Indonesia Health Profile reported a stunting prevalence of 24.4% in children under five years old (Kemenkes RI, 2021). This issue is particularly pronounced in rural areas, such as the Muara Enim district, where various factors, including nutritional deficiencies and infections, contribute to the high stunting rates (Sanatang et al., 2022).

Previous studies have established that stunting is often linked to nutritional deficiencies, especially in terms of iron and protein intake. Hemoglobin, a protein in red blood cells responsible for oxygen transport, is a key indicator of nutritional status and plays a crucial role in growth and development (Rahmawati et al., 2020). Low hemoglobin levels, indicative of iron deficiency anemia, are commonly observed in children with stunting. Similarly, leukocyte levels, which reflect the body's immune response to infections, are often elevated in children suffering from chronic malnutrition and infections (Gunawan &

Yuliati, 2019). Infections can exacerbate malnutrition by reducing appetite, impairing nutrient absorption, and increasing nutrient losses (Rahman et al., 2019). However, while the relationship between malnutrition, anemia, and infections is well-documented, studies specifically examining the role of hemoglobin and leukocyte levels in stunting in rural Indonesia remain scarce (Sanatang et al., 2022; Rahmawati et al., 2020).

The novelty of this study lies in its focus on the physiological indicators, particularly hemoglobin and leukocyte levels, and their association with stunting in a rural Indonesian setting. While most previous research has primarily focused on dietary intake and socioeconomic factors, this study adds to the existing literature by investigating the direct relationship between these blood parameters and stunting in children. This research aims to fill the gap in current knowledge by providing empirical evidence on how hemoglobin and leukocyte levels correlate with stunting among children in the working area of Puskesmas Tanjung Agung, Muara Enim (Sanatang et al., 2022). This focus on physiological indicators offers new insights that could contribute to more effective health interventions targeting stunting in rural areas.

This study hypothesizes that low hemoglobin levels and elevated leukocyte counts are significantly associated with higher stunting incidence among children aged 24-60 months. This hypothesis is grounded in the understanding that hemoglobin deficiency can lead to insufficient oxygen supply to tissues, impairing growth, while elevated leukocyte levels indicate the presence of infections, which can further exacerbate malnutrition (Gunawan & Yuliati, 2019; Rahmawati et al., 2020). The study aims to test these hypotheses through statistical analysis, using data collected from children in the working area of Puskesmas Tanjung Agung. By examining these variables, the study seeks to uncover whether addressing anemia and infections in children could be a viable strategy for reducing stunting rates in rural Indonesia.

The purpose of this study is to investigate the relationship between hemoglobin levels, leukocyte counts, and the incidence of stunting in children aged 24-60 months in the Puskesmas Tanjung Agung area. The findings are expected to provide valuable insights into the role of physiological factors in stunting, which could inform public health policies and interventions aimed at reducing stunting in rural and underserved areas. Additionally, this research aims to contribute to the growing body of literature on stunting by offering new perspectives on the importance of addressing both nutritional and infection-related factors in combating this public health issue.

METHODS

This study used observational analytic design with a cross-sectional approach, conducted from June to July 2024. The sample consisted of 79 children aged 24-60 months selected through purposive sampling from a population of 434. Hemoglobin levels and leukocyte counts were measured using the Hematology Analyzer. Data were analyzed using descriptive statistics and chi-square tests.

RESULTS AND DISCUSSION

This study aimed to explore the relationship between hemoglobin levels, leukocyte counts, and the incidence of stunting in children aged 24-60 months in the working area of Puskesmas Tanjung Agung. The results indicate a significant association between both low hemoglobin levels and elevated leukocyte counts with stunting.

Relationship between Hemoglobin Levels and Stunting

The data analysis revealed that 64% of children with low hemoglobin levels (≤ 11 g/dL) were stunted, compared to 27% of

children with normal hemoglobin levels. The statistical analysis using the chi-square test demonstrated a significant relationship between low hemoglobin levels and stunting (p=0.003) (Table 1). Low hemoglobin, indicative of iron-deficiency anemia, is known to impair oxygen transport, leading to reduced growth and cognitive function. The findings of this study align with prior research showing that children with low hemoglobin levels are at greater risk of stunted growth due to prolonged malnutrition (Gunawan & Yuliati, 2019).

This result emphasizes the critical role of anemia in growth restriction, suggesting that interventions aimed at addressing anemia could significantly reduce stunting rates. Previous studies support this, indicating that anemia in early childhood contributes to long-term physical and cognitive deficits (Rahmawati et al., 2020). This study adds novelty by confirming these findings within a rural Indonesian context, where anemia is prevalent, and access to adequate nutrition may be limited.

Table 1. Relationship between Hemoglobin Levels and Stunting

Hemoglobin levels	Incidence		Total	*p-value*
	stunting	non *stunting*		
Low	18 (64%)	10 (36%)	28 (100%)	
Normal	14 (27%)	37 (73%)	51 (100%)	0,003
Total	32 (100%)	47 (100%)	79 (100%)	

Relationship between Leukocyte Counts and Stunting

Similarly, 66% of children with elevated leukocyte counts (>10,000/µL) were stunted, compared to 26% of children with normal leukocyte counts. The chi-square test confirmed a significant association between high leukocyte counts and stunting (p=0.001) (Table 2). Elevated leukocyte counts indicate the presence of infections, which can worsen malnutrition and further impair growth. Chronic infections lead to increased metabolic demand, reduced appetite, and impaired nutrient absorption, contributing to stunted growth (Rahman et al., 2019).

These findings suggest that addressing infections alongside improving nutritional intake is crucial for preventing stunting. Children in rural areas are more susceptible to infections due to poor sanitation and limited access to healthcare, which compounds the effects of malnutrition. The novelty of this study lies in its identification of leukocyte count as a significant factor, expanding the focus beyond nutritional deficits to include infection-related contributors to stunting in children.

Table 2. Relationship between Leukocyte Counts and Stunting

Leukocyte Count	Incidence		Total	*p-value*
	Stunting	non *Stunting*		
High	19 (64%)	10 (36%)	29 (100%)	
Normal	13 (26%)	37 (74%)	50 (100%)	0,001
Total	32 (100%)	47 (100%)	79 (100%)	

The results of this study offer valuable insights for both theory and practical applications. The findings emphasize that stunting is influenced not only by nutrition but also by immune health. While previous research has largely focused on dietary factors, this study highlights the importance of considering physiological markers such as hemoglobin and leukocyte levels. This suggests that healthcare providers should consider incorporating routine blood tests for these markers during early childhood screenings to identify children at risk of stunting and provide timely interventions. Moreover, public health initiatives aimed at reducing stunting should extend beyond improving nutrition to also include infection control, particularly in rural areas. By addressing both nutrition and infection prevention, we can more effectively reduce stunting and improve both the short- and long-term health outcomes for children in these communities

CONCLUSION

This study demonstrated a significant relationship between hemoglobin levels and leukocyte counts with the incidence of stunting in children aged 24-60 months in the working area of Puskesmas Tanjung Agung. Children with low hemoglobin levels and elevated leukocyte counts were more likely to experience stunting.

ACKNOWLEGMENT

The author would like to express sincere gratitude to Lecturer of Laboratory Technology Department, for the invaluable guidance and advice throughout this writing.

CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

REFERENCES

Gunawan, D.C.D. dan Yuliati, Endri. 2019. Intervensi Penatalaksanaan Gizi dalam Meningkatkan Kadar Hemoglobin dan Tumbuh Kembang Balita Stunting. Jurnal Gizi Klinik Indonesia. 15 (4): 128-136.

Rahman, MS., Mushfiquee, M., Masud, MS., dan Howlader T. 2019. Association between malnutrition and anemia in underfive children and women of reproductive age: evidence from Bangladesh Demographic and Health Survey 2011. Journal PLOS ONE. 14 (7): 1-18.

Rahmawati NF, Fajar NA, Idris H. 2020. Faktor sosial, ekonomi, dan pemanfaatan posyandu dengan kejadian stunting balita keluarga miskin penerima PKH di Palembang. Jurnal Gizi Klinik Indonesia. 2020;17(1):23-33.

Sanatang, dan Irmayni, S. Y. 2022. Analisis Kadar Hemoglobin Dan Kadar Leukosit Pada Balita Penderita Stunting Di Puskesmas Lepo-Lepo. Dalam Jurnal MediLab Mandala Waluya Vol 6 No 2, Desember 2022