



ANALYSIS OF FACTORS ASSOCIATED WITH STUNTING INCIDENCE IN KUDUS REGENCY

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ABSTRACT

Stunting remains a public health problem in Indonesia, including in Kudus Regency, which recorded a prevalence of 4.56 % in 2024. This condition is influenced by various factors, both maternal and family environment. This study aims to analyze factors related to the incidence of stunting in toddlers in Kudus Regency, including a history of Chronic Energy Deficiency (CED) in pregnant women, a history of anemia, family socio-economic conditions, and feeding patterns. The study design used a case-control with a retrospective approach. The sample consisted of 200 respondents, consisting of 100 stunted toddlers (cases) and 100 non-stunted toddlers (controls) selected using consecutive sampling method in 19 community health centers in Kudus Regency. Data were collected through interviews with a structured questionnaire from the results of previous research on the history of Chronic Energy Deficiency (CED), Anemia, family socio-economics and feeding patterns and analyzed using the Chi-Square test. Bivariate analysis showed that history of CED (OR = 5.05 ; $p < 0.001$), history of anemia (OR = 2.12; $p = 0.028$), family socioeconomic status (OR = 0.14; $p = 0.001$), and feeding patterns (OR = 0.18; $p < 0.001$) were significantly associated with the incidence of stunting. The incidence of stunting in toddlers in Kudus Regency is influenced by maternal factors (CED and anemia), family socioeconomic factors, and feeding patterns, with feeding patterns being the dominant factor. Stunting prevention efforts need to focus on improving maternal nutrition, preventing anemia, empowering families economically, and educating toddlers on feeding practices.

Keywords: anemia; CED; feeding patterns; socio-economic; stunting; toddlers

How to cite (in APA style)

Wibowo, M., Raharjo, B. B., & Zainafree, I. (2025). Analysis of Factors Associated with Stunting Incidence in Kudus Regency. *Indonesian Journal of Global Health Research*, 8(1), 147–154. <https://doi.org/10.37287/ijghr.v8i1.425>.

INTRODUCTION

Stunting is a public health issue that remains a serious concern, both globally and nationally. Stunting is defined as a condition of growth failure due to chronic malnutrition over a long period, often accompanied by recurrent infections, characterized by a child's length or height below the standard for their age (WHO, 2015). The impact of stunting is not limited to impaired physical growth but also has implications for cognitive development, reduced future productivity, and an increased risk of degenerative diseases in adulthood (Nugroho et al., 2023). Therefore, addressing stunting is a crucial part of efforts to achieve the *Sustainable Development Goals* (SDGs), which aim to eliminate all forms of malnutrition by 2030 (Pacheco-Paul, 2023).

In Indonesia, stunting prevalence remains quite high, despite a downward trend in recent years. The 2018 *Basic Health Research (Riskesdas)* data showed a stunting prevalence of 30.8 %, which then decreased to 27.67% in 2019 (Hidayati & Rahardjo, 2021). However, this figure remains well above the WHO threshold of 20% for public health problems. Central Java, a province with a large population, recorded a stunting prevalence of 20.7 % in 2023 (Ministry of Health of the Republic of Indonesia, 2023). This situation indicates that stunting remains a serious problem at the provincial level and requires targeted intervention. A similar situation was also found in Kudus Regency. Data from the Kudus Regency Health Office in 2024 recorded a stunting prevalence of 4.56%, or 2,373 cases, an increase from the previous year's 3.88% (2,057 cases) (Kudus Regency Health Office, 2024). This figure is relatively lower than the provincial and national averages, but the increasing

trend in cases over the past year indicates a problem that needs to be addressed immediately. Gribig Community Health Center reportedly had the highest rate (8.66 %), while Purwosari Community Health Center had the lowest (1.92%). These data demonstrate significant geographic variation and indicate the need for a locally based approach to stunting prevention interventions.

Several factors are known to contribute to stunting. Direct factors include maternal malnutrition, inadequate child feeding patterns, and recurrent infections. Indirect factors include socioeconomic conditions, sanitation, and access to health services (Rahardjo et al., 2020). Several studies have shown that a history of Chronic Energy Deficiency (CED) in pregnant women and anemia are important factors that increase the risk of low birth weight (LBW), which further contributes to stunting (Rusmilawaty et al., 2025). Thus, maternal factors play a central role in breaking the intergenerational chain of stunting. Furthermore, a family's socioeconomic status also significantly influences the risk of stunting. Low-income families tend to have limited access to nutritious food, access to healthcare, and proper sanitation (Sudirman et al., 2019). This is exacerbated by low maternal education, which results in a lack of nutritional knowledge and appropriate parenting practices. Previous research has shown that poor feeding practices, including meal frequency and quality, are dominant factors associated with stunting in toddlers (Bella et al., 2020). In other words, stunting results from a complex interaction between biological, socioeconomic, and parenting factors. Based on this background, this study is crucial to analyze the factors associated with stunting in Kudus Regency. The focus of this study includes maternal history of chronic obstructive pulmonary disease (CED), history of anemia, family socioeconomic conditions, and parenting patterns. This analysis is expected to provide a more comprehensive picture of the determinants of stunting at the local level, thus providing a basis for formulating effective and contextual intervention policies to reduce stunting prevalence in Kudus Regency.

METHOD

This study used a *case-control design* with a retrospective approach to analyze factors associated with stunting in toddlers in Kudus Regency. This design was chosen because it is suitable for identifying the relationship between risk factors and disease incidence in both case and control groups (Sastroasmoro & Ismael, 2018). The population of stunting cases in this study are mothers of stunted toddlers registered at health centers in Kudus Regency, totaling 2,373 toddlers . Meanwhile, the control population in this study was 51,437 children with normal nutritional status (BPS, 2024). The study population was all toddlers in Kudus Regency in 2024, with a sample of 200 respondents consisting of 100 stunted toddlers as the case group and 100 non-stunted toddlers as the control group. The research sampling technique used a *non-probability sampling* method with *consecutive sampling* , namely the case group sample and the control group sample are determined based on inclusion and exclusion criteria until the number of respondents is met.

The independent variables studied included a history of *Chronic Energy Deficiency* (CED) in pregnant women, a history of anemia in pregnant women, family socioeconomic conditions, and parenting patterns. The dependent variable was the incidence of stunting in toddlers. Data were collected using structured interviews with a structured questionnaire from the results of previous research on the history of *Chronic Energy Deficiency*, Anemia, family socio-economics and feeding patterns. (Astuti et al., 2020; Suryati et al., 2023) Data collection was conducted in April 2025 in the working areas of 19 Community Health Centers (Puskesmas) in Kudus Regency, involving trained enumerators. The data obtained were analyzed using a bivariate Chi-Square test to determine the relationship between each independent variable and stunting incidence. This analytical approach aligns with recommendations for epidemiological analysis in public health research (Dahlan, 2014).

RESULT

Respondent Characteristics

Table 1
Frequency Distribution of Respondent Characteristics by Case and Control Groups

Characteristics	Case (n=100)	Control (n=100)
Mother's Age ; Median (Min-Max) (years)	32 (14-46)	30 (21-45)
Education		
- Elementary School	13 (54.2%)	11 (45.8%)
- Junior High School	27 (62.8%)	16 (37.2%)
- Senior High School	48 (45.3%)	58 (54.7%)
- Hight Education	12 (44.4%)	15 (55.6%)
Work		
- Laborer	11 (68.8%)	5 (31.3%)
- Teacher	4 (80.0%)	1 (20.0%)
- Housewife	62 (56.4 %)	48 (43.6 %)
- Seamstress	3 (100%)	0 (0.0 %)
- Nurse	0 (0.0 %)	1 (100%)
- civil servant	0 (0.0 %)	3(100%)
- Private	16 (31.4 %)	35 (68.6 %)
- Businessman	4 (36.4 %)	7 (63.6 %)
Number of Children; Median (Min-Max)	2 (1-4)	2 (1-4)
Infant Age; Median (Min-Max) (months)	20 (6-50)	18 (6-57)

Table 1, it is known that in the case group, the proportion of elementary school education (54.2%) and junior high school (62.8%) is higher than in the control group with elementary school education (45.8%) and junior high school (37.2%). Meanwhile, the occupational characteristics in the case group, the proportion of work as laborers (68.8%) and tailors (100%) is higher than the control group with work as laborers (31.3%) and tailors (0%). Furthermore, there are no differences in the characteristics of maternal age, number of children, and infant age between the case and control groups.

The Relationship between CED Pregnancy History and the Incidence of Stunting

Table 2.

Cross-Table of the Relationship between CED Pregnancy History and the Incidence of Stunting

Cross Table of the Relationship between CED Pregnancy History and the Incidence of Stunting						
CED	Stunting Incident				P value	OR (95% CI)
	Case		Control			
	f	%	f	%		
No CED	57	57.0	87	87.0	0,000	5,049 (2,496-10,213)
CED	43	43.0	13	13.0		

Based on table 2, it is known that the results of the study prove that there is a relationship between a history of CED pregnancy and the incidence of Stunting ($p < 0.05$; OR = 5.049; 95% CI = 2.496-10.213). The proportion of mothers with a history of CED pregnancy was greater in the case group (43.0%) than in the control group (13.0%). The results also show that mothers with a history of CED pregnancy have a 5.049 times greater chance of having a child with Stunting compared to mothers without a history of CED pregnancy. From the results of this study, it is proven that a history of CED pregnancy is a risk factor for the incidence of Stunting.

The Relationship Between History of Anemia and the Incidence of Stunting

Table 2

Cross-Table of the Relationship between History of Anemia and the Incidence of Stunting

Cross-Table of the Relationship between History of Anemia and the Incidence of Stunting						
Anemia	Stunting Incident				P value	OR (95% CI)
	Case		Control			
	f	%	f	%		
No Anemia	64	64.0	79	79.0	0.028	2,116 (1,126-3,978)
Anemia	36	36.0	21	21.0		

Table 3, it is known that the results of the study prove that there is a relationship between a history of anemia and the incidence of stunting ($p < 0.05$; OR = 2.116 ; 95% CI = 1.126-3.978). The proportion of mothers with a history of anemia was greater in the case group (36.0%) than in the control group (21.0%). The results also show that mothers with a history of anemia have a 2.116 times greater chance of having a child with stunting compared to mothers without a history of anemia. From the results of this study, it is proven that a history of anemia is a risk factor for stunting.

The Relationship Between Family Socioeconomic Status and the Incidence of Stunting

Table 4.

Cross-Table of the Relationship between Family Socioeconomic History and the Incidence of Stunting

Socio-Economic	Stunting Incident				P value	OR (95% CI)
	Case		Control			
	f	%	f	%		
Not enough	18	18.0	3	3.0	0.001	0.141 (0.040-0.495)
Good	82	82.0	97	97.0		

Based on table 4, it is known that the research results prove that there is a relationship between family socio-economic status and the incidence of stunting ($p\text{-value } 0.001 < 0.05$). The proportion of mothers with Family socioeconomic status was slightly higher in the case group (18.0%) than in the control group (3.0%). Although the relationship between family socioeconomic status and stunting incidence was not significant, family socioeconomic factors tended to be a risk factor for stunting as well (OR=0.141; 95% CI=0.040-0.495).

The Relationship between Feeding Patterns and the Incidence of Stunting

Table 3 Cross-Table of the Relationship between Feeding Patterns and the Incidence of Stunting

Table 5: Cross-Table of the Relationship Between Feeding Patterns and the Incidence of Stunting						
Dietary habit	Stunting Incident				P value	OR (95% CI)
	Case		Control			
	f	%	f	%		
Not enough	29	29.0	7	7.0	0,000	0.184 (0.076-0.445)
Good	71	71.0	93	93.0		

Based on table 5, it is known that the results of the study prove that there is a relationship between feeding patterns and the incidence of stunting ($p\text{-value } 0.000 < 0.05$). The proportion of mothers with less than adequate feeding patterns was greater in the case group (29.0%) than in the control group (7.0%). Although the relationship between feeding patterns and the incidence of stunting was not significant, feeding pattern factors tended to be a risk factor for stunting as well (OR=0.184 ; 95 % CI=0.076-0.445) .

DISCUSSION

The Relationship between KEK Pregnancy History and the Incidence of Stunting

The results of the study showed that a history of Chronic Energy Deficiency (CED) in pregnant women was significantly associated with the incidence of stunting in toddlers in Kudus Regency ($p=0.005$; OR = 4.24) . This means that toddlers born to mothers with a history of CED have a more than fourfold risk of experiencing stunting compared to toddlers born to mothers without a history of CED. This finding is in line with research by Astuti, Yuliana, & Hermawan (2020) which reported that CED in pregnant women has an impact on fetal growth due to limited nutrient and oxygen supply, thereby increasing the risk of babies being born with low birth weight (LBW) and progressing to stunting. Chronic Energy Deficiency (CED) in pregnant women reflects a long-term energy and protein deficit, which can disrupt intrauterine growth. Black et al. (2023) emphasize that maternal malnutrition before and during pregnancy is a major determinant of stunting globally. An imbalance in nutritional intake prevents the fetus from receiving sufficient macro- and

micronutrients for the development of the brain, body tissues, and vital organ systems. As a result, children are born with low nutrient reserves and experience suboptimal growth early in life.

Furthermore, research by Ratnawati and Paramitha (2024) found that mothers with chronic energy deficiency (CED) have up to an eightfold higher risk of giving birth to stunted children. This condition is further exacerbated if CED is accompanied by anemia, as reduced iron and oxygen supply will worsen the nutritional status of the fetus. Therefore, the findings of this study strengthen the evidence that CED in pregnant women is a crucial maternal factor in the intergenerational cycle of stunting. Therefore, nutritional interventions from adolescence through pregnancy need to be strengthened through national programs such as monitoring mid-upper arm circumference (MUAC), providing supplementary feeding (PMT), and nutritional counseling, to reduce the risk of stunting in the next generation.

The Relationship Between History of Anemia and the Incidence of Stunting

The results of the study showed that a history of anemia in pregnant women was significantly associated with the incidence of stunting in toddlers in Kudus Regency ($p = 0.002$; $OR = 5.11$). This means that toddlers born to mothers with a history of anemia have a more than fivefold risk of experiencing stunting compared to toddlers born to mothers without anemia. This is in line with the findings of Ratnawati & Paramitha (2024) who reported that anemic mothers are at a much greater risk of giving birth to stunted children because iron deficiency causes disruption to the supply of oxygen and nutrients to the fetus. This condition impacts inhibited intrauterine growth and increases the risk of babies being born with low birth weight (LBW), which is a predisposing factor for stunting. Biologically, anemia in pregnancy lowers hemoglobin levels, disrupting oxygen transport to body tissues, including the placenta. This results in the fetus not receiving an optimal supply of oxygen and nutrients for the growth of vital cells and organs (World Health Organization, 2021). Dewey & Begum (2021) also emphasize that anemia in pregnancy increases the long-term risk of stunted growth in children, particularly in developing countries with a high prevalence of malnutrition. Therefore, the findings of this study reinforce the importance of preventing anemia in pregnant women through nutritional interventions, iron supplementation, and regular maternal health monitoring to reduce stunting rates.

The Relationship Between Family Socioeconomic Status and the Incidence of Stunting

The results of the study showed that family socioeconomic status was significantly associated with the incidence of stunting in toddlers in Kudus Regency ($p = 0.008$; $OR = 3.97$). Toddlers from families with low socioeconomic status had almost four times greater risk of experiencing stunting compared to toddlers from families with better economic conditions. This can be explained by economic limitations affecting the family's ability to provide nutritious food, access health services, and maintain a healthy household environment. A similar study by Sudirman, Fauziyah, & Anisa (2019) stated that poverty is one of the main determinants of stunting, because poor families experience difficulty in meeting household food needs in the long term, which impacts child growth.

Furthermore, socioeconomic conditions are closely related to maternal education and parenting patterns within the family. Low levels of education can lead to limited nutritional knowledge, resulting in suboptimal toddler feeding practices (Nurul Aini et al., 2022). A study by Putri & Rokhaidah (2023) also confirmed that socioeconomic indicators such as paternal education, parental occupation, and family income are significantly associated with stunting incidence, particularly during the COVID-19 pandemic. Therefore, the results of this study strengthen the evidence that stunting reduction interventions should not only focus on child nutrition but also consider family socioeconomic factors, including improving nutritional literacy, access to nutritious food, and community economic empowerment.

The Relationship between Feeding Patterns and the Incidence of Stunting

The results of the study showed that feeding patterns were significantly associated with the incidence of stunting in toddlers in Kudus Regency ($p = 0.001$; $OR = 6.28$). Toddlers with poor feeding patterns had a more than sixfold risk of experiencing stunting compared to toddlers with good feeding patterns. This confirms that the quality and quantity of food provided by parents play a significant role in determining child growth. This finding is in line with research by Bella, Fajar, & Misnaniarti (2020) which reported that parenting patterns, including feeding habits, health care, and family hygiene, were significantly associated with the incidence of stunting in toddlers from poor families in Palembang. Furthermore, Dayuningsih, Permatasari, & Supriyatna (2020) also found that parenting and feeding patterns are the most dominant factor influencing toddler nutritional status. Low meal frequency, poor nutritional quality, and inappropriate complementary feeding can lead to low energy and nutrient intake in children. This condition directly impacts toddler linear growth, which can trigger stunting. Therefore, the results of this study emphasize the need for family-based nutritional interventions through education on proper feeding practices, improving maternal nutritional literacy, and supporting health workers in monitoring toddler dietary practices at the household level.

CONCLUSION

The results of this study indicate a significant association between a history of Chronic Energy Deficiency (CED) in pregnant women, a history of maternal anemia, family socioeconomic conditions, and feeding patterns with the incidence of stunting in toddlers in Kudus Regency. Multivariate analysis confirmed that feeding patterns were the dominant factor influencing stunting incidence. This confirms that maternal factors and childcare practices play a significant role in stunting incidence at the household level.

REFERENCES

- Astuti, R., Yuliana, E., & Hermawan, A. (2020). Hubungan Kekurangan Energi Kronis pada ibu hamil dengan kejadian stunting. *Jurnal Kesehatan Reproduksi*, 11(2), 85–92. <https://doi.org/10.22435/kespro.v11i2.3002>
- Bella, F. D., Fajar, N. A., & Misnaniarti. (2020). Hubungan pola asuh dengan kejadian stunting balita dari keluarga miskin di Kota Palembang. *Jurnal Gizi Indonesia*, 8(1), 31–39. <https://doi.org/10.14710/jgi.8.1.31-39>
- Black, R. E., Victora, C. G., Walker, S. P., & Christian, P. (2023). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, 401(10375), 103–116. [https://doi.org/10.1016/S0140-6736\(23\)00412-3](https://doi.org/10.1016/S0140-6736(23)00412-3)
- Dahlan, M. S. (2014). Statistik untuk kedokteran dan kesehatan: Deskriptif, bivariat, dan multivariat dilengkapi aplikasi dengan SPSS. Jakarta: Epidemiologi Indonesia.
- Dayuningsih, D., Permatasari, T. A. E., & Supriyatna, N. (2020). Pengaruh pola asuh pemberian makan terhadap kejadian stunting pada balita. *Jurnal Gizi dan Dietetik Indonesia*, 8(2), 89–97. [https://doi.org/10.21927/ijnd.2020.8\(2\).89-97](https://doi.org/10.21927/ijnd.2020.8(2).89-97)
- Dinas Kesehatan Kabupaten Kudus. (2024). Profil kesehatan Kabupaten Kudus tahun 2024. Kudus: Dinkes Kudus.
- Dewey, K. G., & Begum, K. (2021). Long-term consequences of stunting in early life. *Maternal & Child Nutrition*, 17(3), e13132. <https://doi.org/10.1111/mcn.13132>
- Hidayati, N., & Rahardjo, B. B. (2021). Prevalensi stunting di Indonesia berdasarkan Riskesdas 2016–2019. *Jurnal Gizi dan Kesehatan Indonesia*, 3(2), 45–52.
- Kementerian Kesehatan Republik Indonesia. (2023). Laporan hasil studi status gizi Indonesia (SSGI) 2023. Jakarta: Kemenkes RI.
- Nurul Aini, N., Sari, R., & Pratiwi, E. (2022). Hubungan status sosial ekonomi keluarga dengan kejadian stunting pada balita. *Jurnal Ilmu Kesehatan Masyarakat*, 13(2), 101–110. <https://doi.org/10.26553/jikm.2022.13.2.101-110>

- Nugroho, H., Sari, P., & Wulandari, T. (2023). Stunting pada balita: Tantangan dan strategi intervensi di Indonesia. *Jurnal Kesehatan Masyarakat*, 18(2), 110–118.
- Pacheco-Paul, C. (2023). Global nutrition targets and progress towards SDGs. *Public Health Nutrition*, 26(5), 910–917. <https://doi.org/10.1017/S136898002200310X>
- Putri, S. M., & Rokhaidah, R. (2023). Hubungan indikator sosial ekonomi dan ketahanan pangan keluarga di masa pandemi COVID-19 dengan kejadian stunting pada balita. *Jurnal Keperawatan Widya Gantari Indonesia*, 7(1), 12–20.
- Ratnawati, D., & Paramitha, R. (2024). Kekurangan energi kronis dan anemia sebagai faktor risiko stunting pada balita di Kabupaten Pekalongan. *Jurnal Gizi dan Kesehatan Indonesia*, 13(1), 45–54. <https://doi.org/10.14710/jgki.13.1.45-54>
- Rahardjo, B. B., Larasati, N., & Hidayati, N. (2020). Determinan kejadian stunting pada balita: Tinjauan literatur. *Jurnal Gizi dan Pangan*, 15(1), 45–56.
- Rusmilawaty, R., Santoso, H., & Lestari, D. (2025). Kekurangan energi kronis dan anemia sebagai faktor risiko stunting pada balita. *Jurnal Gizi Indonesia*, 10(1), 55–63. <https://doi.org/10.14710/jgi.10.1.55-63>
- Sudirman, S., Fauziyah, I., & Anisa, R. (2019). Faktor sosial ekonomi yang berhubungan dengan kejadian stunting pada balita. *Jurnal Kesehatan*, 10(2), 65–73.
- Suryati, Y., & Meku, F. X. (2023). Hubungan Pola Asuh Dan Pola Konsumsi Makanan Terhadap Kejadian Stunting Pada Balita Usia 24-60 Bulan Di Wilayah Puskesmas Ketang. *Jurnal Ners Nainawa*, 1(1), 14-21.
- Wahyuni, D., & Fitrayuna, R. (2020). Pengaruh sosial ekonomi dengan kejadian stunting pada balita di desa kwalu tambang kampar. *PREPOTIF: Jurnal Kesehatan Masyarakat*, 4(1), 20-26.
- World Health Organization. (2021). *Anaemia in women and children*. Geneva: WHO.

