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The Relationship Between A History Of Anemia During Pregnancy And The Incidence Of Stunting In Sumbermulyo Village, Jogoroto, Jombang

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Abstract

Stunting is a persistent dietary problem that affects physical growth and cognitive development in children. One significant risk factor is anemia during pregnancy. In Sumbermulyo Village, a high prevalence of stunting was recorded, with many mothers having a history of anemia in pregnancy. This research seeks to examine the correlation between pregnancy history anemia (second trimester) and the incidence of stunting in toddlers in Sumbermulyo Village, Jogoroto, Jombang. This quantitative study uses a correlational design with a retrospective approach. The study population consists of 30 mothers with stunted toddlers, selected using a total sampling method. Secondary data were obtained from maternal hemoglobin (Hb) history records and toddler height measurements. Data analysis was conducted with the Spearman Rank statistical test. The findings of this research indicate that a majority of mothers (63.3%) had anemia during the second trimester. The correlation test findings indicate a significant value of p = 0.011 (p < 0.05) and a correlation coefficient of -0.459. This signifies a substantial association of moderate intensity and negative correlation between a history of anemia during pregnancy and the incidence of stunting. It may be argued that decreased maternal hemoglobin levels during pregnancy correlate with an elevated risk of childhood stunting. Interventions to prevent anemia in pregnant women are essential as a main approach to reduce stunting rates.

Keywords: Pregnancy Anemia, Hemoglobin, Stunting, Toddlers.

INTRODUCTION

Stunting is a nutritional problem caused by consistently inadequate nutrient intake over a long period of time. Malnutrition can lead to growth and developmental disorders in children, such as short height and motor skills below age-standard levels, due to long-term chronic malnutrition (Lestari et al., 2023). Stunting not only impacts physical growth but also brain development, putting stunted children at risk of delayed cognitive development, educational attainment, and future productivity, as well as an increased risk of degenerative diseases in adulthood. (Kurniati et al., 2025).

Stunting is a global public health problem that reflects a condition of growth failure due to chronic malnutrition, especially during the first 1,000 days of a child's life, namely from pregnancy to age two. According to the World Health Organization (WHO), stunting is defined as a child's height that is below -2 standard deviations from the median growth for age and sex (Rahmawati & Purwati, 2025). Globally, there are 149 million children under five experiencing stunting, and it is estimated that 26% of children in developing countries are stunted. Indonesia ranks fifth with the highest stunting prevalence. The long-term effects of stunting will disrupt economic growth and increase poverty, with the prevalence of stunting among toddlers in Indonesia reaching 25.6% in 2021, making stunting a major nutritional problem in Indonesia. Compared with malnutrition and weight problems, the prevalence of stunting is higher. Stunting in toddlers in Indonesia is dominated by those aged 24-35 months (43%), followed by those aged 12-23 months (41.2%).(Ministry of Health, 2021)

In Jombang, the prevalence of stunting was recorded at 17.2%, placing Jombang above regions such as Kediri (7.9%) and Sidoarjo (10.6%). With a 95% confidence interval, the prevalence of stunting in Jombang is estimated to be between 14.3% and 20.7%.Health Development Policy Agency (Asnawi Abdullah et al., 2024)One of the areas in Jombang with the highest stunting rate is

Sumbermulyo Jogoroto village. According to data, there are 30 cases of stunting in toddlers in Sumbermulyo Jogoroto village, with 19 cases involving mothers with a history of anemia during pregnancy.

Stunting begins in the womb and continues through the First Thousand Days of Life (HPK), the window of opportunity for growth and development of all organs and body systems. This is known as the golden period and critical period. Nutritional issues are closely related to maternal nutrition during pregnancy and breastfeeding, which will affect newborns and children aged two years. According to the WHO website, stunting prevention should be initiated as early as possible, within the first 1,000 days of life, starting during pregnancy. Prevention measures include meeting nutritional needs during pregnancy, consuming prenatal supplements, quitting smoking and alcohol consumption, getting enough rest, regular physical activity, regular prenatal checkups, and consuming folic acid from the time of pregnancy planning.(Anugrahini et al., 2024).

Previous research has shown that early signs of stunting risk are already apparent in newborns through anthropometric measurements at birth. Infants born with low birth weight (LBW; <2,500 grams) experience intrauterine growth retardation associated with malnutrition and suboptimal nutrient supply during pregnancy, increasing the risk of future stunting. Low birth weight (LBW), defined as a birth weight below 2,500 grams, is one of the most common anthropometric indicators associated with growth retardation and the risk of long-term stunting. Low birth weight (LBW) infants exhibit nutritional deficiencies during pregnancy, which are associated with suboptimal bone and tissue growth (Itha Idhayanti & Musringah, 2022). Inferior birth length compared to normal standards is also an early indicator of stunting risk in the neonatal period. Anthropometric studies indicate that infants born with short stature are more likely to experience linear growth retardation in the first year of life.(Health & Husada, 2019).

Body proportion indicators such as the Ponderal Index in newborns can predict the risk of stunting later in life. A low Ponderal Index indicates that the baby's weight is disproportionate to his or her length, reflecting chronic malnutrition since infancy and indicating a risk of stunted growth later in life.(Rahmatul Fitria et al., 2024).Research shows that babies who experience growth restriction in the womb tend to exhibit several characteristics that are risk factors for stunting later in life. The impact of stunting is permanent, making it difficult to return an individual to their growth potential. Children who experience stunting experience reduced physical potential, which in turn hinders other abilities and skills crucial for future quality of life. Stunting also reflects a decline in intelligence. As a result, in later life, individuals will have lower cognitive abilities, resulting in uncompetitive work quality and lower economic productivity.(Central Java Provincial Bappeda Strategic Plan, 2018).

Clinically, the above characteristics indicate that the infant has experienced growth disorders since prenatally, which increases the likelihood of the child experiencing stunting after the initial growth period (6–24 months). This study emphasizes the need for early detection through anthropometric measurements of newborns as a first step in preventing stunting later in life.(Hani Sutianingsih, 2023).

Another risk factor for stunting is anemia during pregnancy. Pregnancy anemia is a condition in which the hemoglobin (oxygen-carrying protein in red blood cells) level in a pregnant woman's blood is below the normal threshold. According to the Indonesian Ministry of Health in 2021, anemia in pregnancy is defined as a condition in which a pregnant woman's hemoglobin level is below 11 g/dL. This condition often arises due to the significant increase in iron requirements during pregnancy to support fetal and placental growth. If a pregnant woman experiences anemia, this can negatively impact fetal growth and development, thereby increasing the risk of stunting, which affects the physical and cognitive development of toddlers. This indicates a correlation between anemia during pregnancy and the incidence of stunting in toddlers.(Erni Setianingsih, 2023)

Anemia is linked to stunting because a pregnant woman's hemoglobin deficiency can reduce

the blood's capacity to transport oxygen and nutrients to the fetus, triggering fetal hypoxia (oxygen deficiency) and intrauterine growth retardation (IUGR). This condition inhibits cell proliferation (increase in cell number), organ development, and fetal linear growth, which are the initial foundation for stunting. This condition can trigger fetal growth retardation, which can lead to stunting in toddlers.(Uluf et al., 2023).

Recent research reveals that anemia during pregnancy also contributes to post-natal conditions through increased incidence of infant anemia, malabsorption of nutrients and immune system weakness which ultimately accelerates growth faltering (failure to thrive) leading to stunting.(Reviani & Tampubolon, 2025).Overall, research evidence from 2022–2025 indicates that maternal anemia is a significant determinant of stunting through biological pathways (hypoxia, hormonal disturbances, low iron stores), anthropometric pathways (low birth weight, short birth length), and postnatal infection and malabsorption pathways. These findings underscore the need for anemia prevention interventions in pregnant women as a key strategy to reduce the risk of stunting in children under five.(Oktarina et al., 2024)

If prevention is not implemented, the risk of stunting is potentially greater, potentially leading to long-term impacts, particularly on child development. Previous research has shown that toddlers with stunting exhibit more significant delays in language development, personal-social development, cognitive development, and gross and fine motor skills compared to toddlers without stunting. These delays are caused by nutritional deficiencies/malnutrition, which affect children's growth, development, and physical activity, as well as impacting brain development through the child's behavior and interactions with the environment.

This study aims to investigate the relationship between a history of anemia during pregnancy and the incidence of stunting in Sumbermulyo Village, Jogoroto, Jombang. This study aims to analyze this relationship by considering maternal hemoglobin levels during the second trimester of pregnancy and the initial weight (BW) and height (HH) of toddlers in the area. Therefore, the author is interested in compiling a journal entitled "The Relationship Between a History of Anemia During Pregnancy and the Incidence of Stunting in Sumbermulyo Village," Jogoroto, Jombang.

RESEARCH METHODS

This research is analytical with correlational design to identify the relationship between variables, namely nutritional status (independent variable) and the incidence of anemia in pregnant women (dependent variable) through a cross-sectional approach. This research was conducted in the operational area of the Mayangan District Health Center. Jogoroto, Jombang Regency, with a research period from June to August 2025. The population in this study included all pregnant women who underwent pregnancy check-ups at the Mayangan District Health Center, Jombang Regency during the research period, with a total population of 334 pregnant women.

The sample size was determined using the Slovin formula with an error rate (e) of 0.05, which was 183 respondents. The technique used was Simple Random Sampling. Researchers compiled a list of all pregnant women who underwent examinations at the Mayangan Community Health Center (N=334) and randomly selected them with serial numbers 1–183 as the research sample.

Data were collected through anthropometric measurements including height (H), weight (BW), and mid-upper arm circumference (MUAC), as well as hemoglobin (Hb) level analysis using a digital hemoglobinometer. A MUAC below 23.5 cm is categorized as undernourished, while a level above 23.5 cm is considered well-nourished. A Hb level below 11 g/dL is considered anemic, while a level above 11 g/dL is considered abnormal. Additionally, additional data such as blood pressure was recorded to support the analysis of the pregnant woman's physiological condition.(Retsanboy et al., 2025).

The data were analyzed in two stages: descriptive analysis presenting respondent characteristics based on age, MUAC, and Hb levels in frequency distribution tables and diagrams. The analysis used the Chi-Square (χ^2) correlation test to identify the relationship between nutritional status (MUAC) and the incidence of anemia. The significance level used was $\alpha = 0.05$. If the p-value <0.05, there is a significant relationship.

RESULTS AND DISCUSSION

Respondent Characteristics

The results of the respondent analysis in the research conducted in Sumbermulyo Village, Jogoroto, Jombang are presented as follows:

Table 1. Frequency Distribution of Respondent Characteristics, Frequency of History of Pregnancy Anemia and Frequency of Stunting

Category	Frequency (F)	Percentage (%)
Gender of Stunting Toddlers		
Man	14	46.6
Woman	16	53.4
Age of Toddlers Experiencing Stunting		
12 – 23 months	21	70
24 – 35 months	4	13.3
36 – 59 months	5	16.7
History of Maternal Anemia During Pregnancy		
Anemia	19	63.3
No anemia	11	36.7
Stunting Incident		
No Stunting	0	0
Stunting	30	100
Stunting Category		
Short	22	73.3
Very Short	8	26.7

Table 1 shows that the majority of stunted children were 16-year-old girls (53.4%). The majority of stunted toddlers were aged 12-23 months (70%). The majority of mothers experienced anemia during pregnancy (19) (63.3%), and all toddlers (30) experienced stunting. Furthermore, the majority of stunted toddlers were categorized as short (22) (73.3%).

These data indicate a significant incidence of anemia, indicating that anemia during pregnancy is a serious problem in Sumbermulyo Village. This condition has a significant potential to lead to stunting in children, as low hemoglobin levels result in suboptimal oxygen and iron supply to the fetus, thus inhibiting growth.

Relationship between Two Variables

Table 2. Correlation Test of the Relationship Between Anemia and the Incidence of Stunting

Correlations

			Anemia	Stunting
Spearman's rho	Anemia	Correlation Coefficient	1.000	-.459*
		Sig. (2-tailed)	.	.011
		N	30	30
	Stunting	Correlation Coefficient	-.459*	1.000
		Sig. (2-tailed)	.011	.
		N	30	30

*. Correlation is significant at the 0.05 level (2-tailed).

Based on the results of the Spearman's Rho correlation test, the significance value (p-value) obtained was 0.011, which is smaller than 0.05 ($p < 0.05$). This indicates a significant relationship between anemia during pregnancy and the incidence of stunting. The correlation coefficient of -0.459 indicates a moderate relationship with a negative direction, meaning that the lower the mother's Hb (the more anemic), the higher the risk/rate of stunting. This indicates that mothers who experience anemia in the second trimester are at greater risk of giving birth to children with a birth length below the WHO standard (<48 cm) so that they have the potential to experience stunting and low birth weight (<2,500 grams).

Previous research has shown that birth length is a strong predictor of stunting. Infants born with a birth length of less than 48 cm have a 4.091 times higher risk of stunting compared to infants born with a normal birth length (Ni'mah et al., 2015). This recent case study in Samarinda confirms that birth length is an essential perinatal factor. Infants with a birth length of less than 48 cm were found to be at high risk for stunting with a strong statistical correlation ($p = 0.02$).(Rahayu et al., 2025).

Biologically, this relationship can also be explained through the mechanism of oxygen and nutrient transport through the placenta. Low hemoglobin reduces the oxygen supply to fetal tissues. This hypoxic (oxygen deficiency) condition inhibits fetal metabolic activity and protein synthesis, ultimately slowing the growth of body cells and tissues. As a result, the fetus experiences intrauterine growth retardation (IUGR), which is an early factor in stunting in toddlers. This is supported by a study that found that low Hb levels in the second trimester were a significant predictor of birth length and nutritional status at 24 months.(Fatimah et al., 2025).

The effects of anemia further exacerbate the risk of stunting when it occurs in conjunction with Chronic Energy Deficiency (CED). A study of 160 pregnant women in Tangerang found that the combination of anemia and CED increased the risk of stunting by 5.6 times compared to women without anemia and with good nutritional status. These results indicate that anemia does not exist in isolation but is closely related to the overall macro- and micro-nutritional status of pregnant women.(Setiawati & Maulana, 2024)

Field observations show that children born to mothers with Hb levels <10.5 g/dL tend to be taller and weigh less than children born to mothers with normal Hb levels. Untreated anemia can impact brain development, the immune system, and metabolism, significantly increasing the risk of stunting in the first two years of life.(Handayani et al., 2022).

Facts and Theories

Facts (Field Research Findings)

Overview of Pregnancy Anemia History

A study of 30 mothers with stunted toddlers in Sumbermulyo Village found that most had a history of anemia during the second trimester of pregnancy. Of the total respondents, 19 (63.3%) had hemoglobin (Hb) levels below the normal range during the second trimester.

The high prevalence of anemia in pregnancy indicates that anemia remains a health problem for pregnant women in Sumbermulyo Village. This fact also indicates that iron requirements during pregnancy are not being met optimally, both through dietary intake and through adherence to iron tablet consumption.

Overview of Stunting Incidents in Toddlers

All children who were subjects in the study were toddlers with stunting status, which was determined based on the height-for-age (H/U) indicator being below the WHO growth standard. This situation confirms that growth disorders don't just occur after birth, but begin during pregnancy. In other words, stunting in toddlers in Sumbermulyo Village is the result of chronic nutritional problems that persist from the prenatal period to the postnatal period.

Relationship between History of Pregnancy Anemia and the Incidence of Stunting

The correlation analysis results showed a significance value (p-value) of 0.011, which is smaller than 0.05 ($p < 0.05$). This indicates a significant relationship between anemia during pregnancy and the incidence of stunting. The correlation coefficient value obtained was -0.459, indicating a moderate relationship with a negative direction, meaning that the lower the mother's hemoglobin level (the more anemic), the greater the risk of stunting. These data indicate that the lower the mother's hemoglobin level during pregnancy, the higher the risk of the child experiencing stunting.

Children born to mothers with a history of anemia tend to have lower height and weight than children born to mothers with normal hemoglobin levels. This finding confirms that anemia during pregnancy is a significant risk factor for stunting in toddlers in Sumbermulyo Village.

Theory (Scientific Review and Conceptual Explanation)

Pregnancy Anemia from the Perspective of Nutritional Theory

Anemia in pregnancy is a condition of hemoglobin deficiency, generally caused by iron deficiency. During pregnancy, iron requirements nearly double to support the mother's increased blood volume, placental growth, and fetal development. If these needs are not met, the mother will develop anemia.

Anemia during pregnancy can disrupt metabolic balance and nutrient transport to the fetus. Hemoglobin functions as an oxygen carrier, so low Hb levels reduce oxygen supply to fetal tissues and lead to chronic hypoxia.

Biological Mechanism of Anemia on Stunting

Biologically, the relationship between pregnancy anemia and stunting can be explained through several mechanisms:

a. Decreased oxygen and nutrient supply to the fetus
   Low hemoglobin levels reduce the mother's blood's ability to transport oxygen and nutrients to the placenta. As a result, the fetus experiences limited oxygen and nutrients needed for cell and tissue growth.
b. Intrauterine growth disorders (IUGR)
   Chronic hypoxia due to anemia inhibits fetal cell division and protein synthesis. This condition triggers intrauterine growth restriction (IUGR), which is a precursor to stunting.
c. Risk of low birth weight and short birth length

Anthropometric theory explains that babies with low birth weight and short birth length have limited nutritional reserves, so they are more susceptible to growth faltering at the age of 6–24 months.

Conformity of Research Facts with Theory

Research in Sumbermulyo Village shows that the majority of mothers of stunted toddlers have a history of anemia during pregnancy. This finding aligns with the theory of nutrition and growth, which states that maternal anemia plays a significant role in stunting through biological, anthropometric, and metabolic pathways. The negative correlation, meaning that the lower the mother's Hb, the higher the risk/rate of stunting, supports the theory that the quality of child growth is significantly influenced by the mother's physical condition and nutritional status during pregnancy.

CONCLUSION

This study found that most mothers of stunted toddlers in Sumbermulyo Village (63.3%) had a history of anemia in the second trimester of pregnancy, and there was a significant relationship between low maternal hemoglobin levels during pregnancy and the incidence of stunting in toddlers, with a p value of 0.011 and a Spearman correlation coefficient of 0.459. These results indicate a moderate and negative relationship, meaning that the lower the maternal hemoglobin level, the higher the risk of stunting in children, which is consistent with the theory that anemia in pregnancy causes fetal hypoxia, intrauterine growth disorders, and an increase in the incidence of low birth weight and short birth length which lead to stunting. These findings reinforce the importance of meeting iron needs and monitoring Hb during pregnancy as part of efforts to prevent stunting from the first 1,000 days of life.

Methodologically, this study has limitations because it only used a sample of 30 mothers with severe stunting, without a control group of non-stunted toddlers, and relied on secondary data from medical records, thus not capturing other risk factors such as socioeconomic status, complementary feeding patterns, recurrent infections, and chronic energy deficiency comprehensively. Future research is recommended to use a cross-sectional or case-control design with a larger sample, include other variables known to influence stunting, and more detailed Hb measurements per trimester. The practical implications of these findings are the need to strengthen anemia prevention interventions for pregnant women in Sumbermulyo Village through nutrition education, increasing adherence to Fe tablet consumption, routine Hb monitoring at integrated health posts (posyandu), and integrating this program into the stunting prevention agenda at the village level to reduce stunting rates in future generations.

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