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The Influence Of A History Of Anemia In Pregnant Women On The Incident Of Stunting Newborn Babies

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ABSTRACT

Maternal and Child Health Problems (MCH) are still a health problem in Indonesia. Many factors affect the stunting condition, one of which is the history of anemia in pregnant women. The study aimed to know the effect of a history of anemia in pregnant women on stunting in newborns. The research design used case control. The population was all newborns of the Ponjong II Public Health Center (PHC) Gunungkidul working area in 2020-2022, with as many as 315 babies. The election of case and control groups used inclusion and exclusion criteria, which were selected from 62 samples. The research instrument used a table of data collection. Data analysis used univariate and odds ratio analysis, and Mantel Haenszel. The results of the study show that anemia in pregnancy influences stunting conditions in newborns. Mothers who have a history of anemic conditions during pregnancy and stunting conditions are 28,125 times more likely than mothers who have no history of anemia. There is an influence of anemia history in pregnant women that affects the stunting condition. A history of anemia increases the risk of newborn babies having stunts.

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INTRODUCTION

Global Nutritional Report2021 shows that Indonesia is included in 40 of the total population in 194 countries with three nutritional problems, namely stunting, wasting and overweight in babies.1Stunting is a failure to achieve optimal growth, measured based on height for age (TB/U). Stunting can occur from the time the fetus is still in the womb and becomes clearly visible when the child is two years old. Stunting is a condition of failure to thrive in newborns and toddlers due to chronic malnutrition, especially in the first 1,000 days of life (HPK).2

Stunting events that occur from childhood or from birth will have an impact in the future, one of which is impaired intelligence quotient (IQ), psychomotor development, motor skills and neurosensory integration, having an average IQ lower than that of normal toddlers. The government's target in the National Medium Term Development Plan (RPJMN) is to reduce the prevalence of stunting in 2024 by 14 percent with the stunting rate in 2021 amounting to 24.4%, so a reduction of 2.7% is needed each year.3

World Health Organization(WHO) ranked Indonesia third with the highest stunting prevalence rate in Asia in 2017.4The results of the 2019 data show that there has been a

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decrease in the prevalence of stunting from 30.8% in 2018 to 27.67% in 2019.5Even though it has decreased, this figure is still relatively high, because the WHO tolerance figure for stunting is 20%. This condition was made worse by the Covid-19 pandemic which caused layoffs so that unemployment increased and food purchasing power decreased, indirectly this had an impact on the incidence of stunting.6

WHO sets the tolerance limit for stunting (short stature) at a maximum of 20% or one fifth of the total number of children under five. In Indonesia, around 24.4% (almost 9 million) of children under five will experience stunting in 2021. The 2021 Nutritional Status Monitoring (PSG) shows that the prevalence of stunted children under five in Indonesia is still high.5Sourced from data from the Indonesian Ministry of Health, in 2021 29% of toddlers in Indonesia will be categorized as short and stunted with the percentage for the Yogyakarta Special Region being 16.2%.5The prevalence of stunted toddlers in DI Yogyakarta Province is quite fluctuating, but Gunungkidul Regency is the district with the highest prevalence of stunted toddlers, namely 20.60%.7Based on 2021 PSG data, Ponjong II Community Health Center is one of the community health centers that has a high prevalence of stunting. The number of stunted toddlers in the Ponjong II Community Health Center area is 80 toddlers, with a description of 24 toddlers being very short and 56 toddlers being short. The highest prevalence of stunting in the Ponjong II Community Health Center area is in Gombang Village, which is the priority stunting focus (locus) location in Gunungkidul Regency in 2022. Sourced from Webkesga data in 2021, the Ponjong II Community Health Center had a number of stunted live births of 12.18%, which then increased in 2022 to 14.39%.8

According to WHO, the causes of stunting in newborns are maternal factors and the living environment, inadequate food supplies, exclusive breastfeeding, and infection.5Apart from that, the main cause of stunting is pregnant women, namely 48.9% suffer from anemia and some others experience Chronic Energy Deficiency (CED).3Pregnant women's hemoglobin levels are related to the length of the baby born. The higher the Hb level, the longer the baby born.9

Iron deficiency anemia that occurs during pregnancy is associated with an increased risk of prematurity, low birth weight (LBW), and low iron reserves in newborn babies. These three risks are the risk of stunting due to impaired growth and development both in the womb and 24 months after birth. This is because the flow of iron from the mother to the fetus is inadequate, thereby disrupting metabolism, bone growth, erythropoiesis and the formation of fetal immune cells.10Previous research shows that the chance of stunting in newborns up to 24 months of age is 3.2 times greater in children with a history of maternal anemia during pregnancy.11Destarina's research states that there is a relationship between a history of anemia in pregnant women and short birth length.12However, other research by Prabandari showed that there was no relationship between anemia in pregnant women and the nutritional status of the PB/U index ($p>0.05$).13

The general aim of this research is to determine the effect of a history of anemia in pregnant women on the incidence of stunting in newborns in the Ponjong II Gunungkidul Community Health Center working area.

METHOD

The type of research is quantitative case control design. The population used in this study was all newborns in the working area of the Ponjong II Gunungkidul Community Health Center in 2020-2022, totaling 315 babies. The samples used in this study were newborn babies who met the criteria in the Ponjong II Gunungkidul Community Health Center working area, 31 in the case group (babies who experienced stunting) and 31 in the control group (babies who did not experience stunting). Sampling was based on a matching technique, namely taking into account the height of the mothers in the case and control groups. The place used for research is the Ponjong II Community Health Center area. This

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type of data uses secondary data, namely data taken from the cohort, written on the data collection sheet. The data analysis carried out was univariate analysis and bivariate analysis with the stratified OR test (Hanszel's Mantle). The researcher has received an ethical letter from the Yogyakarta Ministry of Health Polytechnic Ethics Commission No. DP.04.03/e-KEPK.1/060/2023.

RESULTS

The characteristics used in this research are education, maternal age, height, occupation, nutritional status, and anemia. Some of these characteristics are distributed according to the case group and control group. The following is the distribution of each characteristic based on the case group and control group:

Table 1. Frequency Distribution of Stunted Birth Babies Based on Mother's Characteristics at Ponjong II Health Center

Characteristics	Subject				Amount		*p value*
	Stunting		Not Stunting				
	n	%	n	%	n	%	
Education							
elementary school	2	6.5	3	9.7	5	8.1	
Junior High School	14	45.2	11	35.5	25	40.3	0.560
Senior High School	15	48.4	17	54.8	32	51.6	
Mother's Age							
At risk (<20 or>=35 years)	8	25.8	5	16.1	13	21	0.065
No risk (20-35 years)	23	74.2	26	83.9	49	79	
Height							
At risk (<45 cm)	1	3.2	1	3.2	2	3.2	1,000
No risk (>=45 cm)	30	96.8	30	96.8	60	96.8	
Work							
Formal work	5	16.1	4	12.9	9	14.5	0.479
Informal work	26	83.9	27	87.1	53	85.5	
Nutritional status							
KEK (LILA<23.5 cm)	2	6.5	1	3.2	3	4.8	0.242
Not KEK (LILA>23.5 cm)	29	93.5	30	96.8	59	95.2	

Based on the data in table 6, it is known that the proportion of senior high school education in the stunting group was 48.4%, while in the non-stunting group it was 51.6%. The proportion of maternal age at risk in the stunting group was 25.8%, while in the non-stunting group it was 16.1%, while the proportion of maternal age not at risk in the stunting group was 74.2%, while in the non-stunting group it was 83.9%. The proportion of maternal height at risk in the stunting group was 3.2%, the same as in the non-stunting group. Meanwhile, the proportion of maternal height not at risk in both the stunting and non-stunting groups was 96.8%.

The proportion of maternal employment with non-formal work in the stunting group was 87.1% and in the non-stunting group was 85.5%. The proportion of CED status with CED mothers in the stunting group was 6.5% while in the non-stunting group it was 3.2%, the proportion of CED status with non-CED mothers in the stunting group was 93.5% while in the non-stunting group it was 96.8%. The proportion of anemia in the stunting group was 48.4%, while in the non-stunting group it was 3.2%, the proportion of non-anemia in the stunting group was 51.6%, while in the non-stunting group it was 96.8%. The results of the

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analysis show that the p value is >0.05, meaning the data in the two groups is homogeneous.

Bivariate analysis was carried out on two variables that were thought to be related. The bivariate analysis used in this research is Odd-Ratio. The following are the results of the bivariate analysis:

Table 2. Relationship between anemia in pregnant women and the incidence of babies born with stunting

Characteristics	Subject				Amount		OR	CI 95% *Lower-Upper*
	Stunting		Not Stunting					
	n	%	n	%	n	%		
History of Anemia								
Anemia	15	93.8	1	6.3	16	100	28,125	3,399-232,730
Not anemic	16	34.8	30	65.2	46	100		

In the group of babies born with stunting, most of the respondents were anemic, 93.8%, while the proportion in the group of babies born without stunting, most of the respondents were not anemic, was 6.3%. The analysis results showed an OR value of 28.125 (95% CI: 3.399-232.730). So mothers with a history of anemia during pregnancy increase the risk of stunting babies being born 28,125 times greater than mothers who do not have a history of anemia. The lower bound and upper bound values show that in the study population, pregnant women who are anemic have a risk of giving birth to stunted babies between 3,399 and 232,730 times greater than those who are not anemic.

The statistical analysis method aimed at obtaining an estimate of the strength of the relationship between exposure and outcome by taking into account the influence of one or more third factors (external variables) which have the potential to act as confounding variables is called a stratification test. The test uses the Haenszel coat test on several variables, namely education, mother's age, height, employment status and nutritional status. The results of the stratification test are as follows:

Table 3. Confounding factors in the relationship between a history of anemia in pregnant women and the incidence of babies born with stunting

Variable		Subject				Amount		OR	CI 95% *Lower-Upper*
		Stunting		Not Stunting					
		N	%	N	%	N	%		
Education And Stunting									
Elementary School	Anemia	2	100	0	100	2	100	29,360	3,553 – 242,622
	Not Anemic	0	0	3	0	3	100		
Junior High School	Anemia	6	100	0	57.9	6	100		
	Not Anemic	8	42.1	11	12.5	19	100		
Senior High School	Anemia	7	87.5	1	66.7	8	100		
	Not Anemic	8	33.3	16		24	100		
Age And Stunting									
Risky	Anemia	4	100	0	0	4	100	29,199	3,399 – 250,833
	Not Anemic	4	44.4	5	55.6	9	100		
No Risk	Anemia	11	91.7	1	8.3	12	100		
	Not Anemic	12	32.4	25	67.6	37	100		

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Height And Stunting									
Risk	Anemia	0	0	0	0	0	0	29,000	3,488 –
	Not Anemic	1	50	1	50	2	100		241,131
No Risk	Anemia	15	93.8	1	6.3	16	100		
	Not Anemic	15	34.1	29	65.9	44	100		
Work	Anemia	5	100	0	0	5	100	23,611	3,329 –
Formal	Not Anemic	0	0	4	100	4	100		167,483
	Anemia	10	90.9	1	9.1	11	100		
Non-Formal	Not Anemic	16	38.1	26	61.9	42	100		
Nutritional Status									
Good	Anemia	2	100	0	0	2	100	26,021	3,284 –
	Not Anemic	0	0	1	100	1	100		206,150
Not good	Anemia	13	92.9	1	7.1	14	100		
	Not Anemic	16	35.6	29	64.4	45	100		

The results of the stratification test for history of anemia and the incidence of stunted newborns based on education show that the risk difference is more than 15%, so it can be assumed that education is a cofounding factor for the relationship between history of anemia and stunted newborns. The results of the Mantel Haenszel test show that the OR value is 29,360 (95% CI 3,533-242,622), meaning that when the maternal education variable is controlled, the risk of stunting newborns with a history of anemia is 29,360 times higher in mothers who have a history of anemia. Mothers who have a history of anemia and low education are at risk of giving birth to stunted newborns 29,360 times more than mothers with high education. Mothers who have elementary or middle school education and have a history of anemia are at least 3.53 times more likely to give birth to a stunted baby and at most 242,622 times more likely to give birth to a stunted baby.

The results of the stratification test for history of anemia and the incidence of stunted newborns based on age show that the risk difference is more than 15%, so it can be assumed that education is a cofounding factor for the relationship between history of anemia and stunted newborns. The results of the Mantel Haenszel test show that the OR value is 29,000 (95% CI 3,399-250,833), meaning that the incidence of stunted newborns with a history of anemia is higher in mothers who have a history of anemia and the possibility of stunting will increase if the woman is at risk age (<20 or >=35 years). Mothers who have a history of anemia and are at risk are 29,000 times more likely to give birth to stunted newborns than mothers who are not at risk. Mothers who are at risk and have a history of anemia are at least 3,399 times more likely to give birth to a stunted baby and at most 250,833 times more likely to give birth to a stunted baby.

The results of the analysis of the history of anemia and the incidence of stunted newborns based on body height show that the risk difference is more than 15%, so it can be assumed that height is a confounding factor for the relationship between a history of anemia and stunted newborns. The results of the Mantel Haenszel test show that the OR value is 29,199 (95% CI 3,488-241,131), meaning that the incidence of stunted newborns with a history of anemia is higher in mothers who have a history of anemia and the possibility of stunting will increase if the woman has a height at risk (< 145 cm). Mothers who have a history of anemia and are <145 cm tall give birth to 29,199 times more stunted newborns than mothers who are >=145 cm tall. Mothers who are at risk of height and have a history of anemia are at least 3,488 times more likely to give birth to a stunted baby and at most 241,131 times more likely to give birth to a stunted baby.

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The results of the stratification test for history of anemia and the incidence of stunted newborns based on occupation show that the risk difference is more than 15%, so it can be assumed that employment is a cofounding factor for the relationship between history of anemia and stunted newborns. The results of the Mantel Haenszel test show that the OR value is 23,611 (95% CI 3,329-167,483), meaning that the incidence of stunted newborns with a history of anemia is higher in mothers who have a history of anemia and the possibility of stunting will increase if the woman has a formal job. Mothers who have a history of anemia and have formal education give birth to 23,611 times more stunted newborns than mothers who work non-formally. Mothers who have formal jobs and have a history of anemia are at least 3,399 times more likely to give birth to a stunted baby and at most are 250,833 times more likely to give birth to a stunted baby.

The results of the stratification test for the history of anemia and the incidence of stunted newborns based on nutritional status show that the risk difference is more than 15%, so it can be assumed that education is a cofounding factor for the relationship between a history of anemia and stunted newborns. The results of the Mantel Haenszel test show that the OR value is 26.021 (95% CI 3.284-206.150), meaning that the incidence of stunted newborns with a history of anemia is higher in mothers who have a history of anemia and the possibility of stunting will increase if the woman experiences CED. Mothers who have a history of anemia and experience CED give birth to 26,021 times more stunted newborns than mothers who do not CED. Mothers who experience CED and have a history of anemia are at least 3,284 times more likely to give birth to a stunted baby and at most are 206,150 times more likely to give birth to a stunted baby.

DISCUSSION

Stuntingis a linear growth disorder that occurs in toddlers which describes chronic malnutrition during the growth and development period since the baby was born. It is marked with a z-score value, namely height for age (TB/U) which shows a figure below -2 standard deviation (SD).14,15 Short birth body length is a short body condition determined based on the body length index for age (PB/U). The normal body length of a newborn is≤46.1 cm in men and ≤45.4 cm in womenbetween.16 There are various risk factors that can cause stunting in babies, divided into 4 large categories, namely family and household factors, inadequate additional/complementary food, breastfeeding and infection.

Based on these results, the research hypothesis states There is a significant influence between a history of anemia in pregnant women on the incidence of stunting in newborn babies proven. Stunting has a 28,125 chance (3,399-232,730) occurs in newborns who have pregnant mothers with a history of anemia than newborns who have pregnant mothers without a history of anemia. This research is in line with research conducted by Rolla Destriana (2018) which shows a p-value of 0.00, which means there is a significant relationship between anemia and the incidence of stunted babies and mothers with anemia have a 4.31 times greater risk of experiencing incidence of stunted babies born.17

Based on research conducted by Dalal and Patel, the more severe the degree of anemia in pregnant women, the greater the influence on the child's body length at birth, which is thought to be caused by chronic placental insufficiency.11Lack of Hb levels causes the blood to not be able to send enough oxygen to all tissues, so that metabolic processes and the exchange of important nutrients in the tissues are disrupted. As a result, the placenta becomes small and the transfer of nutrients to the fetus necessary for fetal development and growth is reduced. This condition causes slow fetal growth so that the baby's birth weight becomes low because the placenta is the fetus' main source of food.18

Anemia in pregnant women affects the growth and development of the fetus, as a result of which the fetus is born in a condition of malnutrition which, if not treated immediately, will persist and cause chronic malnutrition which causes stunting. The need

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for oxygen during pregnancy is higher, which triggers an increase in erythropoietin production which results in increased plasma volume and increased red blood cells. However, the increase in plasma volume occurs in a greater proportion compared to the increase in erythrocytes, resulting in a decrease in hemoglobin (Hb) concentration due to hemodilution. Anemia can be treated by consuming foods that contain iron and blood supplement tablets. Anemia in pregnant women can reduce the supply of oxygen to the mother's metabolism, thereby affecting the baby's metabolism to become suboptimal because there is a lack of hemoglobin levels to bind oxygen. This condition has the potential to cause LBW babies to be born, putting them at risk of being underweight, wasting and stunting.17

Some of the main causes of stunting include growth restriction in the womb, insufficient nutritional intake to support rapid growth and development in infancy and childhood, and frequent exposure to infectious diseases during early life.18Malnutrition in mothers during pregnancy can affect and inhibit fetal growth, as well as causing problems with the fetus, placenta and maternal health. Some of these things especially occur in poor communities where there is insufficient availability of nutritious food and inadequate health services for pregnant women.11Handling stunting incidents is not only the responsibility of the community but also a collective responsibility. Community health centers can reduce the prevalence of stunting by creating policies and cross-sector collaboration in the field of MCH, especially in terms of preventing pregnancy anemia.

CONCLUSION

Mothers with a history of anemia during pregnancy increase the risk of stunted babies being born 28,125 times greater than mothers who do not have a history of anemia.

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