



The Influence of a History of Anemia during Pregnancy on Stunting Incidents

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Stunting is a form of growth failure (growth faltering) due to the accumulation of insufficient nutrition that lasts for a long time from pregnancy to 24 months of age. Children are classified as stunted if their Z-score is < -2 SD (stunted) and < -3 SD (severely stunted). Based on data from the Indonesian Nutrition Status Survey (SSGI), in 2022 Sumedang Regency was known as the highest stunting incidence in West Java Province, which is reported to be above 20% every year. Among 26 sub-districts in Sumedang Regency, Rancakalong District has the highest prevalence. This study aims to describe the incidence of stunting in children under five in the Rancakalong Health Center from

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August 2022 - February 2023. The design of this study is observational analytic with a retrospective case-control approach. The sample used in this study was 55 toddlers with the total sampling method. The results of the analysis found that 17 children (30.9%) were included in the stunting category and 28 mothers (50.9%) with stunting toddlers had a history of anemia during pregnancy. P value=0.002 (<0.05). This study concludes that there is a significant association between a history of maternal anemia and the incidence of stunting in toddlers.

Keywords: Children; stunting; toddlers; anemia.

1. INTRODUCTION

Stunting is a condition of failure to thrive in children under five due to chronic malnutrition, especially in the first 1,000 days of life (HPK). A lack of nutritional intake causes this condition for a long time and the occurrence of recurrent infections, both of these causal factors are influenced by inadequate parenting patterns by parents, especially within 1,000 HPK (Roselo et al, 2019, Hidayani et al, 2020, Solin et al 2019) Children are classified as stunted if their length or height according to age is lower than the applicable national standards, namely based on the body length measurement index according to age (PB/U) or height according to age (TB/U), showing measurement results with a z-score value of less than -2 Standard Deviation (SD). Stunting affects brain growth and development. Apart from that, stunting also has an increased risk of morbidity, child mortality, and disruption of children's physical, mental, intellectual, and cognitive development. Children who are affected by stunting until the age of 5 years will be difficult to correct so it will continue into adulthood and can increase the risk of offspring with low birth weight (LBW) (Adriani et al., 2022, Aryanto et al., 2020, Kamilia, 2019).

Anemia is a condition where hemoglobin (Hb) levels are reduced from normal. According to WHO, pregnant women are said to suffer from anemia if the hemoglobin (Hb) level in the blood is ≤ 11 g/dL. Many factors can influence the occurrence of anemia, but more than 50% of cases of anemia are caused directly due to reduced intake of iron, which is commonly known as iron deficiency anemia. Iron deficiency anemia occurs due to increased body needs, one of which is due to increased iron requirements during pregnancy (Cholidah et al, 2023, Rahmadhita et al, 2020). In general, there are three causes of iron deficiency anemia in pregnant women, namely the tendency for low iron (Fe) reserves in women during menstruation and previous childbirth, lack of iron intake from the food consumed, and disturbed eating patterns in pregnant women due to nausea felt during

pregnancy (Amelia et al., 2024, Rosiana, 2023; Rahayu et al., 2015).

According to the World Health Organization (WHO), the global prevalence of stunting in 2020 was 22% or 149.2 million in children under the age of five. There are around 79 million stunted children reported in Asia and 51.1 million reported in Southeast Asia (World Health Organization, 2022). Stunting is still a nutritional problem in Indonesia that has not been resolved to date (Ministry of Health of the Republic of Indonesia. (2022) Candra A, 2020). The prevalence of stunting in Indonesia in 2022 is reported to be 21.6%. This figure has decreased compared to 2013 of 37.2%, 2018 of 30.8%, 2018 of In 2019 it was 27.7% and in 2021 it was 24.4% or an average reduction in stunting of 2.0% per year. A reduction in stunting is needed by 2.7% per year so that the government's target of 14% can be achieved (SSGI 2022).

The prevalence of stunting in West Java in 2022 is reported to be 20.2%. In 2022, among the 27 regencies/cities in West Java Province, Sumedang Regency is in first place, followed by Sukabumi Regency in second place. Sumedang Regency was designated as one of the 100 priority districts/cities for stunting intervention in Indonesia because of the high prevalence of stunting in Indonesia, which is reported to be above 20% every year. The prevalence of stunting in 2021 is 22.0% and in 2022 it is 27.6%. Rancakalong District is one of the sub-districts in the Sumedang Regency area with the highest prevalence among the 26 sub-districts, although it has decreased over the last 5 years by 8.11% from 2016 29.14% to 18.03% in 2018. This is still below the target. Sumedang Regency's Regional Medium Term Development Plan (RPJMD) is expected to decrease to 17% in 2023 (TNP2K, 2018). According to data from the West Java Provincial Health Service, as of 2020, Sumedang Regency recorded 1,058 cases of pregnant women with a history of anemia. Based on this background, it is necessary to conduct research on the influence of a history of anemia during

pregnancy on the incidence of stunting in the work area of the Rancakalong Community Health Center, Sumedang Regency (Rosselo et al., 2019). A history of anemia during pregnancy describes a condition in which a woman has suffered from anemia either in her current or past pregnancies (Wija et al., 2023). Anemia arises due to a lack of red blood cells or hemoglobin, which reduces oxygen supply to body tissues. This condition can trigger a series of health complications that may contribute to stunting in toddlers (Setiawan et al., 2018). Preventing and managing maternal anemia through iron supplementation, proper nutrition, and routine prenatal care is essential in breaking the cycle of malnutrition and promoting healthy child development.

2. MATERIALS AND METHODS

2.1 Research Design

Research design is essentially a forum for answering research questions or for testing the validity of hypotheses. This research is an observational analytical study that examines the relationship (correlation) with a retrospective case-control research design approach. This design aims to study the causes of events retrospectively so that data collection on a disease is carried out now and then exposures that occurred in the past are identified based on disease tracing (Raing et al 2023, Reska et al, 2020, Damayanti et al, 2017)

2.2 Place and Time of Research

2.2.1 Research place

The location of this research was at the Rancakalong Community Health Center.

2.2.2 Research time

Data collection and implementation of this research was carried out in May 2023.

2.3 Research Population and Sample

Population is a generalization area consisting of objects or subjects that have certain qualities and characteristics determined by the researcher to be studied and then conclusions drawn. Meanwhile, the sample is defined as part of the number and characteristics of the population.

2.3.1 Population

The population determined in this study were all toddlers (under five years) in Rancakalong District, Sumedang Regency from August 2022 to February 2023.

2.3.2 Sample

A sample is a portion of the number of members of a population that can represent the characteristics of that population. The larger the sample size used, the more representative it will be of the population. This research sample was taken using the Total Sampling method for age and families who met the inclusion and exclusion criteria. The number of samples in this study was 56 toddlers

2.4 Inclusion and Exclusion Criteria

2.4.1 Inclusion criteria

Inclusion criteria are characteristics that need to be met by each sample, which in this study are:

1. Stunted toddlers based on a diagnosis at the Rancakalong Community Health Center, Sumedang Regency in August 2022 - February 2023, lived in Rancakalong District, Sumedang Regency at the time this research took place.
2. The mother checked the Hb during the child's pregnancy during Ante Natal Care (ANC) and the results were listed in the profiling data of the Rancakalong District Health Center.
3. Mother is willing to have her data used in research.

With control inclusion criteria, namely:

1. Toddlers who were not diagnosed with stunting by the Rancakalong Community Health Center, Sumedang Regency in August 2022 - February 2023, lived in Rancakalong District, Sumedang Regency at the time this research took place.
2. The mother checked the Hb during the child's pregnancy during Ante Natal Care (ANC) and the results were listed in the profiling data of the Rancakalong District Health Center.
3. Mother is willing to have her data used in research.

2.4.2 Exclusion criteria

The exclusion criteria in this study are:

1. Toddlers have physical abnormalities related to their legs and height.
2. Mothers whose data were not available were used in the research.

The control exclusion criteria are:

1. Toddlers have physical abnormalities related to their legs and height.
2. Toddlers diagnosed with stunting by the Rancakalong village health center, Sumedang Regency.
3. The mother is not willing to have her data used in research.

2.5 Research Instruments

Research instruments are tools used in research activities, especially for measuring and collecting data. The research instrument used in this research is secondary data in the form of the Sumedang Regency Regional Stunting Data Report, for the period August 2022 to February 2023.

2.6 Data Processing and Analysis

2.6.1 Data processing

Data obtained from toddler weighing reports and profiling of mothers who have stunted children for the period August 2022 - February 2023 at Rancakalong Community Health Center. The research sample obtained under the inclusion criteria was 55 patients archive data of stunting reports was obtained and all data was processed using the SPSS version 16.0 application. Tabulating/grouping the data into tables for analysis using the SPSS version 16.0 application program in the form of a frequency distribution.

2.6.2 Data analysis

Data obtained from stunting data reports in the Rancakalong District, Sumedang Regency were analyzed univariately and bivariately. Univariate analysis is a series of the most basic forms of calculations from statistical data analysis techniques. Univariate analysis aims to explain and interpret the variables studied by entering data separately in a frequency distribution table which includes demographic data, description of stunting in toddlers aged 0 - 59 months, and history of anemia in pregnant women at the

Rancakalong District Health Center. Bivariate analysis is used to determine whether there is a correlation between the dependent and independent variables using the chi-square statistical test. In this study, this study analyzes the relationship between a history of anemia in pregnant women and the incidence of stunting in toddlers.

3. RESULTS AND DISCUSSION

3.1 Research Results

Based on data obtained from toddler weighing reports and profiling of mothers who have stunted children for the period August 2022-February 2023 at Rancakalong Community Health Center. The research sample obtained following the inclusion criteria was 55 patients. The results of this research will be described using univariate and bivariate analysis.

3.1.1 Univariate analysis

Univariate analysis was used to determine the characteristics of the frequency distribution of stunting in children under five years of age (toddlers) based on height for age (TB/U).

Table 1 shows that out of a total of 55 children, 38 children (69.1%) were not included in the stunting category and 17 children (30.9%) were included in the stunting category.

Table 1. Frequency of stunting in children under five years of age (toddlers) at the rancakalong community health center for the period August 2022 - February 2023

Height/Age	Frequency	Percentage (%)
Stunting	17	30.9
Normal	38	69.1
Total	55	100

Based on Table 2, of the 55 (100%) mothers with stunting toddlers who were sampled, there were 28 (50.9%) mothers had a history of anemia during pregnancy, and 27 (49.1%) were normal/not anemic.

Table 2. Frequency of history of anemia during pregnancy in mothers with stunted toddlers at the rancakalong community health center for the period August 2022 - February 2023

Hb	Frequency	Percentage (%)
Anemia	28	50.9
Tidak Anemia	27	49.1
Total	55	100

3.1.2 Bivariate analysis

Bivariate analysis is used to determine whether there is a correlation between the dependent and independent variables using the chi-square and odds ratio statistical tests.

The table above shows that there is a significant relationship between a history of maternal anemia and the incidence of stunting in toddlers with a p-value <0.05 , namely 0.002. The table shows that there is no (0%) expected cell less than 5. The Pearson chi-square test value above can be seen that the significance value of the p-value is 0.002 with an odds ratio value of 8.

4. DISCUSSION

Based on the research results, it was found that there is a relationship between anemia that occurs in pregnancy and the incidence of stunting. Where the results of this research are in line with research conducted by Milda H, 2020 regarding the relationship between anemia in pregnant women and the incidence of stunting in toddlers at the UPTD Puskesmas Kampar in 2018 (Hastuty, 2020). The risk of stunting increases due to anemia that occurs during pregnancy. Anemia that occurs when a mother is pregnant will put 8 mothers at risk of giving birth to a baby with a short body length. The baby is born prematurely and has insufficient iron stores at birth (Hastuty, 2020). The consequences of anemia in pregnant women can cause complications, and problems during childbirth, and can endanger the mother's condition, such as fainting or even death. A pregnant woman's hemoglobin level is related to how long the baby will take to be born. In the womb, the fetus will increase in weight and length, develop the brain, and grow and develop other organs (Hulayya, 2021). Premature birth and underweight are also risk factors for stunting, so anemia in pregnant women can cause stunting in children under 5 years of age. High and low Hb levels during pregnancy will affect the birth weight of the baby because it can disrupt the growth of the fetus in the womb (Rahayu, 2015; Rahayu, 2020, Widyawati et al, 2021).

The second trimester is a time when the fetus grows faster than the previous three months. Low hemoglobin levels in pregnant women in the

second trimester can cause stunted fetal growth/small growth/length (Rahayu, 2020). From the results of this research, it was found that 17 children were stunted, of which 14 respondents experienced anemia during pregnancy, this is because there are still many pregnant women who are reluctant to consume Fe tablets regularly, the reason is because the side effects of Fe tablets make mothers feel uncomfortable. Based on the results of research conducted by Eline C, 2019 regarding the relationship between consumption of Fe tablets and body length in children aged 12-24 months, it was found that 16 respondents (36.4%) reported consuming Fe tablets from 44 postpartum mothers who stated that they were compliant with consuming Fe tablets and 28 respondents (63.6%) were not compliant with consuming Fe tablets. With analysis results of P Value 0.002 ($\alpha < 0.05$) (ESB Chart, 2019, Wulansari et al 2021). Iron deficiency during pregnancy is very common. It is estimated that half of all pregnant women worldwide are iron deficient. If you don't get enough iron from food, the body gradually takes it from iron stores in the body, thereby increasing the risk of anemia (ESB Chart, 2019). According to experts, anemia caused by iron deficiency in the first two trimesters is associated with twice the risk of premature birth and three times the risk of low birth weight. Stunting begins to occur when the fetus is still in the womb due to the mother's food intake during pregnancy being less nutritious (ESB Chart, 2019, Kamila, 2019).

Efforts that must be made by health workers, especially midwives, to prevent anemia in pregnant women are increasing the consumption of iron from food sources such as vegetables, fruit, nuts, and grains, as well as providing iron supplements (Rahayu, 2020) Some of these things especially occur in poor communities where there is insufficient availability of nutritious food and inadequate health services for pregnant women. Factors such as age, parity, occupation, and maternal education can also influence maternal anemia during pregnancy (Rahayu, 2020). From the results of this research, it was also found that from 17 stunted children, there were 3 stunted children whose mothers were not anemic. So this shows that mothers who have good Hb also have a risk of giving birth to stunted children (Directorate of Maternal Health Development.,2012).

Table 3. Correlation of history of anemia in pregnant women with stunted toddlers at Rancakalong Community Health Center for the period August 2022 - February 2023

Hb	Frequency TB/U		Total	P-Value	Odds Ratio
	Stunting	Normal			
Anemia	14	14	28	0.002	8
Not Anemia	3	24	27		
Total	17	38	55		

According to research conducted by Rolla Destarina (2017) entitled Risk Factors for Anemic Status of Pregnant Women, Short Birth Body Length at Sentolo 1 Health Center. Kulon Progo D.I Yogyakarta, the results of the research showed that 30% of pregnant women experienced anemia at Sentolo 1 Health Center or 96 pregnant women. Meanwhile, there were 219 (70%) pregnant women who were not anemic (Hastuty, 2020). According to the researchers' assumptions, of the 53 stunted children, 14 respondents did not experience anemia during pregnancy, this is because even though during pregnancy the mother's nutrition was fulfilled and the Hb level was always normal, it does not rule out the possibility that when the child is born if the mother does not pay attention to the child's nutrition and lack of monitoring the child's growth and development at the Posyandu, it could cause the child to experience stunting (Hastuty, 2020). Most of the reasons mothers don't pay attention to their children's nutrition are due to lower economic factors, parents are not fully able to buy highly nutritious food, even though parents could give their children nutritious food from the garden or food ingredients that are not too expensive but have sufficient nutrition such as tempeh, spinach or even fish they catch themselves. Parents can also come to the nearest health facility to get PMT (supplementary feeding) from the local health facility nutritionist (Hastuty, 2020).

5. CONCLUSION

Based on the research results obtained, it can be concluded that: 1) Description of the incidence of stunting in the Rancakalong Community Health Center working area of 17 children under five (30.9%); 2) The description of mothers who experienced anemia during pregnancy in the Rancakalong Community Health Center working area was 28 pregnant women (50.9%); 3) There is a relationship between anemia in pregnancy and the incidence of stunting at the Rancakalong District Health Center, which is according to the analysis of this relationship, the p-value = 0.002 (<0.05) with a confidence level of 90%; 4) At the Rancakalong District Health Center, mothers with

a history of anemia during pregnancy have a 2.3 times higher chance of having a stunted child, namely based on the results of OR = 8.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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