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Determinants of stunting in Samadua sub-district, South Aceh district

Faktor yang mempengaruhi stunting pada anak usia 6-24 bulan di Kecamatan Samadua kabupaten Aceh Selatan

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Abstract

Stunting remains a major malnutrition problem in Indonesia, and is caused by chronic malnutrition and recurrent infections. The 2022 Indonesian Nutrition Status Survey (INSS) reported that Aceh ranked fifth, with a high prevalence of stunting. Malnutrition during the golden period (toddlers) can be corrected. This study aimed to analyze the factors that influence stunting and the most dominant factors in children aged 6-24 months. The study had a cross-sectional design. The subjects were 120 children in Samadua District, South Aceh Regency, recruited by simple random sampling from November 2023 to January 2024. Data were collected through interviews using questionnaires, anthropometric measurements, and 24-hour recalls. Analysis was performed through binary logistic regression test and continued multivariate analysis using 95% logistic regression test (CI). Results, risk factors affecting stunting in children aged 6-24 months were birth length (p=0.093; OR=13.0), birth weight (p=0.043; OR=15.400), maternal anemia history (p=0,006; OR=18,000), antenatal care history (p=0.001; OR=20.429), ARI frequency (p=0.004; OR=7.500), protein sufficiency (p=0.005; OR=5.910), fat sufficiency (p=0.006; OR=7.083), calcium sufficiency (p=0.009; OR=6.081), iron sufficiency (p=0.054; OR=4.375), and zinc sufficiency (p=0,014; OR=5,500). In Conclusion, the factors that influence the incidence of stunting in children aged 6-24 months are length and birth weight, history of maternal anemia and antenatal care, frequency of ARI, and nutritional adequacy (protein, fat, calcium, iron, and zinc adequacy).

Keywords: Birth length, birth weight, frequency of ARI, stunting

Abstrak

Stunting masih menjadi masalah kekurangan gizi utama di Indonesia yang disebabkan oleh gizi kronik dan infeksi berulang. Survei Status Gizi Indonesia (SSGI) tahun 2022 melaporkan bahwa Aceh memiliki peringkat ke lima dengan prevalensi stunting tinggi. Kekurangan gizi pada masa periode emas (balita) masih dapat diperbaiki. Penelitian bertujuan untuk menganalisis faktor yang mempengaruhi stunting dan faktor paling dominan pada anak usia 6-24 bulan. Penelitian berdesain *cross sectional*. Subjek berjumlah 120 anak dilakukan di Kecamatan Samadua Kabupaten Aceh Selatan, dengan cara *simple random sampling* pada bulan November tahun 2023 hingga Januari 2024. Data dikumpulkan melalui wawancara menggunakan kuesioner, pengukuran antropometri dan *recall* 24 jam. Analisis melalui uji regresi logistik biner dan dilanjutkan analisis multivariat menggunakan uji regresi logistik (CI) 95%. Hasil, faktor risiko yang mempengaruhi stunting pada anak usia 6-24 bulan adalah panjang badan lahir (p=0,093; OR=13,0), berat badan lahir (p=0,043;OR=15,400), riwayat anemia ibu (p=0,006; OR=18,000), riwayat antenatal care (p=0,001; OR=20,429), frekuensi ISPA (p=0,004;OR=7,500), kecukupan protein (p=0,005; OR=5,910), kecukupan lemak (p=0,006;OR=7,083), kecukupan kalsium (p=0,009; OR=6,081), kecukupan zat besi (p=0,054; OR=4,375), dan kecukupan zink (p=0,014; OR=5,500). Kesimpulan, faktor yang mempengaruhi kejadian stunting pada anak usia 6-24 bulan yaitu panjang dan berat badan lahir, riwayat anemia ibu dan antenatal care, frekuensi ISPA, kecukupan zat gizi (protein, lemak, kalsium, zat besi dan kecukupan zink).

Kata Kunci: Berat badan lahir, frekuensi ISPA, panjang badan lahir, stunting

Introduction

Current nutritional problems in Indonesia include overnutrition and undernutrition. Overnutrition includes overweight and obesity, whereas undernutrition includes wasting, underweight, and stunting. As many as 45,4 million children are wasted worldwide, 150 million are stunted (World Bank, 2021), and 250 million do not meet their potential development (Black et al., 2017). The prevalence of stunting is 21,6%, wasting is 7,7%, and underweight is 17,1% (SSGI, 2022). Aceh Province occupies the fifth position with a stunting prevalence of 31,2%. The high incidence of stunting in Aceh is inseparable from the contribution of stunting prevalence rates from various districts/cities in Aceh, including South Aceh District.

Stunting is a condition of unsuccessful linear growth that occurs in childhood due to chronic nutritional deficiencies that last for a long period and is characterized by a z-score value of height-for-age or length-for-age of less than -2 standard deviations (WHO, 2019). Stunting can be caused by several factors. One of them is the low intake of nutrients and poor health status, which is the direct cause of the stunting problem (Kemenkes RI, 2018). The Impact of stunting can lead to bad things for children's health, both in the short and long term. Short-term adverse effects include inhibition of brain and motor development, inhibition of physical growth, and disturbed metabolism. Long-term stunting results in decreased learning achievement, cognitive decline, and productivity in adulthood and is very vulnerable to the risk of infection. Thus, the adverse effects of stunting will affect the quality of human resources and the nation's future productivity (UNICEF, 2013).

The golden period of human life is the first thousand days of life, which starts from conception until the child is two years old. This period is also a critical period of growth and development that determines the child's future (Victora et al., 2010). A study in West Sulawesi Province using RISKESDAS (2018) found that the mother's education, father's education, mother's pregnancy check-up history, mother's pregnancy TTD consumption history, and mother's age at delivery had a significant effect on stunting (Ardian & Utami, 2018). Research conducted in Indonesia found that the determinants of stunting in toddlers were male children, living in slums, and experiencing an increase in the number of family members (F. Wicaksono & Harsanti, 2020). Meanwhile, research in Nigeria shows that the dominant factors causing stunting in children aged 0-59 months are sex, child weight at birth, breastfeeding duration, household wealth, political region, and diarrhea (Akombi et al., 2017).

The Indonesian government has been trying to address stunting by implementing a national strategy to reduce the incidence of stunting by combining various nutrition intervention programs, both general and more specific, to accelerate addressing the problem (TNP2K, 2017). Despite this, in the incidence of stunting remains high in a number of provinces, for example, Aceh province

This research provides a strong basis for policymakers to design more effective health and nutrition programs, with a better understanding of the risk factors for stunting, as the government can allocate resources more efficiently and direct their efforts to areas of need. Therefore, this study aimed to analyze the factors that have a significant association with the incidence of stunting. A better understanding of these factors is expected to make a valuable contribution to the development of effective intervention strategies to reduce the incidence of stunting in children under five years of age. In addition, no studies have analyzed the factors associated with the incidence of stunting in Samadua District, South Aceh Regency.

Methods

Type of research used a quantitative approach with a cross-sectional design. This study was conducted in the Samadua sub-district from November 2023 to January 2024. The data collected in this study consisted of primary and secondary data. Primary data were obtained through interviews conducted with mothers of toddlers using a questionnaire and direct measurement of body weight and height using a weight scale and an infantometer or microtoise.

The participants were 120 children aged 6-24 months who met the following inclusion criteria: mothers/caregivers who had children aged 6-24 months, had a mother and child health book (MCH), and were willing to participate in the study. The independent variables in this

study were children's characteristics (age, sex, weight, age, sex, and age). Maternal characteristics (maternal age, height, history of anemia during pregnancy, and antenatal care), family characteristics (parental education, parental occupation, household income, and number of family members), history of infectious diseases (frequency of ARI and diarrhea), IYCF practices (EBI, exclusive breastfeeding, breastfeeding 6-24 months, and complementary feeding), basic immunization divided into two categories: complete and incomplete), access to health services (Posyandu and Puskesmas), and sanitation (hand washing with soap, access to healthy latrines, access to clean water, and waste disposal).

The data processing and analysis included coding, cleaning, and analysis. The data analysis consisted of univariate, bivariate, and multivariate analyses. Univariate analysis was performed by conducting a frequency distribution test for percentages and numbers. Bivariate analysis was used to determine the extent of the relationship between factors suspected of being associated with stunting using the chi-square test with a significance level of p = 0,05, and 95% CI. To determine the most dominant risk factor or odds ratio (OR), multivariate logistic regression analysis was conducted on bivariate selection variables with a p-value <0,25 (Riyanto, 2017).

This research has passed ethical approval obtained from the Health Research Ethics Commission of the Poltekkes Kemenkes Aceh (No: KP.0403/12.7/001/2024).

Result and Discussion

Child characteristics included birth length and birth weight. Table 1 shows that half of the sample (60%) had a normal birth length and (66,7%) had a normal birth weight. The characteristics included normal maternal height (80%) and a history of Antenatal Care fewer than six times (63,7%). Family characteristics included the number of household members being less than or equal to four (59,2%) and approximately half (55%) of fathers with a high school education level. The history of infectious diseases included a history of diarrhea, and almost all (88,3%) had not experienced frequent diarrhea in the last three months, most (61,7%) frequency of ARI was classified as infrequent ARI.

Infant and young child feeding practices included EBI (54,2%) and complementary feeding at less than 6 months of age (57,5%). Sanitation includes access to as much clean water as (72,5%) households that have access to clean water and access to healthy latrines that do not use their own defecation facilities, the type of place to defecate goose neck or and septic tank landfills (not feasible) as many as (53,3%). Nutrient intake included energy and calcium intake. Almost all the samples were in the energy deficit category (90%), and most of the calcium intake was in the deficient category (69,2%).

Table 2 shows that the proportion of stunting in infants born short was higher (66,7%) than that in infants born with normal body length (33,3%) (p<0,000). The incidence of stunting was higher in children who experienced LBW (58,3%) than in those who did not (41,7%). The incidence of stunting was higher in mothers with a history of Antenatal Care less than six times during pregnancy (65%) than in mothers with a history of antenatal care more than six times during pregnancy. The incidence of stunting was significantly more prevalent in toddlers born to families with more than four household members (55 %) than in toddlers born to families with less than four household members (45 %) (p<0,002).

Table 1. Child characteristics, mother characteristics, family characteristics, history of infectious diseases, sanitation and nutrient intake (n=120)

Variable	Category	n	%
Child characteristics			
Birth length	Birth length short (<48 cm)	48	40,0
	Normal (≥48 cm)	72	60,0
Birth weight	Low birth weight (<2500 g)	40	33,3
	Normal (≥2500 g)	80	66,7
Maternal characteristics			
Mother's height	Normal (≥150 cm)	96	80,0
	Short (<150 cm)	24	20,0

Antenatal care history	< 6 time	44	36,7
	≥6 time	76	63,7
Family characteristics			
Number of household members	Large > 4 person	49	40,8
	Small ≤ 4 person	71	59,2
Father's education	Low (Elementary school/equivalent- Junior High School/equivalent)	42	35,0
	Medium (Senior High School/equivalent)	66	55,0
	High (assosiate degree /bachelor/magister/doctor)	12	10,0
History of infectious disease			
Frequency of diarrhea	Frequent (>2x/last 3 months)	14	11,7
	Not often (≤2x/last 3 months)	106	88,3
Frequency of ARI	Frequent (≥7x/year)	46	38,3
	Not often (<7x/year)	74	61,7
Infant and young child feeding practices			
early breastfeeding initiation	Yes	55	45,8
	No	65	54,2
Practice of complementary feeding	< 6 months	69	57,5
	≥ 6 months	51	42,5
Sanitation			
Access to clean water	Not feasible	33	27,5
	feasible	87	72,5
Access to healthy latrine	Not feasible	64	53,3
	feasible	56	46,7
Nutrient intake			
Energy intake	Deficit (<89%)	96	80
	Normal 90%-119%	24	20
Calcium Intake	Deficit (<77%)	83	69,2
	Adequate (≥77%)	37	30,8

Another significant difference (p<0,004) was in the incidence of stunting in children who rarely experienced diarrhea (96,7%) compared to children who often experienced diarrhea (3,3%) in the last three months. The incidence of stunting was significantly higher in children who did not receive EBI (70%) than in those who received EBI (30%) (p<0,000). The incidence of stunting was significantly higher in children with energy adequacy levels classified as deficit (43,3%) than in those with energy adequacy classified as normal (11,7%) (p<0,000).

The factors associated with stunting are presented in Table 3, where birth length was found to be a factor associated with stunting. The risk of a child with a birth length of less than 48 cm being stunted is 13 times that of a child with a birth length greater than 48 cm. Children with low birth weight have a 15,400-fold higher risk than children with normal birth weight. Mothers with a history of anemia have a risk of stunting 18 times higher than mothers with a normal history of anemia. Antenatal care visits fewer than six times have a risk of stunting children 20,429 times compared to mothers who make antenatal care visits more than six times. Children who frequently experience ARI are at risk of stunting 7,500 times compared to children who do not frequently experience ARI. Children with low protein intake were at risk of stunting 5,910 times compared to children with normal protein intake. Children with less fat intake are at risk of stunting 7,083 times compared with children with normal fat intake. Children with low calcium intake are stunted 6,081 times compared to children with normal calcium intake. Children with less iron intake are at a higher risk of stunting 4,375 times than children with normal iron intake. In addition, children with insufficient zinc intake are at risk of stunting 5,500 times compared with children with normal zinc intake.

Table 2. Relationship between birth length, birth weight, antenatal care history, family size, diarrhea frequency, EBI, and protein sufficiency level with stunting

Variabel	Stunting		Normal		p-value	PR
	n	%	n	%		
Birth Length						
Short <48cm	40	66,7	8	13,3	0,000	11,227
Normal ≥48 cm	20	33,3	52	86,7		
Birth Weight						
LBW <2500 g	35	58,3	5	8,3	0,000	5,600
Normal ≥2500 g	25	41,7	55	91,7		
Antenatal Care History						
Not strandardized < 6 times	39	65,0	5	8,3	0,000	20,429
Stardardized ≥ 6 times	21	35,0	55	91,7		
Number of household members						
Large > 4 people	33	55,0	16	26,7	0,002	3,361
Small ≤ 4 times	27	45,0	44	73,3		
Diarrhea Frequency						
Frequent (>2x/last 3 months)	2	3,3	12	20,0		
Infrequent (≤2x/last 3 months)	58	96,7	48	80,0		
EBI						
Yes	18	30,0	37	61,7	0,000	3,754
No	42	70,0	23	38,3		
Protein Adequacy Level						
Deficit (<89%)	26	43,3	7	11,7	0,000	7,083
Normal (90%-119%)	34	56,7	53	88,3		

Table 3. Final model of factors associated with stunting

Variabel	β	OR (95% CI)	p-value
Birth length	1,438	13,000 (5,193-32,546)	0,093
Short <48cm			
Normal ≥48 cm			
Birth weight	2,219	15,400 (5,391-43,988)	0,043
LBW <2500 g			
Normal ≥2500 g			
Mother's history of anemia	3,276	18,000 (6,624-48,917)	0,006
Anemia (Hb ≤11 g/dL)			
Normal (Hb > 11 g/dL)			
Antenatal Care history	4,466	20,429 (7,091-58,852)	0,001
Not standardized < 6 times			
Standardized ≥ 6 times			
Frequency of ARI	3,421	7,500 (3,196-17,601)	0,004
Frequent (≥7x/year)			
Not often (<7x/year)			
Protein Adequacy	1,718	5,910 (3,170-11,019)	0,005
Deficit (<89%)			
Normal (90%-119%			
Fat Adequacy	1,679	7,083 (2,776-18,075)	0,006
Deficit (<89%)			
Normal (90%-119%			
Calcium Adequacy	1,417	6,081 (2,472-14,960)	0,009
Deficient (<77%)			
Adequate (≥77%)			
Iron Adequacy	1,046	4,375 (1,875-10,210)	0,054
Deficient (<77%)			

Adequate (≥77%)			
Zink sufficiency	1,303	5,500 (2,510-12,053)	0,014
Deficient (<77%)			
Adequate (≥77%)			

Birth length is significantly associated with the incidence of stunting. This result is in line with previous research (Nshimyiryo et al., 2019), which states that birth length is significantly associated with the incidence of stunting. These results are also in line with research conducted by Ni'mah & Nadhiroh (2015), Kusumawati et al. (2015), and Budiastutik & Rahfiludin (2019), which showed that toddlers with low birth length are at risk of stunting compared to toddlers with normal birth length. Low birth length occurs when women experience a lack of nutritional intake, which affects the growth of non-optimal children. After birth, there is insufficient nutritional intake for a long period. One of the impacts is the nutritional status of children based on their height and age (stunting) (Sutrio & Lupiana, 2019).

Low birth weight is associated with a higher risk of stunting than normal-weight children. This research is in line with research conducted by Sarma et al. (2017) on 7647 children in Bangladesh, which states that LBW children are at a higher risk of becoming stunted than children born normally. This research is also in line with research conducted in Yogyakarta, which states that LBW children have a 3,5 times chance of becoming stunted compared to children born normally (Huriah et al., 2021). Low birth weight is a public health problem with significant short- and long-term effects. LBW not only predicts prenatal morbidity and mortality rates but can also increase the risk of future non-communicable diseases such as diabetes and cardiovascular disease (WHO, 2014).

Anemia during pregnancy is associated with the possibility of stunting. Anemia during pregnancy can increase the risk of premature birth, low birth weight, short birth length, bleeding before and during delivery, and maternal and infant mortality (Widyaningsih et al. 2018). The causes of anemia in pregnant women can vary, ranging from insufficient energy and nutrient intake to dietary iron deficiency. In addition, a lack of iron consumption from the recommended supplements can cause anemia during pregnancy.

Mothers with a history of Antenatal Care less than six times during pregnancy were at a risk of stunting 20,429 times greater than mothers with a history of Antenatal Care more than six times during pregnancy. This is in line with research Amini (2017) that mothers who do not perform antenatal care according to the standard may have a 2,1 times greater risk of experiencing stunting in children under 12-59 months of age. Regular Antenatal care visits can help detect pregnancy risks early, particularly those related to nutritional problems. Mothers who perform antenatal care as recommended have a lower risk of stunted children (Lailatul & Ni'mah., 2014; Al Rahmad et al., 2023).

Toddlers with a history of ARI disease with a frequency of more than seven times a year are at risk of stunting 7,5 times greater than toddlers with a history of ARI disease with a frequency of less than seven times a year. This is in line with research conducted in Southern Ethiopia showing that toddlers who experience repeated attacks of acute respiratory infections are twice as likely to be stunted as those who do not. This is because during illness, nutritional needs increase, and children lose their appetite, making them stunted (Dewana et al., 2017). Research conducted in Southeast Aceh also showed a significant relationship between a history of ARI and the incidence of stunting in children. Children with a history of ARI have a 3,47 times risk of becoming stunted compared to children without a history of ARI (Wicaksono et al., 2021).

Protein deficiency, in terms of both quality and quantity, has a significant relationship with the incidence of stunting. Protein has an important role that cannot be replaced by other nutrients, namely in the formation and maintenance of cells and body tissues. Toddlers who lack protein have a 9,1 times higher risk of stunting (Anshori et al., 2020). Another study showed that toddlers who do not get enough protein than recommended have a 4 times greater risk of stunting (Fikawati et al., 2021). Growth in toddlers requires more protein than in adults because they are in a period of growth (Sari et al., 2016). Proteins are important for bone growth and matrix formation. Children

who lack protein tend to grow more slowly than those who receive sufficient protein (Azmy & Mundiastuti, 2018). This is because protein deficiency can affect the genetic ability to reach peak bone mass as well as regulate the secretion and action of hormones important for bone growth. Studies in several Asian countries have shown that protein-deficient children have an average height that is 1,39 cm shorter than children with adequate protein intake (Acosta et al., 2017).

In addition to proteins, fat is associated with stunting. This study is in line with research conducted in Bangkalan showing that a lack of fat consumption can increase the risk of stunting by 1,7 times greater to experience stunting (Azmy & Mundiastuti, 2018). Fat is an important component of many hormones, including leptin, which plays a role in bone growth. Additionally, fat contains essential fatty acids that play a role in maintaining health (Mikhail et al., 2013). During a child's growth period, fat is needed to support the development of the nervous system, provide energy, and aid in the absorption of fat-soluble vitamins, such as vitamins A, D, E, and K. Consumption of macronutrients, such as fat, is very important and must be sufficient every day to prevent stunting.

Children with a calcium intake of less than 77% are at a risk of stunting 8,805 times greater than children with a calcium intake of more than 77%. The results of the same study conducted by Armelia (2014) showed that calcium deficiency in children can inhibit growth because it affects the bone mineralization needed for bone growth (Peacock, 2010). Adequate calcium intake is essential during growth to support new bone mineralization and critical bone cell functions (Khairy et al., 2010).

Iron deficiency often occurs in infants aged 6-24 months. Some risk factors that lead to deficiencies in this age range include early consumption of formula or cow's milk, formula milk that does not contain additional iron, limited purchasing power for nutritious foods, and poor nutritional knowledge (Avinashi et al., 2014; Al Rahmad, 2023). Insufficient iron intake is associated with a 12,228 times greater risk of stunting than children with normal iron adequacy levels. The results of the same study conducted by Rosmanindar (2013) showed that iron supply has a significant relationship with the incidence of stunting. The non-heme iron contained in vegetables generally has a lower absorption rate than heme iron. This causes stunted children to have insufficient iron intake, mainly due to these factors. In addition, inhibiting factors, such as tea consumption, can inhibit proper iron absorption in children (Kurnia et al., 2014).

Zinc deficiency can have mild-to-severe effects, including delayed growth and immune system disorders. Zn intake has a significant relationship with stunting. Children with insufficient Zn intake tend to experience stunting. The same results in this study conducted by Lestari 2016) indicate that zinc intake is related to the incidence of stunting. Therefore, it is important to provide adequate food to children to prevent zinc deficiency. Zinc deficiency can occur because of low meat consumption, which may be caused by economic or religious problems. Meat, poultry, and fish are food sources that are rich in zinc and are easily absorbed by the body (Cakmak, 2009).

Conclusion

The dominant factors that influence stunting in children aged 6-24 months in Samadua District, South Aceh Regency are birth length, birth weight, history of maternal anemia, Antenatal Care history, frequency of ARI, adequacy of protein, fat, calcium, iron, and zinc. The results of this study can assist governments in formulating public policies aimed at preventing and reducing the incidence of stunting. This could include nutrition policies, public health education programs, and appropriate resource allocations.

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