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Factors influencing the nutritional status of children aged 6–23 months based on the Composite Index of Anthropometric Failure (CIAF)

Faktor penyebab status gizi anak usia 6-23 bulan menurut Composite Index of Anthropometric (CIAF)

Rizki Maulidya[1*], Zulfan[2], Sarah Nadya[3], Amelia Zahara[4]

[1] Bachelor Program in Nutrition, STIKes Muhammadiyah Lhokseumawe, Lhokseumawe, Aceh, Indonesia
E-mail: kikie.maulidya086@gmail.com
[2] Bachelor Program in Nutrition, STIKes Muhammadiyah Lhokseumawe, Lhokseumawe, Aceh, Indonesia.
E-mail: zulfangizi@gmail.com
[3] Bachelor Program in Nutrition, STIKes Muhammadiyah Lhokseumawe, Lhokseumawe, Aceh, Indonesia.
E-mail: snsarah25@gmail.com
[4] Bachelor Program in Nutrition, STIKes Muhammaiyah Lhokseumawe, Lhokseumawe, Aceh, Indonesia
E-mail: ameliazahara439@gmail.com

***Correspondence Author:**
Bachelor Program in Nutrition, STIKes Muhammadiyah Lhokseumawe, Jl. Darussalam No. 47, Desa Hagu Selatan, Lhokseumawe. Provinsi Aceh, 23353, Indonesia.
E-mail: kikie.maulidya086@gmail.com

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Abstract

Lhokseumawe City still experiences the nutritional problems of being underweight, stunting, and wasting, so it is necessary to know the factors that cause it, especially in the Banda Sakti Health Center. The aim of this study was to determine the factors that affect the nutritional status of children aged 6-23 months according to the Composite Index of Anthropometry (CIAF). This cross-sectional study was conducted at the Banda Sakti Health Center in 2023. A total of 314 children aged 6-23 months were randomly selected. Data were collected via interviews, questionnaires, and anthropometric measurements (weight and height). Nutritional status data were processed using WHO Anthro 2005 software. Data were analyzed using the chi-squared test and logistic regression analysis. Results: The prevalence of growth failure in children at Banda Sakti Health Center was 23,2%. The determinants of growth failure were ANC (p=0,000; OR=20,8), birth weight (p=0,000; OR=8,44), complementary feeding diversity (p=0,000; OR=10,3), animal protein consumption (p=0,000; OR=17,23), and complete immunization (p=0,000; OR=4,41). Antenatal Care (ANC) examination was the dominant factor affecting the incidence of growth failure in children aged 6-23 months (OR= 20,8). In conclusion, incomplete ANC examination is the dominant factor associated with the incidence of growth failure in children aged 6-23 months at the Banda Sakti Health Center, Lhokseumawe City.

Keywords: Anthropometric, antenatal care, composite index, growth failure

Abstrak

Kota Lhokseumawe masih mengalami masalah gizi baik underweight, stunting mapun wasting, sehingga perlu diketahui faktor penyebabnya terutama di wilayah kerja Puskesmas Banda Sakti. Tujuan penelitian untuk mengetahui faktor penyebab status gizi anak usia 6-23 bulan menurut Composite Index of Anthropometric (CIAF). Penelitian menggunakan desain coss sectional dan dilakukan di Puskesmas Banda Sakti pada tahun 2023. Jumlah sampel 314 anak usia 6-23 bulan diambil secara random. Data dikumpulkan dengan wawancara menggunakan kuesioner, dan pengukuran antropometri (berat badan dan tinggi badan). Data status gizi diolah menggunakan sofware *WHO 2005*. Analisa data menggunakan uji Chi-square dan regresi logistik pada CI 95%. Hasil, prvalensi gagal tumbuh pada anak di Puskesmas Banda Sakti sebesar 23,2%. Faktor determinan gagal tumbuh yaitu pemeriksaan ANC (p= 0,000; OR=20,8), berat badan lahir (p=0,000; OR=8,44), keragaman MPASI (p=0,000; OR=10,3), konsumsi protein hewani (p=0,000; OR=17,23), kelengkapan imunisasi (p=0,000; OR=4,41). Pemeriksaan ANC merupakan faktor dominan dengan kejadian gagal tumbuh anak usia 6-23 bulan dengan OR=20,8. Kesimpulan, pemeriksaan ANC tidak

lengkap merupakan faktor dominan berhubungan dengan kejadian gagal tumbuh anak usia 6-23 bulan di Puskesmas Banda Sakti, Kota Lhokseumawe

Kata Kunci: Antropometri, indeks komposit, kegagalan pertumbuhan, perawatan antenatal

Introduction

The nutritional status of children under five years is an assessment of the success of sustainable national development or Sustainable Development Goals (SDGs). This assessment can be seen in the prevalence of malnutrition among toddlers (Balalian et al., 2017). Nutritional problems in children can cause cognitive disorders that affect educational attainment and reduce productivity. Cognitive disorders result in a lack of literacy, numeracy, reasoning, and vocabulary (Oot et al., 2016). In addition, nutritional problems in children can also increase the risk of non-communicable diseases, such as diabetes mellitus and coronary heart disease, and can increase morbidity and mortality due to infectious diseases, such as pneumonia and diarrhea. The risk of illness and death in children will continue into adulthood (Prendergast & Humphrey, 2014).

The prevalence of nutritional problems varies worldwide. According to WHO, in 2021 the stunting rate among toddlers worldwide reached 22%, and wasting 6,7% (Hasanah et al., 2020). The prevalence of nutritional problems in Indonesian children aged 6-23 months was 10,4%, 12,9%, and 6,6%, respectively. Aceh Province is still below the national average, with 13,7%, stunting 17,2% and moderate wasting 8,8% (BKPK 2024). In Lhokseumawe, the prevalence rates in children aged 6-23 months were 17,4%, 20,7%, and 7,6%, respectively. The Banda Sakti Health Center has 47 children aged 6-23 months stunted, 34 wasted, and 53 children aged 6-23 months are underweight (Dinkes Lhokseumawe, 2024).

Nutritional status in children can be assessed using three primary conventional or single anthropometric indices: the weight-for-age index (WAZ), height-for-age index (HAZ), and weight-for-height index (WHZ). Measuring children's nutritional status by using conventional indicators is considered incapable of describing the overall prevalence of malnutrition. An index that can describe all nutritional problems using the Composite Index of Anthropometric (CIAF) indicators is needed. The results from these categories will be accumulated into a single index value that reflects all nutritional problems (Siswati et al., 2023)

The Composite Index of Anthropometric Failure (CIAF) is an indicator utilized to evaluate the nutritional status of children by integrating three anthropometric indices: weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ) indexes. In the CIAF, children's nutritional status is divided into two categories: failure to thrive and normal. Failure to thrive includes six nutritional problems: undernutrition only, shortness only, thinness only, undernutrition and shortness, undernutrition and thinness, and undernutrition, shortness, and thinness. Nutritional status is normal if malnutrition, shortness, or thinness are not detected (Khan & Raza, 2016). This indicator is more suitable for use in developing countries than in developed ones. In addition, there is research that proves that children who have three anthropometric failures, namely stunting, wasting, and underweight, have a higher risk of death than children who have a single anthropometric failure (Permatasari & Chadirin, 2022).

The results of the 2023 Indonesian Health Survey state that the determinants of nutritional problems are caused by many factors that are interrelated and can be related to each other. This determinant occurs in three periods, namely the prenatal period (pregnant women receiving Iron-Folic Acid (IFA) supplements, pregnant women drinking BST, completeness of Antenatal Care (ANC), perinatal period (birth weight and birth length), and postnatal period (diversity of eating complementary feeding, consumption of animal sources, children aged 6-23 months measured for height, toddlers weighed, and completeness of basic immunization) (BKPK, 2024).

Measurements of children's nutritional status, which are usually carried out using a single indicator, are considered less capable of comprehensively describing the prevalence of nutritional problems, while measurements using a more comprehensive indicator, namely the Composite Index of Anthometric Failure (CIAF), especially in children aged 6-23 months 6–24 months, are still limited. This study aimed to

determine the determinants that influence the nutritional status of toddlers based on CIAF at the Banda Sakti Community Health Center.

Methods

This study used an analytical observational design and a cross-sectional approach. The study population included all mothers with children aged 6-23 months who were in the working area of the Banda Sakti Community Health Center. The research sample consisted of 314 mothers with children aged 6-23 months in the working in the Banda Sakti Health Center. The research population consisted of mothers of children aged 6-23 months who were in the working area of the Banda Sakti Health Centre.

The sample in this study was mothers of children aged 6-23 months, totaling 314 mothers of children aged 6-23 months in the working area of the Banda Sakti Community Health Center. Sampling was performed using a simple random sampling technique, where all subjects in the population who met the inclusion and exclusion criteria were randomly selected for inclusion in the study. Inclusion criteria were children aged 6-23 months, 6–23 months, and a Maternal and Child Health Book (MCH). Meanwhile, the exclusion criteria included children aged 6-23 months who were disabled or did not have a limb, did not want to be weighed, or refused to participate in the research.

Data were collected through interviews using a standardized 2023 Indonesian Health Survey (IHS) questionnaire. The questionnaire was administered nationally. The dependent variable studied was the nutritional status of the toddlers, which was expressed based on the CIAF index. The independent variables included the prenatal period (pregnant women receiving Iron-Folic Acid (IFA) supplements, pregnant women taking BST, and completeness of ANC), perinatal period (birth weight and birth length), and postnatal period (diversity of complementary feeding, consumption of animal sources, weighing of children aged 6-23 months, completeness of basic immunization, and vitamin A).

Information on nutritional status was obtained using anthropometric measurements. Toddler weight and body length were measured and translated into the WHO 2005 Z-score. Based on the indices of weight for age, height for age, and weight for height, if the Z-score was < -2SD, children aged 6-23 months were underweight, stunted, and wasted. If the Z-score was ≥ -2SD, the children aged 6-23 months were considered normal. Based on the CIAF index, children aged 6-23 months are said to have failed to grow if they are considered underweight, stunted, wasted, underweight and stunting, wasted and underweight, stunted, or wasted. Children aged 6-23 months are considered normal if they are not underweight, stunted, or wasted.

Data were analyzed using univariate, bivariate, and multivariate analyses. Univariate analysis was performed to determine the distribution of children aged 6-23 months who failed to thrive, pregnant women receiving BST, completeness of ANC, birth weight, birth length, diversity of complementary feeding, consumption of animal sources, weighing of children aged 6-23 months, completeness of immunization, and administration of vitamin A. Bivariate analysis was performed using the chi-square test with a significance value of $p<0,05$, and the degree of risk was expressed as Odds Ratio (OR). Multivariate analysis was performed using a multiple logistic regression test with a determinant model because the dependent variable was categorical and dichotomous. The candidate selection process was carried out before the multivariate test with a logistic regression test with a significance of $p<0,25$ and will be tested simultaneously in a multivariate test with a significance of $p<0,05$.

Result and Discussion

Based on the composite index, the prevalence of failure to thrive was 23,2% and the normal prevalence was 76,8%. This figure is higher than the single indicators of growth failure: underweight (14%), stunting (15%), and wasting (12,1%). CIAF failure is shown in Table 1.

In line with Andini et al. (2023), the prevalence of malnutrition in children based on the CIAF indicator is much greater than that based on a single indicator (Andini et al., 2020). Research in Yogyakarta also found that the prevalence of failure to thrive was much higher when combined indicators were used than when single indicators were used (Siswati et al. 2023). Research Femelia (2018) in Bukit Tinggi City, only 53,6% had normal nutritional status, 19,7% experienced two nutritional problems, 3,7% had three nutritional problems and 23% had one nutritional problem (Femelia et al., 2019). If only one indicator of nutritional status is used,

information on other malnutrition problems will be lost. An interpretation such as this will affect the mitigation efforts because it does not represent a real problem. The prevalence of malnutrition remains high even though interventions to overcome nutritional problems have been implemented (Fitri, 2019).

Table 1. Distribution of Nutritional Status of Children aged 6-23 months

Index	Category	n	%
WAZ	Severely underweight	17	5,4
	Underweight	27	8,6
	Normal	270	86
	Severely stunted	16	5,1
HAZ	Stunted	31	9,9
	Normal	262	84,4
	Hight	2	0,6
WHZ	Wasted	38	12,1
	Normal	275	87,6
	Overweight	1	0,3
CIAF	Underweight	0	0
	Stunted	11	3,5
	Wasted	15	4,8
	Underweight and Stunted	12	3,9
	Underweight and Wasted	9	2,8
	Stunted and Underweight	10	3,1
	Stunted and Wasted	4	1,2
	Underweight, Stunted, and Wasted	12	3,9

Table 2 shows that there were more girls aged 6-23 months than boys did. The percentage of pregnant women was 80,3%, and 75,8% of the mothers had complete ANC checks. 95% of babies were born normal, and 96,5% of babies were born with normal length. Furthermore, 56,1% of children aged 6-23 months consume a variety of complementary feeds and 86% consumed animal-side dishes. 62,4% of the children aged 6-23 months received regular weighing, 54,8% of the children aged 6-23 months received complete immunization, and 79,6% of the children aged 6-23 months received vitamin A as recommended. The complete univariate results for the independent variables are presented in Table 2.

Table 2. Frequency distribution based on independent variables

Independent Variable	Category	n	%
Gender	Man	130	41,4
	Woman	184	58,6
IFA supplements	No	62	19,7
	Yes	246	80,3
ANC	Incomplete	76	24,2
	Complete	238	75,8
Birth Weight	Low Birth Weight (LBW)	14	4,5
	Normal	300	95,5
Birth Body Length	Short	11	3,5
	Normal	303	96,5
Diversity of complementary	Not Various	138	43,9
Feeding	Various	176	56,1
Consume Animal Sources	No	44	14
	Yes	270	86
Toddler Weighing	Irregular	118	37,6
	Regular	196	62,4
Basic Immunization	Incomplete	142	45,2
	Complete	172	54,8
Vitamin A	Not as recommended	64	20,4
	As recommended	250	79,6

Variables that provide differences in the proportion of nutritional status of children aged 6-23 months are BST, ANC examination, birth weight, birth length, complementary feeding diversity, consumption of animal protein, weighing of children aged 6-23 months, basic immunization and vitamin A. Proportion of children aged 6-23 months who fail to thrive who do not receive BST, incomplete ANC, LBW examinations,

short birth babies, do not consume a variety of complementary feeding, do not consume animal protein, irregular weighing, incomplete basic immunization and did not get vitamin A as recommended, significantly more than those who received BST, complete ANC examination, normal birth weight, normal birth length, consumed a variety of complementary feeding, consumed animal protein, regular weighing, complete basic immunization and received vitamin A as recommended.

Factors Associated with the Event of Failure to Thrive

Based on the results of bivariate analysis (Table 3), the IFA supplement variable was statistically significantly associated with failure to thrive (p=0,041; OR= 1,9). The results of this study are in line with the results of Widiyanto's research in Riau in 2022, and it was found that iron folic Acid (IFA) supplements were associated with failure to grow in children. Mothers who do not receive Iron-Folic Acid (IFA) supplements experience anemia and disrupted fetal development in the womb (Widiyanto et al., 2022). Hastuti's research at the Kampar Community Health Center showed that the incidence of failure to thrive was more common in the anemic group (60%) than in the non-anemic group (34,1%) (Hastuty, 2020).

Table 3. Results of bivariate analysis of nutritional status variables for children aged 6-23 months

Variable	Failure to Thrive		Normal		Total		P Value	OR (95% CI)
	n	%	n	%	n	%		
Iron-Folic Acid Supplements								
No	21	33,9	41	66,1	62	100	0,041	1,9 (1,07-3,61)
Yes	52	20,6	200	79,4	252	100		
ANC								
Incomplete	50	65,8	26	34,2	76	100	0,000	17,9 (9,48-34,08)
Complete	23	9,7	215	90,3	238	100		
Birth Weight								
LBW	8	57,1	6	42,9	14	100	0,006	4,8 (1,61-14,38)
Normal	65	21,7	235	78,3	300	100		
Body Length at Birth								
Short	6	54,5	5	45,4	11	100	0,033	4,2 (1,25-14,28)
Normal	67	22,1	236	77,9	303	100		
Diversity of Complementary Feeding								
Not Various	58	42,0	80	58,0	138	100	0,000	7,7 (4,15-14,58)
Various	15	8,5	161	91,5	176	100		
Consume Animal Sources								
No	31	70,5	13	29,5	44	100	0,000	12,9 (6,26-26,78)
Yes	42	15,6	228	84,4	270	100		
Toddler Weighing								
Irregular	46	39,0	72	61	118	100	0,000	3,9 (2,30-6,92)
Regular	27	13,8	169	86,2	196	100		
Immunization								
Incomplete	52	36,6	90	63,4	142	100	0,000	4,1 (2,34-7,34)
Complete	21	12,2	151	87,8	172	100		
Vitamin A								
Not as recommended	34	53,1	30	46,9	64	100	0,000	6,1 (3,37-11,15)
As recommended	39	15,6	211	84,4	250	100		

Iron folic Acid (IFA) supplements are administered to pregnant women to prevent anemia in pregnant women. Research in the Temanggung Regency found an increase in hemoglobin levels in pregnant women after the administration of BST (Retnorini et al., 2017).

Likewise, research in Manado showed that pregnant women who were obedient to consuming IFA supplements regularly by health workers had normal hemoglobin levels compared to pregnant women who were not obedient to consuming BST (Malah & Montol, 2016). Anemia during pregnancy can lead to LBW at birth. Pregnant women with anemia are at a 5,5 times risk of giving birth to LBW than pregnant women who are not anemic (Sari & Indriani, 2020), and anemia in pregnant women can cause a lack of oxygen supply to the fetus, which can inhibit fetal growth and development, resulting in low birth weight in children (Amiruddin et al., 2022).

Babies with birth weights less than 2500 grams often have difficulty catching up with their growth. Infants with LBW are associated with a higher risk of death and morbidity. LBW has also been associated with cognitive impairment in childhood (Wati, 2021). LBW babies with insufficient food reserves will face difficulties in pursuing optimal development if not handled properly. LBW babies are at risk of failure to thrive compared to normal-born babies (Akombi et al., 2017).

Children aged 6-23 months failed to thrive with a history of incomplete ANC examinations (65,8%), whereas children aged 6-23 months failed to thrive with a complete ANC examination (9,7 %). There was a difference in the proportion of children aged 6-23 months who failed to thrive between the complete and incomplete ANC groups (p= 0,000).

Children aged 6-23 months with a history of incomplete ANC examinations received an OR= 17,9 (95% CI: 9,48-34,08). These results support the findings of Hutasoit et al. (2018), who concluded that there is a relationship between antenatal care checks for pregnant women and the incidence of failure to thrive in children aged 6-23 months. Pregnant women who did not undergo prenatal checkups were more likely to experience growth failure (24% and 7%, respectively) (Hutasoit et al., 2018). Dinamara's research (2021) also states that complete ANC examinations are 2,7 times better at preventing growth failure than pregnant women who do not complete ANC examinations (Dinamara et al., 2021).

Antenatal Care (ANC) examinations for pregnant women aim to ensure that mothers have a healthy pregnancy, a safe delivery, and the birth of a healthy baby. ANC examinations are recommended six times during pregnancy. Mothers who do not have regular ANC checks are less likely to receive early detection of health problems, such as hypertension, anemia, or infections that affect the fetus (Permenkes RI, 2021). Anemia in pregnant women is more dominantly caused by irregular ANC checks than by regular ones (Dolang, 2020). Pregnant women who do not have regular ANC checks have a four times greater risk of anemia than those who have regular and complete ANC checks (Nurhaidah & Rostinah, 2021).

ANC examinations also provide education and counseling to pregnant women. The information provided is in the form of information about healthy food patterns, a healthy lifestyle, and the importance of monitoring fetal movements. This information can increase knowledge about the description and guidance of mothers' behavior in caring for their children. Mothers with sufficient knowledge will care for them and provide food so that their nutrition is adequate. On the other hand, mothers who lack knowledge tend not to pay attention to their children's food intake and experience nutritional problems. This is also supported by Kusanti's research, which states that mothers with low knowledge are at risk of experiencing nutritional problems compared to mothers with sufficient knowledge (Kuswanti & Azzahra, 2022). Research in Labuan states that mothers with low knowledge are three times more likely to have their children stunted than are mothers with high knowledge (Ramdaniati & Nastiti, 2019).

The variable history of LBW has a 4,8 times chance of experiencing growth failure compared with children aged 6-23 months who have a history of normal birth weight. These findings strengthen the theory that LBW is associated with poor postnatal growth, especially during the first year of life. Malnutrition indicators, such as stunting, wasting, and underweight, were significantly more common in the LBW baby group (Zoleko-Manego et al., 2021). The results of the research in Yogyakarta also strengthen this research. Children born with LBW are 5,6 times more likely to experience failure to thrive than children born normally. Babies born with LBW in the womb experience intrauterine growth retardation and will continue until the next age after birth. (Nasution et al., 2014).

Infants with LBW have a weaker immune system, which increases the risk of infectious diseases. Research states that LBW causes increased susceptibility to infections such as diarrhea and ARI, as well as the risk of complications such as sleep apnea, jaundice, anemia, fatigue, and loss of appetite, compared to children born with normal weight. (Khanal et al., 2014). Increased morbidity in children with LBW can cause stunted growth and physical development, which ultimately leads to malnutrition or anthropometric failure. (Rahman et al., 2016)

LBW in babies is generally caused by prenatal factors in the mother and baby, especially inadequate nutritional supply from the mother to the fetus. Lack of nutritional supply to the fetus can be caused by a lack of maternal nutritional intake, causing a decrease in insulin secretion, which simultaneously causes insulin resistance in the fetus and can slow down the baby's weight gain in the prenatal phase (Negrato & Gomes, 2013).

The birth length variable was also statistically related (p=0,033) with OR=4,2 (95% CI: 1,25-14,28), confirming the results of previous research, which showed that short birth length was significantly related to the incidence of failure to thrive based on CIAF in children aged 0 - 23 months (p = 0,005) (Andini et al., 2020). In addition, research on toddlers aged under 5 years in North Sulawesi shows that there is a significant relationship between short birth length and the incidence of stunting (p= 0,000), where babies with short birth length have a 5 times risk of experiencing stunting than those born with normal body length (Lukman et al., 2021).

The birth length of a baby cannot be separated from the growth and development of the fetus during the prenatal phase. Babies who are born short need to catch up with their height, but this is often not accompanied by adequate nutritional intake so that in the end, they are at risk of experiencing malnutrition (Andini et al., 2020), and it is not uncommon for babies who are born short to generally remain short even when they reach adulthood (Negrato & Gomes, 2013).

The statistical test results for the complementary feeding diversity variable showed that there was a difference in proportion with a value of p = 0,000 with OR = 7,7; thus, children aged 6-23 months who do not consume a variety of complementary feeding have a 7,7 times risk of experiencing growth failure compared to children aged 6-23 months who consume a variety of complementary feeding. This research is supported by Rahmad (2016), who showed that poor complementary feeding patterns have a impact on the abnormal growth of children aged 6-23 months by 6,5 times. This means that children aged 6-23 months who get poor complementary feeding are 6,5 times more likely to experience failure to thrive than children aged 6-23 months who get good complementary feeding (Rahmad & Miko, 2016). The results of another study also showed that children aged 6-23 months who received complementary feeding were 3,2 times more likely to experience growth failure than children aged 6-23 months who received varied complementary feeding. The variation refers to the variety of food ingredients given to children aged 6-23 months (Indah Nurdin et al., 2019).

Providing complementary feeding that is not varied can result in the nutritional needs of children aged 6-23 months not being met. A lack of energy intake causes the body to conserve energy, resulting in obstacles to weight gain and linear growth. The lack of energy intake in children aged 6-23 months is associated with a 1,8 times risk of failure to thrive. Lack of protein intake carries a 1,7 times greater risk of failure to thrive in children aged 6-23 months (Soumokil, 2017). Deficiencies in other nutrients such as zinc and iron intake are associated with failure to thrive in children aged 6-23 months (Kundarwati et al., 2022)

When giving baby food, it is necessary to pay attention to the accuracy of the time of administration, frequency, type, and amount of food ingredients, and how they are prepared. Many factors are related to the diversity of food consumption, including the child's age, mother's education, food availability, and place of residence (Zulfan and Sudiarti, 2023). Research in Madagascar has shown that maternal education and socioeconomic conditions can influence complementary food consumption (Remonja et al. 2018). The number of family members also contributes to the diversity in children's consumption of complementary feeding (Alfiati, 2018).

Loya and Nuryanto (2017) found that complementary feeding, which does not vary

and the frequency of feeding that is not in accordance with recommendations, can cause growth failure (Loya & Nuryanto, 2017). Research in Bengkalis also concluded that there is a link between complementary food diversity and the incidence of failure to thrive. Children aged 6-23 months who do not consume complementary feeding are seven times more at risk of failure to thrive than children aged 6-23 months who consume complementary feeding (Mitra et al., 2014).

Regarding animal protein consumption, children aged 6-23 months who did not consume animal protein were associated with growth failure (p = 0,000). Children aged 6-23 months who do not consume animal protein have a 12,9 times risk of failure to thrive compared with children aged 6-23 months who consume animal protein. Proteins are important nutrients in life and are a part of all living cells. Children aged 6-23 months who do not consume animal protein are 12,9 times more likely to experience a failure to thrive. The results of this study support previous research in Tasikmalaya City, where an OR value of 5,1 indicates that children aged 6-23 months who do not consume animal protein have a 5,1 times risk of experiencing growth failure compared to children aged 6-23 months who consume animal protein (Aisyah & Yunianto, 2021). Sari et al. (2016) showed that the prevalence of failure to thrive in the low-protein group was 1,87 times greater than that in the sufficient protein intake group (Sari et al., 2016).

Adequate protein levels in children are important for growth. Protein intake is related to serum transthyretin (TTR), amino acids, and insulin-like growth factor-1 (IGF-1), which play a role in the linear growth and development of toddlers (Tessema et al., 2018). Proteins in the body have a short half-life, meaning that they are quickly used and degraded. Thus, continuous protein production is essential. If the body lacks protein, it breaks down the protein in the muscles. If this continues, it will cause muscle wasting and affect a person's nutritional status, making them thin and experiencing stunting (Rahman et al., 2016). Proteins function to maintain tissues, change body composition, and synthesize new tissues. The protein content increases during growth, increasing from 14,6% at one year of age to 18-19% at four years of age. Even though toddler growth decreases during this period, the need for protein increases because it is required for gradual tissue maintenance. The protein requirement aged 1-3 years is 26 g, and the need increases to 35 g at the age of 4-6 years. Research has shown differences in protein intake among stunted children. Protein intake is lower in stunted children than in healthy children (Cahyati et al., 2019).

The regularity of integrated service post weighing was also significantly related to failure to thrive (p=0,00), and OR= 3,9 shows that children aged 6-23 months who are not regularly weighed are at a 3,9 times risk of failure to thrive compared to children aged 6-23 months who are regularly weighed. In line with research at the Amplas Community Health Center, the more regularly a mother visits integrated service post, the better her child's nutritional status (Theresia, 2020). Likewise, in Diagama's research (2019), the prevalence of good nutrition was higher (69%) in mothers who regularly came to integrated service posts than in mothers who did not regularly come to integrated service posts (Diagama et al., 2019). In Depok, children aged 6-23 months who are weighed irregularly have a 1,5 times risk of failure to thrive, which is the dominant factor associated with failure to thrive (Rahmadini et al., 2013).

Body weight measurements were performed monthly. By weighing, the growth status of children aged 6-23 months can be determined, and growth and development can be detected. If abnormalities are found in a child's growth, development, and health status, efforts can be made immediately to improve growth, development, and health. Triana et al. (2020) stated that good knowledge, attitudes, and motivation from mothers of children aged 6-23 months influence the regular weighing of children aged 6-23 months at integrated service post (Triana et al., 2021).

Integrated service post-activities also provide education on the health and growth of children aged–6-23 months. Health information provided to mothers of children aged 6-23 months can increase their knowledge and attitudes towards caring for children aged 6-23 months. Thus, knowledge gained can be implemented in households. Sulistyawati and Mistyca (2016) stated that mothers' knowledge and attitudes have a significant influence on

childcare to achieve optimal growth (Sulistyawati & Mistyca, 2016).

Children aged 6-23 months who do not have complete basic immunization are at a 4,1 times risk than children aged 6-23 months who have complete basic immunization. The results of this study are in accordance with those of Ariati (2019), which state that there is a relationship between immunization status and failure to thrive in children aged 6-23 months (Ariati, 2019). In addition, 38% of children aged 6-23 months experienced stunting in Pidie due to incomplete immunization (Juwita et al., 2019). The results of this study are also supported by research by Mianna (2020), who found that children aged 6-23 months, children aged 6-23 months with incomplete immunization status are 2,6 times more likely to experience failure to thrive compared to children aged 6-23 months whose immunization status is complete (Mianna & Harianti, 2020).

Basic immunization is very important for children aged 6-23 months, where, according to the national target, complete basic immunization must reach 100%. Immunization aims to increase the body's immunity against a disease so that if one day you are exposed to that disease, you will not get sick or only experience mild illness. Children who are not fully immunized have compromised immunity against infectious diseases (Kemenkes RI, 2017). Infection will later affect nutritional intake, so that nutritional needs are not met. On the other hand, if nutritional intake is inadequate, the infectious diseases experienced by children will worsen. If this event continues for a long time, it interferes with growth and increases the incidence of failure to thrive (Aguayo & Menon, 2016).

Other supporting research was conducted by Raisa et al. (2022); children whose immunization is incomplete are the cause of growth failure in children (Raisah et al., 2022). In line with Picauly and Toy's research on NTT, it shows that if children do not have a history of immunization, this will be followed by a 1,9 times increase in the incidence of stunting compared with children who have a complete immunization history (Picauly & Toy, 2013).

If we look at the administration of vitamin A, it also shows that there is a statistical relationship with failure to thrive in children aged 6-23 months. Children aged 6-23 months who do not receive vitamin A as recommended are 6,1 times more likely to experience growth failure than children aged 6-23 months who receive vitamin A as recommended. The results of this study are in line with Muliah's research, which showed that there was a relationship between vitamin A administration and failure to thrive (Nafijah et al., 2017). Aritonang et al. (2020) also found a difference in the proportion of vitamin A intake between stunted and non-stunted children aged 6-23 months. As many as 75% of stunted children aged 6-23 months have insufficient vitamin A intake, compared to 25% of non-stunted children aged 6-23 months (Aritonang et al., 2020). Research with a sample of children aged 6 to 59 months in Bengkulu found that children who did not receive enough vitamin A had a 1,9 times risk of experiencing stunting than children who received sufficient vitamin A (Simanjuntak et al., 2018).

Vitamin A has a role in vision function, cell epithelialization, growth and development, and reduced appetite. Providing vitamin A is a government program at community health centers, especially integrated service posts, which are administered twice a year in February and August, along with measles immunization. Vitamin A is administered to children aged 6-59 months (Kemenkes, 2016). Children aged 6-23 months who were not given vitamin A completely were excluded because their mothers did not regularly take them to the integrated service post, so they did not know the schedule for giving vitamin A. Knowledge, attitudes, and behavior of integrated service post cadres in implementation are important in providing vitamin A (Elisabet & Ayubi, 2021).

The main level of adequate vitamin A is through food intake, which can be obtained through fruits and vegetables that are rich in vitamins. Usually, orange and red fruits and vegetables contain high levels of vitamin A. Apart from that, you can also get side dishes, such as fish, eggs, and shrimp. Vitamin A supplementation, which is routinely scheduled to be administered in February and then continued in August, is a preventive measure against vitamin A deficiency and can reduce the incidence of measles and diarrhea. By having a regular schedule of vitamin A administration to toddlers, it is hoped that children will become healthy and strong so that their immunity will increase and their growth and development will be optimal (Kemenkes RI, 2018).

Determinant Factors of Failure to Thrive

The determinant model was used to estimate the dominant risk factor. All independent variables were considered to be good predictors of the occurrence of the dependent variable. This model includes all candidate variables with a p-value of <0,25, which will be included in the multivariate model. Independent variables with a p value <0,25 include IFA supplement, ANC examination, birth weight, birth length, complementary food diversity, animal protein consumption, weighing, basic immunization, and vitamin A. Nine variables were tested simultaneously with the logistic regression test. In this multivariate test, all candidates with a p value <0,05 will be removed sequentially starting from the largest p value.

After removing variables with a p-value > 0,05, five variables were obtained that were included in the final model: ANC examination, birth weight, diversity of complementary feeding, consumption of animal protein, and completeness of immunization. Table 4 presents the results.

Table 4. Final results of logistic regression analysis modeling the determinants of nutritional status of children aged 6-23 months

Variable	B	SE	P value	OR	95%CI
ANC check	3,036	0,471	0,000	20,827	8,275-52,417
Birth Weight	2,133	0,831	0,000	8,444	1,658-43,008
Diversity of Complementary feeding	2,341	0,455	0,000	10,394	4,263-25,339
Consume Animal Protein	2,847	0,612	0,000	17,234	5,191-57,208
Immunization	1,484	0,422	0,000	4,412	1,928-10,096
Constant	-18,781	2,891	0,000	0,000	

Multivariate analysis showed that the variables that were significantly associated with failure to thrive in children aged 6-23 months were ANC examination, birth weight, diversity of complementary feeding, consumption of animal protein, and completeness of basic immunization. Based on the highest Odds Ratio (OR) value, ANC examination was found to be the dominant factor influencing failure to thrive in children aged 6-23 months (OR = 20,8), after controlling for birth weight, diversity of complementary feeding, consumption of animal protein, and completeness of basic immunization.

ANC examinations provide an opportunity for health workers to detect and intervene in maternal health problems during pregnancy, such as anemia, malnutrition, or infections that can affect fetal health. The absence or low quality of ANC often contributes to low birth weight (LBW), prematurity, and nutritional disorders in babies, which are risk factors for failure to thrive during infancy (Titaley et al., 2019). This study supports previous findings showing that accessibility, frequency, and quality of ANC play an important role in ensuring healthy pregnancy outcomes. For example, Camelia et al. (2020) showed that mothers who received complete ANC (at least four checks according to WHO guidelines) were less likely to give birth to babies with a risk of stunting or failure to thrive (Camelia et al., 2020).

The results of this study highlight the importance of education in ANC. Mothers who receive information about exclusive breastfeeding, introduction of appropriate complementary feeding, and basic health care tend to be better able to meet their children's nutritional needs during the crucial period of the first 1,000 days of life (Murti et al., 2020). Success in reducing the rate of failure to thrive depends not only on postnatal nutritional interventions but also on interventions during pregnancy. Thus, quality ANC examinations must be prioritized in public health policies as part of a strategy to prevent stunting and failure of children to thrive (Hasanalita, 2023).

Conclusion

The factors determining the incidence of growth failure in children aged 6-23 months include ANC examination, birth weight, diversity of complementary feeding, animal protein consumption, and completeness of immunization. ANC examination of pregnant women was the dominant factor in the incidence of failure to thrive in children aged 6-23 months after controlling for birth weight, diversity of complementary feeding, animal protein

consumption, and completeness of basic immunization. Children aged 6-23 months with a history of incomplete ANC examinations were 20,8 times more likely to experience growth failure than children who underwent complete ANC examinations.

It is suggested that there is a need for cooperation from all parties, both government and cross-sector, cross-program, and community, by increasing social sensitivity to ANC during pregnancy, both the frequency of ANC, the quality of ANC services, and ANC facilities. However, knowledge and skills in childcare also need to be improved to prevent nutritional problems.

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