JOURNAL LA MEDIHEALTICO

VOL. 06, ISSUE 05 (1153-1172), 2025
DOI: 10.37899/journallamedihealtico.v6i5.2532

Analysis of Risk Factors of Parenting Patterns using the Nurturing Care Framework Approach with the Incident of Stunting in Toddlers in a Case Study in the Working Area of Pagambiran Public Health Center

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Article Info

Article history:
Received 7 August 2025
Received in revised form 25 August 2025
Accepted 20 September 2025

Keywords:
Nurturing Care Framework
Stunting
Toddlers

Abstract

Stunting is a linear growth disorder caused by malnutrition and recurrent infections. Prevention is through the Nurturing Care Framework (NCF) approach, which includes health care, adequate nutrition, responsive care, early learning opportunities, and safety and security. This study aims to analyze the relationship between NCF-based parenting risk factors and stunting among toddlers in the Pagambiran Padang Community Health Center (Puskesmas) work area. This study was analytical with a cross-sectional design, conducted from June 2024 to January 2025. Sampling used stratified random sampling and simple random sampling, totaling 214 toddlers aged 24-59 months. Data collection used a questionnaire and was analyzed using univariate, bivariate (chi-square), and multivariate (multiple logistic regression with the backward elimination method). The results showed a stunting prevalence of 43.9%. Parenting patterns using the NCF (composite) approach were less than good at 55.1%. Multivariate analysis showed that risk factors significantly associated with stunting were health care (p=0.011), adequate nutrition (p=0.000), and safety and security (p=0.023). Adequate nutrition was the dominant factor (OR=8.602). Meanwhile, early stimulation and responsive parenting did not show a significant relationship. The conclusion of this study is that there is a relationship between health care, adequate nutrition, and safety and security with stunting. Adequate nutrition is the dominant factor. Cross-sectoral collaboration is expected to address nutritional issues, provide basic health services, monitor growth and development, and implement a healthy environment based on the National Child Protection Framework (NCF).

Introduction

One of the nutritional challenges and problems currently faced globally by communities around the world is stunting. The ambitious World Health Assembly targets a 40% reduction in stunting rates worldwide by 2025. The 2020 Global Nutritional Report reported that approximately 149.2 million (22.0%) children under five suffer from stunting, a factor hindering human development worldwide. The World Health Organization (WHO) has identified five subregions with stunting prevalence, including Indonesia in the Southeast Asia region (30.0%) (WHO, 2022). Children with stunted growth experience higher rates of mortality, morbidity, and suboptimal growth (Vaivada et al., 2020). Stunting has long-term effects such as decreased survival, impaired cognitive motor development, decreased economic

ISSN 2721-1215 (Print), ISSN 2721-1231 (Online)

productivity, and a higher chance of living in poverty in adulthood (Black et al., 2013; Fernandes & Lee, 2021; Lestari et al., 2024; Nguyen & Thrinh, 2024; Awaludin et al., 2025).

The prevalence of stunting (short stature for age) in Indonesian toddlers based on the results of the 2018 Basic Health Research (Riskesdas) reached 30.8% or around 7 million toddlers (Ministry of Health of the Republic of Indonesia, 2018). Furthermore, based on the results of the 2022 Indonesian Nutritional Status Study (SSGI), the national prevalence of stunting was recorded at 21.6%. In West Sumatra Province, the prevalence was 25.2%, and in Padang City, it was 19.5%. This remains a problem because the WHO has a maximum prevalence target of 20%. Therefore, acceleration is needed to reach the 14% target by 2024 (Ministry of Health, 2023).

Research conducted by Yusrawati et al. (2022) on early detection of stunting in the working area of the Pagambiran Community Health Center in Padang City, found that 44% of toddlers were classified as short, while another 6% were included in the very short category. Padang Mayor's Decree no. 342 of 2022 states that the Lubuk Begalung District area, including the working area of the Pagambiran Community Health Center, is a priority locus for integrated stunting prevention and management in 2023 (Padang City Health Office, 2023).

Data from the 2023 Padang City Health Profile shows that the Pagambiran Community Health Center (Puskesmas) area ranks second in terms of stunting among toddlers. The population of 2,806 toddlers in the Pagambiran Community Health Center area is 232 (9.6%) with stunting. The number of individuals experiencing stunting is higher, although the prevalence is lower than that of the Seberang Padang Community Health Center, which had 151 stunting toddlers (15.4%) (Padang City Health Office, 2023; Andika, 2021; Haron et al., 2023).

Risk factors for stunting in West Sumatra Province, based on research (Masrul et al., 2020), include maternal education, birth weight, exclusive breastfeeding, diet, and parenting patterns. Parenting patterns are an indirect cause of stunting and, if not implemented properly, can become a direct cause of stunting (UNICEF, 2015; Achmad et al., 2023; Fikrih et al., 2025). Tørslev et al. (2021) stated that there are four important components in parenting patterns: food provision, hygiene, health, and psychosocial stimulation (Nita, 2023; Engle et al., 1999; dos Santos Costa et al., 2025; Masita et al., 2024). This also supports previous research conducted by Nurdin et al. (2019) that toddlers with a history of poor parenting are at 3.9 times greater risk of experiencing stunting.

Data from the Ministry of Women's Empowerment and Child Protection shows that as many as 75% or the majority of parents in Indonesia do not make any effort to improve their own capacity in terms of parenting (Ministry of Women's Empowerment, Child Protection, Population Control, and Family Planning (DP3AP2KB) of Padang City in 2022, there were 64 cases of toddlers reported receiving inappropriate parenting patterns, and Lubuk Begalung District was the third most affected by inappropriate parenting patterns after South Padang District.

Eating patterns have an influence on the incidence of stunting, as proven by the research results of Kustini et al. (2025) conducted in the work area of the Senen District Health Center, DKI Jakarta Province, which stated that the risk of stunting in toddlers is the most dominant.is the pattern of parenting feeding (p value = 0.000; odds ratio = 6.496; 95% CI = 2.486-16.974) and a 6 times greater risk of experiencing stunting. This is in line with research by Arlinda et al. (2022) on the determinants of stunting in West Pasaman Regency, which found that the greatest indirect influence on the incidence of stunting is parenting feeding (path coefficient = 0.90).

Clean parenting/Environmental hygiene and sanitation are factors in the occurrence of infectious diseases. This is in line with research by Audiena & Siagian (2021) in the Bulak Banteng Community Health Center in Surabaya, which found that infectious diseases (p=0.000) (OR=-3.402) and hygiene practices (p=0.000) (OR=-2.442) influence stunting.

Unfortunately, environmental safety for children is inadequate because approximately 69.42% of early childhood children in Indonesia still live with a household member who smokes (Early Childhood Profile 2022). Research by Muchlis et al. (2023) in a stunting locus village in South Sulawesi found a stunting prevalence of 145 (65.6%), with 157 (71%) children living with smoking parents. Exposure to cigarette smoke for more than 3 hours per day increases the incidence of stunting by 10,316 times.

Health care patterns, such as complete basic immunization coverage, also contribute to stunting. In Indonesia, in 2022, 63.17% of children aged 12-23 months received complete basic immunization (Early Childhood Profile, 2022). Padang City achieved 75.8%, and Lubuk Begalung District achieved 63.05% (Gender and Child Profile, Padang City, 2022). Meanwhile, the national target is 100%. This means that many children still do not have adequate access to immunization services. According to research by Sartika et al. (2021), the likelihood of stunting is higher in children with incomplete immunization coverage (OR = 3.28; 95% CI: 1.61–6.65).

The results of research in the stunting locus area of Pasaman and West Pasaman Regency found that psychosocial parenting patterns were still low between stunted children and normal children by 61.7% and the benefits of psychosocial stimulation can improve mother-baby interactions through the skin-to-skin process, improve the baby's immune system and normalize metabolism (Masrul, 2019). This is proven by previous research conducted by Sri Mulyanti et al. (2017) in the Lubuk Begalung work area of Padang City that the most psychosocial stimulation was in the moderate category at 74.8% and Noftalina's 2019 study which showed that there was a significant relationship between psychosocial stimulation parenting patterns and nutritional status of toddlers based on height according to age in Panti District, Pasaman Regency with a p value = 0.000 and toddlers with poor psychosocial stimulation parenting patterns had a risk of 18,308 times experiencing stunting.

In 2018, WHO recommended childcare patterns based on a holistic approach.The Nurturing Care Framework (NCF) integrates five components of care, including ensuring child health, adequate nutrition, responsive care, early learning opportunities (stimulation), and ensuring child safety and security (Black et al., 2017). It focuses on stunting prevention through increased positive and responsive stimulation (Bliznashka et al., 2020). Research shows that responsive feeding practices in Indonesia are suboptimal, with only 26.5% of caregivers implementing them, and remains a significant barrier to stunting reduction (Robert et al., 2021).

Research by Septamarini et al. (2019) in the Bandarharjo Community Health Center Work Area, Semarang regardingResponsive feeding is one of the NCF approaches (p=0.003; OR=5.6; CI=2.17-21.67) which has an impact on improving the quality of parenting behavior in feeding and psychosocial patterns which are good for mental and cognitive growth and development in stunted children. The previous explanation indicates that stunting remains a significant issue requiring serious attention from the Padang City government (Padang City Health Office, 2022). Therefore, the researcher was interested in conducting a study on the analysis of parenting risk factors using the NCF approach for stunting in toddlers in a case study within the Pagambiran Padang Community Health Center.

Methods

The current study was designed as an observational analytical study that uses a cross-sectional model. The choice of this design was based on the multifactorial etiology of stunting which included nutritional, health, caregiving, and environmental factors. Concurrent measurement of exposure and outcome variables was made with the help of cross-sectional methodology, and it provided a full picture of the relationship between Nurturing Care Framework (NCF)-based parenting practices and the prevalence of stunting. Due to the impractical nature of

longitudinal experimental monitoring of stunting in this case, cross-sectional was considered the most suitable one.

The entire population of the study was selected as the mothers of toddler with an age of 24-59 months living within the catchment area of the Pagambiran Community Health Center in the Lubuk Begalung District, Padang City. The location was intentionally chosen due to its designation as a priority locus of stunting prevention hence contributing to better representativeness regarding a deep analysis of the risk-factors. The sample comprised 1,902 mother-child dyads that were eligible. The sampling was carried out in two phases, firstly, stratified random sampling was done to ensure representation of the different social and environmental levels and then simple random sampling in order to maintain equity and reduce selection bias. As a result, 214 participants were invited, and no one out of the participants failed to meet the inclusion criteria, which included permanent residency in the study area and willingness to take part in the study, which was verified through the informed consent signed.

The data collection involved the use of a structured questionnaire which was previously prepared and validated to be clear. The tool included the five dimensions of the NCF including health care, sufficient nutrition, responsive caregiving, early learning opportunities, and safety and security along with sociodemographic variables that are related to mothers and children. Anthropometric data was collected; special attention was paid to height-to-age (HAZ) which was later compared to WHO Child Growth Standards to determine whether the child is stunted or not. In order to achieve accuracy and uniformity, data collectors were trained on interview methods and anthropometric measures; thus, minimizing measurement error and bias by observers.

The analysis of data was done in stages. The first stage of univariate analysis included the prevalence of stunting and distribution of parenting practices across the NCF elements. This was followed by bivariate tests which used chi-square tests to establish significant relationships between each NCF component and stunting with a significant level of p below 0.05. Lastly, multivariate analyses were performed through using several logistic regression with a backward elimination approach that helped in identifying risk factors with the highest salience besides controlling possible confounders. This methodical process allowed the search of correlations and the definition of the factor of parenting that has the greatest correlation with stunting.

The ethical considerations were strictly applied throughout the research process. The participants were given clear descriptions of the purpose of the study, procedures, and possible benefits. The participation was voluntary, and all the personal data were strictly guarded. Each participant was provided with informed consent, which stipulated that he or she could pull out at any point without prejudice to access to health services. Furthermore, the research protocol had the institutional ethics review board approval hence ensuring that the national and international ethics standards that govern health research were met. These measures highlight the fact that the methodology was not only developed to provide a strong scientific evidence but also to respect the dignity and rights of the participants.

Result and Discussion

Univariate Analysis

Univariate analysis was used to describe the frequency distribution of each studied variable. The data analyzed included stunting incidence, parenting patterns using the composite NCF approach, good health, adequate nutrition, responsive care, opportunities for early learning, and security and safety.

Stunting Incident

Table 1. Distribution of the Frequency of Stunting Incidents in Toddlers in the Working Area of the Pagambiran Padang Health Center

Nutritional Status based on Height/Age	f	%
Stunting	94	43.9
Normal	120	56.1
Total	**214**	**100**

Table 1 shows that the number of toddlers with normal nutritional status is greater than the number of toddlers experiencing stunting in the working area of the Pagambiran Padang Health Center.

Parenting Using the NCF Approach

The distribution of each parenting pattern component based on the NCF is as follows:

Good Health

Table 2. Distribution of Frequency of Health Fulfillment (Good Health) in the Working Area of Pagambiran Padang Health Center

Good Health	f	%
Not good	121	56.5
Good	93	43.5
Total	**214**	**100**

Table 2 shows that most respondents have poor health (good health) category.

Adequate Nutrition

Table 3. Distribution of Frequency of Adequate Nutrition in the Working Area of the Pagambiran Padang Health Center

Adequate Nutrition	f	%
Not good	105	49.1
Good	109	50.9
Total	**214**	**100**

Table 3 shows that adequate nutrition for toddlers is relatively balanced.

Responsive Care

Table 4. Frequency Distribution of Responsive Care in the Work Area of the Pagambiran Padang Health Center

Responsive Care	f	%
Unresponsive	133	62.1
Responsive	81	37.9
Total	**214**	**100**

Table 4 shows that most respondents have responsive care in the unresponsive category.

Opportunities for Early Learning/Early Stimulation

Table 5. Frequency Distribution of Early Learning Opportunities/Early Stimulation (Opportunities for Early Learning) in the Work Area of the Pagambiran Padang Health Center

Opportunities for Early Learning/Early Stimulation	f	%
Not good	114	53.3

Good	100	46.7
Total	**214**	**100**

Table 5 shows that most respondents have opportunities for early learning/early stimulation (opportunities for early learning) in the poor category.

Security and Safety

Table 6. Distribution of Security and Safety Frequency in the Work Area of the Pagambiran Padang Health Center

Security and Safety	f	%
Not good	96	44.9
Good	118	55.1
Total	**214**	**100**

Table 6 shows that some respondents have good security and safety categories.

Parenting Using the NCF Approach

The results of the study show the frequency distribution of parenting patterns using the NCF approach for toddlers in the Pagambiran Padang Community Health Center work area as follows:

Table 7. Frequency Distribution of Parenting Patterns Using the NCF Approach in the Work Area of the Pagambiran Padang Health Center

Parenting Patterns Using the NCF (Composite) Approach	f	%
Not good	118	55.1
Good	96	44.9
Total	**214**	**100**

Table 7 shows that most respondents apply poor parenting patterns based on the NCF approach.

Bivariate Analysis

Bivariate analysis was conducted to determine the relationship between parenting patterns using the NCF approach and the incidence of stunting in toddlers aged 24-59 months in the working area of the Pagambiran Padang Health Center, which was carried out using the chi-square test. It is said to be significantly related if the p-value is <0.05 and is said to be not significantly related if the p-value is >0.05. In the data analysis, no expected value was found to be less than 5. The relationship between variables can be seen through the Continuity Correction (a) value for the 2 x 2 table in the appendix. The results of the bivariate analysis in this study include:

The Relationship Between Parenting Patterns Using the NCF Approach and the Incidence of Stunting

The results of the analysis of the relationship between parenting patterns using the NCF approach and the incidence of stunting can be seen in the following table:

Table 8. Relationship between Parenting Patterns Using the NCF Approach and the Incidence of Stunting in the Work Area of the Pagambiran Padang Health Center

Parenting Using the NCF Approach (composite)	Nutritional Status based on Height/Age				Total		*p-value*
	Stunting		Normal				
	f	%	f	%	f	%	
Not good	84	71.2	34	28.8	118	100	0,000
Good	10	10.4	86	89.6	96	100	

Total	**94**	**43.9**	**120**	**56.1**	**214**	**100**	

Table 8 shows that the percentage of toddlers experiencing stunting was higher among toddlers with poor NCF parenting compared to those with good NCF parenting. Statistical test results indicate a significant relationship between NCF parenting and stunting.

The Relationship between Health Fulfillment (Good Health) and the Incidence of Stunting

Table 9. Relationship between Health Fulfillment (Good Health) and the Incidence of Stunting in the Work Area of the Pagambiran Padang Health Center

Health Fulfillment (Good Health)	**Nutritional Status based on Height/Age**				**Total**		***p-value***
	Stunting		**Normal**				
	f	**%**	**f**	**%**	**f**	**%**	
Not good	80	66.1	41	33.9	121	100	0,000
Good	14	15.1	79	84.9	93	100	
Total	**94**	**43.9**	**120**	**56.1**	**214**	**100**	

Table 9 shows that the percentage of toddlers experiencing stunting is higher among toddlers with poor health compared to those with good health. Statistical tests indicate a significant relationship between good health and stunting.

The Relationship between Adequate Nutrition and the Incidence of Stunting

Table 10. Relationship between Adequate Nutrition and the Incidence of Stunting in the Work Area of the Pagambiran Padang Health Center

Adequate Nutritional Fulfillment *(Adequate Nutrition)*	**Nutritional Status based on Height/Age**				**Total**		***p-value***
	Stunting		**Normal**				
	f	**%**	**f**	**%**	**f**	**%**	
Not good	78	74.3	27	25.7	105	100	0,000
Good	16	14.7	93	85.3	109	100	
Total	**94**	**43.9**	**120**	**56.1**	**214**	**100**	

Table 10 shows that the percentage of toddlers experiencing stunting is higher among toddlers with inadequate nutrition compared to those with good nutrition. Statistical tests indicate a significant relationship between adequate nutrition and stunting.

The Relationship between Responsive Care and the Incidence of Stunting

Table 11. Relationship between Responsive Care and Stunting Incidence in the Work Area of the Pagambiran Padang Community Health Center

Responsive Care	**Nutritional Status based on Height/Age**				**Total**		***p-value***
	Stunting		**Normal**				
	f	**%**	**f**	**%**	**f**	**%**	
Unresponsive	84	63.2	49	36.8	133	100	0,000
Responsive	10	12.3	71	87.7	81	100	
Total	**94**	**43.9**	**120**	**56.1**	**214**	**100**	

Table 11 shows that the percentage of toddlers experiencing stunting is higher among children with unresponsive care compared to those with responsive care. Statistical tests indicate a significant relationship between responsive care and stunting.

The Relationship between Opportunities for Early Learning/Early Stimulation and the Incidence of Stunting

Table 12. Relationship between Opportunities for Early Learning/Early Stimulation and the Incidence of Stunting in the Work Area of the Pagambiran Padang Community Health Center

Opportunities for Early Learning/Early Stimulation	Nutritional Status based on Height/Age				Total		*p-value*
	Stunting		Normal				
	f	%	f	%	f	%	
Not good	74	64.9	40	35.1	114	100	0,000
Good	20	20	80	80	100	100	
Total	**94**	**43.9**	**120**	**56.1**	**214**	**100**	

Table 12 shows that the percentage of toddlers experiencing stunting is higher among toddlers with poor early learning opportunities/early stimulation compared to the group of toddlers with good learning opportunities. Statistical tests indicate a significant relationship between early learning opportunities/early stimulation and the incidence of stunting.

The Relationship between Security and Safety and the Incidence of Stunting

Table 13. Relationship between Security and Safety and the Incidence of Stunting in the Work Area of the Pagambiran Padang Health Center

Security and Safety	Nutritional Status based on Height/Age				Total		*p-value*
	Stunting		Normal				
	f	%	f	%	f	%	
Not good	65	67.7	31	32.3	96	100	0,000
Good	29	24.6	89	75.4	118	100	
Total	**94**	**43.9**	**120**	**56.1**	**214**	**100**	

Table 13 shows that the percentage of toddlers experiencing stunting is higher among toddlers with poor security and safety compared to the group with good security and safety. Statistical tests indicate a significant relationship between security and safety levels and stunting incidence.

Multivariate Analysis

The stages of multivariate analysis in this research model are:

Candidate Variable Selection

The most dominant independent variables in parenting patterns using the NCF approach were identified through multivariate analysis. Before starting the multivariate test, the first step was to select variables to be included in the multivariate analysis, namely variables that in the bivariate analysis had a p-value <0.25. The results can be seen in the following table:

Table 14. Candidate Variables for Multivariate Analysis

Candidate Variables	*P value*	Information
Good Health	0,000	Enter candidate
Adequate Nutrition	0,000	Enter candidate
Responsive Care	0,000	Enter candidate
Opportunities for Early Learning/Early Stimulation	0,000	Enter candidate
Security and Safety	0,000	Enter candidate

Based on Table 14, it shows that at the initial stage all NCF components meet the requirements for multivariate analysis.

Multivariate Modeling

Multivariate modeling was performed using multiple logistic regression. Eligible variables were then analyzed using the backward elimination method, with a significance threshold of p-value <0.05. Variables with a p-value >0.05 were automatically removed for the next stage. The results of the multivariate modeling using the backward elimination method can be seen in Table 15.

Table 15. First Stage Results of Multivariate Analysis with Logistic Regression Backward Elimination Method

Variables	OR	CI 95%	*p-value*
Good Health	2,640	0.885 - 7.879	0.082
Adequate Nutrition	8,004	3,285 - 19,501	0,000
Security and Safety	2,386	1,096 – 5,194	0.028
Opportunities for Early Learning/Early Stimulation	1,179	0.403 – 3.447	0.763
Responsive Care	1,124	0.350 - 3.612	0.844

Based on table 15, it is known that the responsive care variable is the variable with the largest p-value so it is removed from the model. The results can be seen in the following table:

Table 16. Second Stage Results of Multivariate Analysis with Logistic Regression Backward Elimination Method

Variables	OR	CI 95%	*p-value*
Health Fulfillment *(Good Health)*	2,690	0.917 – 7.888	0.072
Adequate Nutrition	8,383	3,901 – 18,014	0,000
Security and Safety	2,405	1,110 – 5,212	0.026
Early Learning Opportunities/Early Stimulation *(Opportunities for Early Learning)*	1,215	0.435 - 3.394	0.710

Based on table 16, it is known that the variable opportunities for early learning/early stimulation (opportunities for early learning) is the variable with the largest p-value, so it is removed from the modeling.

Table 17. Final Stage of Multivariate Analysis Results with Logistic Regression Backward Elimination Method

Variables	OR	CI 95%	*p-value*
Health Fulfillment *(Good Health)*	3,042	1,296 – 7,142	0.011
Adequate Nutrition	8,602	4,048 – 18,279	0,000
Security and Safety	2,443	1,134 – 5,263	0.023

Based on the table 17 The results of the multivariate analysis showed three modeling stages. Good health, adequate nutrition, and security and safety all had statistically significant relationships. In the final modeling, the most dominant variable associated with stunting was adequate nutrition. This means that toddlers with inadequate nutrition had an 8.602 times greater risk of stunting than toddlers with adequate nutrition.

Discussion

Stunting Incident

The results of the study showed that as many as 43.9% of toddlers aged 24-59 months in the working area of the Pagambiran Padang Health Center experienced stunting.This finding is in line with previous research byYusrawati et al., (2022)regarding early detection of stunting in infants and toddlers in the working area of the Pagambiran Community Health Center in Padang City, which reported that 44% of toddlers were short and 6% were very short, and research by Ezeh et al. (2021) conducted in the same location found a stunting prevalence of 42.5% in 174 toddlers aged 24–59 months. This result is higher than the global data in 2022, which reached 22.3% (WHO, 2023), national data in 2023 was 33.5%, and the prevalence of stunting in West Sumatra Province in 2023 was 23.6% and Padang City was 24.2% (Ministry of Health, 2023).

Field findings in this study indicate that stunting is influenced not only by nutritional factors but also by suboptimal parenting patterns. Based on an analysis of the five components of the National Child Health Foundation (NCF), it was found that mothers of stunted toddlers tend to pay less attention to their children's emotional needs, rarely provide early stimulation, and are inconsistent in taking their children to Posyandu (Integrated Health Post) or completing immunizations. Stunted toddlers also experience more frequent recurrent infections, such as diarrhea and acute respiratory infections (ARI).

In terms of nutritional fulfillment, stunted toddlers were found to have more frequent substandard diets, low animal protein consumption, and a history of inadequate exclusive breastfeeding. These findings align with research by Bliznashka et al. (2021) in Sub-Saharan Africa, which demonstrated that responsive parenting and meeting nutritional needs significantly impact child growth.

Environmental factors also contribute significantly to stunting. Research shows that most stunted toddlers live in environments with poor sanitation, lack access to healthy latrines, and are exposed to cigarette smoke from smoking family members. Furthermore, some toddlers also live near industrial areas or factories that potentially pollute their living environment. This situation is exacerbated by the low coverage of toddler growth monitoring, as reflected in the participation rate of toddler weighing in Padang City, which only reached 63%, and the fact that approximately 20% of toddlers in the Pagambiran Community Health Center's work area have not been monitored for their growth and development (Padang City Health Office, 2024). This low level of monitoring leads to delays in early detection of nutritional and growth problems in children.

Another study by Fauziah et al. (2021) at the Limo Community Health Center in Depok reported a stunting prevalence of 50.2% in toddlers aged 2-5 years. Meanwhile, Arifin et al. (2021) in Cirebon Regency reported a stunting prevalence of 47.8%. Both studies identified factors such as inadequate nutritional intake, unresponsive parenting, and limited access to health services and proper sanitation as contributors to stunting, particularly in families with lower-middle socioeconomic status.

Pagambiran Ampalu Nan XX Village is the most densely populated area in Lubuk Begalung District, with a population of 22,522 and a density of 4,373 people/km². Visits to the Pagambiran Community Health Center reach 75,290 per year, and a population growth rate of 0.87% per year indicates high population mobility, which can disrupt the continuity of monitoring child nutrition and growth (BPS Padang City, 2024).

Based on the WHO classification (2023), public health problems are categorized as low if the stunting prevalence is <20%, moderate if the stunting prevalence is 20-29%, high if the stunting prevalence is 30-39%, and very high if the stunting prevalence reaches ≥40%. Based on this

classification, the work area of the Pagambiran Padang Community Health Center has a stunting prevalence that is in the very high category (43.9%). The high stunting prevalence indicates that the work area of the Pagambiran Padang Community Health Center faces a much more serious nutritional problem than the national and regional averages.

Parenting Using the NCF Approach

The results of the study showed a significant relationship between parenting patterns using the NCF approach and the incidence of stunting, and the majority of respondents applied poor parenting patterns based on the NCF approach. These results align with research conducted by McCoy et al. (2022) in 104 low- and middle-income countries (LMICs) with 426,349 children aged 3–4 years, which showed that access to Nurturing Care components remains very limited.

The results of this study are supported by Azwar et al. (2024), who demonstrated a significant relationship between nurturing care practices (feeding practices, psychosocial stimulation, and health service utilization) and stunting. This study emphasizes the importance of a holistic approach to childcare to support optimal physical growth and psychosocial development. Furthermore, Amilia et al. (2024) reported that children with poor NCF practices had an eight-fold greater risk of stunting compared to children with good NCF practices.

A similar study by Chanda (2020) found that mothers with poor parenting practices were 2.8 times more likely to have stunted children than mothers with good parenting practices (OR = 2.837; 95% CI: 1.179 - 6.824). This finding is consistent with research in low- and middle-income countries showing that equitable access to the five components of the NCF is crucial in supporting children's physical and psychosocial growth from an early age (Olusanya et al., 2023).

In this study, the lowest access was found in responsive care (37.9%) and health care (43.5%). Furthermore, only 50.9% of children received adequate nutrition. This disparity in access is influenced by family economic status, with only 5.6% of children from low-income countries receiving minimally adequate care, compared to 50.8% of children from upper-middle-income countries. This may also be due to the fact that the majority of respondents (60.3%) have family incomes below the Padang City minimum wage.

Lucas et al. (2018) defines nurturing care as the conditions created through public policies, programs, and services that enable communities and caregivers to ensure children's good health and nutrition, protect them from harm, and provide opportunities for early learning through responsive and emotionally supportive interactions. This concept emphasizes the importance of an environment that supports optimal child growth and development from an early age (Shonkoff et al., 2012). In the context of this study, nurturing care plays a crucial role in supporting the growth of children aged 2-5 years and preventing stunting by meeting children's basic needs comprehensively.

Manichander (2015) research also highlights that NCF-based parenting influences child growth, particularly through adequate nutrition, responsive care, and a safe environment. The study reported that when NCF components are not met, children are more vulnerable to growth retardation, including the risk of stunting. According to Krisnana et al. (2020), parenting practices are a major factor in stunting. This is reinforced by Wertlieb (2019), who stated that implementing the five NCF components is crucial in supporting optimal child growth and development. Parenting education-based interventions and increasing access to health services are important strategies in supporting good parenting. Srinivasan et al. (2021) emphasized that NCF interventions have a significant impact on reducing the risk of stunting, cognitive delays, and lack of early stimulation. Furthermore, toddlerhood is a critical period for brain development (Bailey, 2002), making appropriate parenting support crucial.

NCF-based parenting can be an effective approach to address these barriers. Abboah-Offei et al. (2022) emphasized that implementing NCF helps parents create a responsive parenting environment, provide adequate nutrition, and ensure child safety. Therefore, based on the research, it can be concluded that weak parenting practices can be a key factor in the high prevalence of stunting. Therefore, improving the quality of NCF-based parenting needs to be a top priority in efforts to address stunting in the Pagambiran Padang Community Health Center working area through a promotive and preventive approach.

Risk Factor Analysis

Multivariate analysis showed that the risk factors of good health, adequate nutrition, and security and safety were statistically significantly associated. Meanwhile, opportunities for early learning and responsive care were not statistically significantly associated with stunting in toddlers.

Risk Factors for Good Health

Multivariate analysis results showed that good health had a statistically significant relationship with stunting, but was not the dominant variable. Toddlers with poor health were 3.042 times more likely to experience stunting than toddlers with good health.

The results of this study align with those of Bailey (2002), who also found a significant relationship between good health and stunting ($p < 0.05$). Research by Prasetyo et al. (2023) also showed a significant relationship between the use of health services, including integrated health service posts (Posyandu) and immunization, and stunting, likely due to differences in regional context, health service coverage, and the level of service utilization by the community.

Good child health refers to the actions taken by mothers in caring for and seeking health services for their children, which can impact the child's health status. These efforts include providing complete immunizations, providing treatment when the child is sick, and accessing professional care for the child's health. Utilization of these health services plays a crucial role in improving children's nutritional status, as mothers can obtain accurate health information and apply it to their parenting practices.

The prevalence of toddlers with suboptimal health care indicates potential risks that require attention. Factors such as access to health services, parenting practices, and environmental conditions significantly influence a child's health status. Reich (2005) emphasized the crucial role of mothers in child care for their growth and development. This study also emphasized the importance of parents' active role in maintaining their children's health, for example by immediately taking sick children to the nearest health facility such as a community health center, clinic, or hospital. Regular visits to the Integrated Health Post (Posyandu) are also crucial because they allow for monitoring of toddlers' nutritional status, provision of supplementary feeding (MP-ASI), and education for mothers about fulfilling children's nutritional needs (Hani'ah & Rizqi, 2022).

Previous research has shown that adequate access to healthcare, complete immunization, and child growth monitoring can improve child health and reduce the risk of disease. Infectious diseases such as diarrhea, acute respiratory infections (ARI), and malaria have been shown to increase the risk of severe stunting. Research by Pebrianti et al. (2022) also reported that immunization is closely related to the nutritional status of toddlers, as it can improve a child's immune system and help improve nutritional problems (Pratiwi, SN et al., 2023). When a child is ill, their appetite usually decreases, leading to decreased nutritional intake and a weakened immune system, which can ultimately hinder growth.

The results of the study showed that the majority of respondents (59.3%) had poor child health outcomes (good health). This is in line with research by Amalia et al. (2024) in Lebong Regency, Bengkulu, which found that approximately 58.60% of toddlers did not receive

adequate health care due to limited health facilities and unsupportive parenting patterns. A similar finding was also found in research by Bella et al. (2020) in Indralaya, Ogan Ilir, among mothers with children aged 24–59 months from poor families. The study reported that 68.8% of toddlers who did not receive adequate health care experienced stunting, while 31.2% had normal nutritional status.

Interviews revealed that the fulfillment of health aspects of toddlers in the study area is still not optimal. As many as 54.21% of toddlers reported experiencing acute respiratory infections (ARI) in the past month, and only 54.21% had received complete basic immunizations. Furthermore, 41.12% of health service posts were located quite far from their mothers' homes, and only 46.26% of mothers used the health service posts for treatment. Only 35.05% of mothers took their children to a doctor or health worker. Meanwhile, 39.25% of children received supplementary feeding (PMT) at the integrated health post (posyandu), and only 36.92% of children were weighed monthly. These findings indicate that access to and utilization of child health services still need to be improved.

The aspect of health provision, as one component of the NCF framework, was statistically significant in this study. Suboptimal provision can negatively impact a child's overall health and increase the risk of stunting if not addressed holistically. Therefore, optimizing child health services within the NCF framework is a strategic step to prevent and reduce the prevalence of stunting, particularly in areas with high incidence rates, such as the Pagambiran Community Health Center.

Risk Factors for Adequate Nutrition and Stunting Incidence

Multivariate analysis results showed that adequate nutrition had a statistically significant relationship with stunting and was the most dominant risk factor. Toddlers with inadequate nutrition were 8.602 times more likely to experience stunting than toddlers with adequate nutrition.

The results of this study are supported by research by Cheikh Ismail et al. (2022), which found that toddlers who receive adequate nutritional support are 7.8 times more likely to have normal nutritional status. Furthermore, timely provision of breast milk and complementary feeding also increases the likelihood of normal nutritional status by 4.3 times. Yaya et al. (2018) in Timor Leste also found a significant association between inadequate nutritional support and the incidence of stunting. A similar study by Suryati (2023) in Bondowoso Regency, which also showed a multivariate analysis of the results, also showed a significant association between parenting patterns and feeding practices with the incidence of stunting in toddlers aged 24-59 months (p=0.002; OR=4.664; 95% CI: 1.707–12.634). This study indicates that the low role of mothers in meeting children's nutritional needs in the long term contributes to stunting.

Observations in the Pagambiran Community Health Center (Puskesmas) area indicate that breastfeeding practices do not fully meet WHO recommendations. Only 55.37% of mothers practice early breastfeeding (IMD), even though IMD is a crucial first step in establishing a mother-child bond and promoting the production of antibody-rich colostrum (WHO, 2009). Furthermore, only 48.60% of toddlers receive exclusive breastfeeding for the first six months of life. Meanwhile, the practice of giving other foods or drinks before breast milk comes in (prelacteal) is reflected in 40.65% of toddlers who have been given formula milk since birth, and 23.36% of toddlers who have received complementary foods before the age of six months. This practice contradicts WHO and UNICEF recommendations, which recommend only breast milk without any additional food or drink for the first six months (WHO and UNICEF, 2021) and carries the risk of causing digestive disorders and reducing the baby's immune system.

The provision of complementary foods (MP-ASI) by mothers also showed various weaknesses, both in terms of quality and responsiveness to children's needs. As many as 71.50% of toddlers reported consuming snacks or junk food more frequently, which are generally low in nutrition

but high in sugar, salt, and fat. Only 47.20% of mothers practiced a balanced diet, while only 57.48% of children varied their daily menus. Nutritious snacks were also not yet a habit, with only 28.50% of children receiving them regularly. Furthermore, only 28.74% of mothers stopped feeding when their children were full, and 30.61% prioritized their children's food over other family members. These findings indicate that the principle of responsive feeding has not been fully implemented, even though this principle emphasizes feeding that pays attention to children's hunger and fullness signals and creates a positive eating experience.

Pemberian makan yang kurang memperhatikan aspek responsivitas dan kebutuhan gizi anak lebih banyak ditemukan pada kelompok anak dengan stunting. Kurangnya keterlibatan ibu dalam mengatur frekuensi dan suasana makan anak berkontribusi terhadap ketidak terpenuhinya asupan nutrisi harian anak. Seperti yang dijelaskan oleh Amalia et al., (2021) peran ibu sangat penting dalam menciptakan suasana makan yang menyenangkan serta menyediakan makanan yang menarik dan sesuai dengan selera anak. Temuan ini mengindikasikan bahwa kualitas pengasuhan dalam pemberian makan masih perlu ditingkatkan, tidak hanya dari sisi ketersediaan pangan, tetapi juga dalam hal pola asuh yang adaptif dan sensitif terhadap kebutuhan anak. Upaya edukasi gizi, peningkatan kapasitas ibu, serta dukungan layanan kesehatan primer, termasuk pemanfaatan kapsul vitamin A dan pemberian Makanan Tambahan di posyandu, perlu diperkuat agar praktik pengasuhan yang mendukung pertumbuhan anak dapat terwujud secara menyeluruh.

Pemenuhan Gizi yang adekuat (adequate nutrition) adalah salah satu komponen utama dalam NCF-yang berperan penting dalam pertumbuhan dan perkembangan anak. Pemberian ASI sejak dini dan pola makan yang beragam terbukti mengurangi risiko penyakit serta meningkatkan status gizi anak. Inisiasi menyusu dini (IMD) merupakan proses menyusui bayi segera setelah lahir. Namun, dalam praktiknya penerapan prinsip IMD seringkali tidak dilakukan dengan optimal, sehingga bayi tidak memperoleh kolostrum secara maksimal sebagai zat pertama yang berperan penting sebagai antibodi alami. Ibu yang tidak melakukan IMD pada cenderung membuang kolostrum, sehingga bayi kehilangan sumber perlindungan awal terhadap infeksi.

Pemberian makanan yang baik dan memadai sangat penting untuk mendukung tumbuh kembang balita. Bella et al. (2020) menyebutkan bahwa sekitar 30% balita mengalami stunting disebabkan oleh pemenuhan gizi yang tidak adekuat dan infeksi. Pemenuhan gizi yang tidak adekuat juga meningkatkan risiko infeksi, yang berdampak langsung pada status gizi dan pertumbuhan anak (Bella et al., 2020). Jika asupan gizi rendah, imunitas anak juga menurun, sehingga lebih rentan terhadap penyakit infeksi yang pada akhirnya berdampak pada status gizinya. Pola asuh gizi ibu, termasuk penyiapan, penyajian, dan cara pemberian makanan, memiliki pengaruh jangka panjang terhadap status gizi anak.

Field findings indicate that toddler feeding practices still need to be improved to meet their nutritional needs. Many toddlers do not receive adequate nutrition for their growth and development. Children's nutritional status can improve if adults guide them and promote proper eating habits. Therefore, education on early breastfeeding initiation, exclusive breastfeeding, appropriate complementary feeding (MP-ASI), and appropriate eating patterns needs to be continuously promoted to prevent stunting and support child growth and development. This education includes menu planning, processing, serving, and proper feeding methods.

Security and Safety Risk Factors with Stunting Incidents

Multivariate analysis results showed that security and safety were statistically significantly associated with stunting. Toddlers with poor security and safety were 4.016 times more likely to experience stunting than those with good security and safety.

The results of this study align with those of Mudadu Silva et al. (2023), who found that vulnerability to access to clean water, sanitation, and hygiene (WASH) increases the risk of

stunting in children in developing countries such as Ethiopia, India, Bangladesh, Tanzania, Peru, China, and Lesotho. This is because the role of parents, especially mothers, in maintaining children's hygiene and sanitation contributes to improving their nutritional status.

Analysis of the 2013 Indonesia National Health Survey data by Ali et al. (2023) involving 46,315 children aged 6–59 months, showed that children living in households with inadequate wastewater disposal systems had a higher risk of experiencing mild (RR = 1.09; 95% CI 1.01 to 1.16; p = 0.022) and moderate (RR = 1.10, 95% CI 1.01 to 1.19; p = 0.023) stunting. Similarly, Nita (2023) also showed that parenting patterns that pay attention to cleanliness and sanitation play a role in reducing the incidence of stunting in toddlers aged 24–59 months.

The study did not directly classify its findings in terms of child safety and security, but indicators such as environmental sanitation, waste disposal systems, and household hygiene are part of a safe and clean environment, which is included in the security and safety component of the NCF framework. Environmental hygiene and sanitation, especially environmental health status based on various criteria, such as healthy housing conditions, access to basic sanitation facilities (toilets, clean water, trash cans, and household waste disposal channels), as well as community behavior, are additional factors that contribute to stunting.

Researchers' observations indicate that child safety and security in their residential environments are still inadequate. 41.12% of households have defecation distances that do not meet standards (<10 meters from water sources), which risks contaminating drinking water, and 28.50% lack proper waste disposal facilities. 22.43% of families do not defecate in healthy latrines, reflecting the low level of basic sanitation. Children's personal hygiene is also still lacking. Only 47.20% of children brush their teeth with toothpaste daily, 45.33% have their ears cleaned regularly, and 53.74% have their nails trimmed regularly. Furthermore, only 34.11% of children consistently wear footwear while playing, which risks worm infections. These infections can reduce nutrient absorption and directly impact children's growth.

This condition is exacerbated by high levels of exposure to cigarette smoke, with 93% of households having a smoking family member, and 18.22% of homes lacking adequate ventilation, resulting in suboptimal air circulation. Unhygienic home environments and exposure to cigarette smoke can compromise children's immune systems, increase the incidence of respiratory infections (ARI), negatively impact children's health and development, and contribute to stunting.

Some toddlers are also known to live near industrial areas or factories that potentially pollute the environment, such as air or water pollution, which can increase the risk of infection. The combination of these factors increases the risk of exposure to unhealthy environments, which can ultimately interfere with nutrient absorption and worsen children's growth and development. These findings confirm that safety and security aspects of the household environment significantly contribute to stunting.

Paternal smoking habits also increase the risk of stunting in children, both in the moderate (RR = 1.07, 95%CI 1.01 to 1.13; p = 0.016) and severe (RR = 1.08, 95%CI 1.02 to 1.15; p = 0.002) categories. Exposure to cigarette smoke contains harmful chemicals such as nicotine, tar, and carbon monoxide, which disrupt metabolism and increase the risk of disease. These findings suggest that environmental factors and parental habits contribute to the incidence of stunting in children.

An unclean living environment increases the risk of health problems, which in turn reduces the quality of children's health. This condition makes toddlers more susceptible to health problems or illnesses, ultimately leading to a significant decrease in appetite. As a result, children's daily calorie and nutrient needs are not met properly, thus inhibiting growth and increasing the risk of stunting.

Therefore, stunting prevention efforts need to focus on improving clean and healthy living behaviors (PHBS), active support from health workers, and improving the quality of environmental sanitation to create safe conditions that support optimal child growth and development.

Research Limitations

Further observation is needed to assess the stimulation provided by mothers to their children. Because the researchers only conducted observations during questionnaires, this study did not measure the toddlers' food intake, so their nutritional levels are unknown.

Conclusion

Based on the research results, it can be concluded that: 1) The frequency distribution shows that the majority of mothers are in the 20–35 age group, have secondary education, are unemployed or are housewives, have incomes below the Padang City UMK, and have 1–2 children.; 2) Most toddlers are in the 24-35 month age group. The gender distribution is relatively balanced, with a slight female predominance. The majority of children have a birth weight of ≥ 2500 grams and a birth length of ≥ 48 cm; 2) The prevalence of stunting in the working area of the Pagambiran Community Health Center, Padang City, was 43.9% (94 toddlers), indicating that the incidence of stunting is still relatively high; 3) There is a significant relationship between risk factors for fulfilling health needs (good health) and the incidence of stunting in toddlers in the working area of the Pagambiran Padang Health Center; 4) There is a significant relationship between risk factors for adequate nutrition and the incidence of stunting in toddlers in the working area of the Pagambiran Padang Health Center; 5) There is no significant relationship between the risk factors of responsive care and the incidence of stunting in toddlers in the working area of the Pagambiran Padang Health Center; 6) There is no significant relationship between the risk factors of early learning opportunities/early stimulation (opportunities for early learning) and the incidence of stunting in toddlers in the working area of the Pagambiran Padang Health Center; 7) There is a significant relationship between security and safety risk factors and the incidence of stunting among toddlers in the Pagambiran Padang Health Center working area; 8) There is a significant relationship between parenting patterns using the composite NCF approach and the incidence of stunting in toddlers in the working area of the Pagambiran Padang Health Center.

The risk factor for adequate nutrition is the most dominant variable in the incidence of stunting in toddlers in the working area of the Pagambiran Padang Health Center.

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