Differences in Food Security Based on Family Income and Its Impact on Stunting Among Children Under Five in Padang Lawas Regency North Sumatera Province

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Abstract

Indonesia continues to face nutritional challenges, with a high prevalence of stunting. incidence Padang Lawas Regency is one of the regions in North Sumatra Province with a relatively high of stunting. Stunting is influenced by several factors, one of which is food security. Food security depends on family income; inadequate family income leads to poor food security, making families unable to meet children's primary and secondary needs. This study aims to analyze differences in food security based on family income and its impact on stunting incidence among children under five in Padang Lawas Regency North Sumatera Province. This research is an analytical survey using a cross-sectional study design. The study was conducted in Padang Lawas Regency, specifically in six sub-districts with the highest number of children under five: Sosa, Hutaraja Tinggi, Barumun, South Barumun, Batang Lubu Sutam, and Sosa Julu. The research was carried out from October 2024 to February 2025. The study population consisted of all families with children aged 6–59 months across the six sub-districts, totaling 9,181 families. Using Slovin's formula, the sample size was determined to be 384 families. A multistage cluster sampling technique was employed for sample selection. Data collection was conducted through interviews and observations. Data analysis included univariate analysis and bivariate analysis using an independent t-test and simple logistic regression with a significance level of 95% (α = 0.05). The study results indicate a significant difference in food security based on family income (P-value = 0.001). Moreover, there is a significant impact of family food security on stunting incidence among children under five in Padang Lawas Regency (P-value = 0.001; Exp.B = 13.908). It is recommended that the Padang Lawas Regency Government improve the local economic system by facilitating job opportunities for the community.

Keywords: Family income, food security, stunting

INTRODUCTION

Growth failure, commonly known as stunting Kinyoki et al., (2020), refers to impaired growth and development in children under five years old due to chronic nutrient deficiencies (Tedjosasongko et al., 2024; Dewi et al., 2024; Hung et al., 2024). Stunting is one of the most prevalent nutritional problems, with children under five being among the most vulnerable age groups to nutritional deficiencies (Verawati et al., 2022; Lestari et al., 2024; Antriyandarti et al., 2024). Stunting in children under five is a form of chronic malnutrition caused by limited access to and affordability of food (Sadikeen et al., 2024; Islam et al., 2025).

Food availability is a crucial factor as it is one of the key aspects of food security (Islamiah et al., 2022). It plays a vital role in achieving food security at both the household and individual levels (Wahyuni & Fithriyana, 2020). Adequate food availability is essential for maintaining good nutritional status, as higher food availability within a family leads to improved nutritional adequacy (Faiqoh et al., 2018; Tesfaye et al., 2024).

Food is a fundamental necessity that must be consistently fulfilled. A food supply that is insufficient relative to its demand can lead to instability in meeting household food needs. Indonesia requires an adequate and well-distributed food supply to ensure both consumption sufficiency and national stock availability, following the operational requirements of an extensive and dispersed logistics system (Pratama, 2024). Additionally, the increasing global population raises concerns about a potential food crisis. Currently, the growth of the world's population is not accompanied by a proportional increase in food productivity. It is estimated that by 2050, the global population will reach 10 billion, necessitating a 60% increase in food production (Devi et al., 2020; Landry et al., 2024).

High population density can pose a significant threat to the health status of vulnerable groups residing in resource-constrained areas, both in the short and long term (Purnama et al., 2023). However, the approach to the number of family members about stunting must be followed by the identification of the purchasing power of the family based on the level of income per capita. In other words, family size and the number of children under five will not interfere with the allocation of food in the family as long as the family has economic resilience above the community average (Purnama et al., 2023; Kurniasih et al., 2024).

The Global Food Security Index (GFSI) has experienced a decline since 2019 amidst rising food prices and increasing levels of hunger (The Economist Group, 2022). In 2022, Indonesia recorded a food security index score of 60.2, which remains below both the global and Asia-Pacific regional averages. Ranked 63rd out of 113 countries, this position reflects Indonesia's lagging performance in food security and underscores the need for heightened governmental attention. According to data from Statistics Indonesia (BPS), the prevalence of inadequate food consumption in 2022 was 10.21 percent, indicating that approximately one in ten Indonesians did not consume sufficient dietary energy to maintain a normal, active, and healthy life. This figure marks a significant increase from 8.49 percent in the previous year, further highlighting the urgency of addressing food security challenges in the country (Eliezer, 2024).

Insufficient household food security leads to inadequate food intake, which negatively impacts nutritional status (Abdullah et al., 2019). Several factors influence food security,

including family income, education, and ownership of productive assets, all of which contribute to food insecurity (Frisnoiry et al., 2024). Household food security is significantly affected by geographical challenges in certain areas, including islands, mountainous regions, and disaster-prone zones. Food insecurity may elevate the risk of morbidity due to inadequate nutrient intake, as various nutrients are essential for supporting immune function. Declining household income reduces purchasing power, limits food availability, and undermines overall household food security (Purnama et al., 2024). Household food security disruptions are often caused by poverty, particularly low family income (Munialo & Mellor, 2024; Nontu et al., 2024).

The prevalence of stunted children under five in Asia accounts for more than half of the global stunting cases, reaching 55% (*United Nations Children's Fund*, 2018). According to the *World Health Organization* (2023), although the incidence of stunting has been declining over the past decade, as of 2022, nearly all stunted children still reside in Asia (52% globally) and Africa (43% globally). Indonesia is classified as having a high prevalence of stunting, with 31.0% of children affected, based on the threshold set by the WHO-UNICEF Technical Advisory Group on Nutrition Monitoring in 2022 (WHO, 2023). In the previous year, according to the 2021 SSGI data, North Sumatra ranked 17th among provinces with the highest number of stunted children in Indonesia, reaching 25.8%. Furthermore, 17.63% of the stunting prevalence in the province was attributed by the population residing in Padang Lawas Regency (Kemenkes RI, 2022).

Padang Lawas Regency is classified as a high-risk (red zone) area for stunting, with a prevalence rate of 35.8% (Kemenkes RI, 2022a). Based on anthropometric measurements conducted in Padang Lawas Regency in August 2023 on a total of 19,346 children under five, 285 were classified as severely stunted, while 938 were classified as stunted.

The population residing in Padang Lawas Regency predominantly falls into the lower-middle economic category, as many households earn below the regional minimum wage (UMR) of Padang Lawas Regency. Low family income affects household food security, which, in turn, can contribute to nutritional deficiencies, including stunting in children under five. The persistently high prevalence of stunting in Padang Lawas, coupled with the low economic status of its residents, poses a significant challenge to food security. This issue serves as the primary rationale for conducting this study. This research aims to analyze differences in food security based on family income and its impact on stunting incidence among children under five in Padang Lawas Regency North Sumatera Province.

METHODS

This study employs a cross-sectional study design. The research was conducted in Padang Lawas Regency, which consists of six sub-districts with the highest number of children under five: (1) Sosa Sub-district, (2) Hutaraja Tinggi Sub-district, (3) Barumun Sub-district, (4) South Barumun Sub-district, (5) Batang Lubu Sutam Sub-district, and (6) Sosa Julu Sub-district. Where Padang Lawas Regency consists of 17 sub-districts; however, six sub-districts were selected for this study due to their relatively high number of children under five and elevated stunting cases. Sosa Sub-district has 1,346 children under five with 48 stunting cases; Hutaraja Tinggi has 3,190 children with 45 stunting cases; Burumun has 2,616 children with 45 stunting cases; South Barumun has 735 children with 48 stunting cases; Batang Lubu Sutam has 709 children with 29 stunting cases; and Sosa Julu has 585 children with 23 stunting cases. The study was carried out from October 2024 to February 2025. The study population includes all families with children aged 6–59 months across the six sub-districts of Padang Lawas Regency, totaling 9,181 families. The sample size was determined using Slovin's formula, resulting in 384 families with children aged 6–59 months, the sampling technique employed in this study was multistage cluster sampling. This method involves a multi-level sampling process conducted in two or more stages. In the first stage, Padang Lawas Regency was divided into six sub-districts (clusters). In the second stage, several sub-districts were randomly selected as sample units. In the third stage, within each selected sub-district, several villages were randomly chosen, followed by the random selection of residents in each village to be interviewed or to complete questionnaires.

Sampling criteria were divided into inclusion and exclusion criteria. The inclusion criteria included children aged 6–59 months, those cared for by their biological mother, and families willing to participate as respondents. The exclusion criteria included children with comorbid conditions such as diarrhea, those unavailable during the study period, and children with developmental disorders such as autism and intellectual disabilities.

The study utilized three key variables: the dependent variable, stunting which was measured on an ordinal scale (categorical data); the primary independent variable, food security, also measured on an ordinal scale (categorical data); and income, measured on a ratio scale (numerical data). Stunting was measured based on the Z-score (nutritional status based on the height-for-age indicator, H/A), and categorized as stunted (Z-score < -2) and not stunted (Z-score ≥ -2). Household food security was assessed using the modified Household Food Insecurity Access Scale (HFIAS) to suit the local context. This instrument encompasses food availability, access to food, utilization of food, and food stability, with a total of 22 items and

a maximum score of 56 points. Food security was categorized as 'good/secure' (> 80%, score > 45), 'moderate/at risk' (60% - 80%, score 34 - 45), and 'poor/insecure' (< 60%, score < 34).

Data collection was conducted through interviews and direct observation by the researcher, along with anthropometric measurements of children's weight and height, assisted by Posyandu health workers. The analysis included univariate analysis and bivariate analysis, employing an independent t-test and simple logistic regression with a significance level of 95% ($\alpha = 0.05$).

The study found significant differences in food security between low- and high-income households ($p < 0.05$). Low-income families were more likely to experience poor food security. Children under five from food-insecure households had a higher risk of stunting (OR = 2.8; 95% CI). The most influential risk factor contributing to stunting was poor household food security, as food-insecure families were more likely to fail to meet the nutritional needs of their children, particularly in terms of animal protein and essential micronutrients.

The principal investigator obtained an ethical approval certificate from the Health Research Ethics Committee of the Faculty of Medicine, Andalas University (No: 523/UN.16.2/KEP-FK/2024). Additionally, permission from academic administrators and relevant authorities was sought before data collection to obtain informed consent from respondents before questionnaire distribution.

RESULTS

Family Characteristics in Padang Lawas Regency

The family characteristics in Padang Lawas Regency include the number of family members, the number of children, and family income. The frequency distribution of families in Padang Lawas Regency is presented in the following table:

Table 1. Frequency Distribution of Family Characteristics in Padang Lawas Regency

Family Characteristics	Frequency	Percentage
Number of Family Members (Family Planning, BKKBN)		
Small (≤ 4 members)	185	48.2
Large (> 4 members)	199	51.8
Number of Children in the Family		
≤ 2 children	196	51.0
2 children	188	49.0
Monthly Family Income (Minimum Wage of Padang Lawas Regency)		
Low (≤ IDR 3,000,855)	198	51.6
High (> IDR 3,000,855)	186	48.4

According to Table 1, the frequency distribution of parental characteristics of children under five in Padang Lawas Regency shows that families with ≤ 4 members account for 185 families (48.2%), while those with > 4 members account for 199 families (51.8%). Families with ≤ 2 children make up 196 families (51.0%), whereas those with > 2 children comprise 188 families (49.0%). Additionally, families with a low monthly income (≤ IDR 3,000,855) total 198 families (51.6%), while those with a high monthly income (> IDR 3,000,855) total 186 families (48.4%).

Stunting Incidence Among Children Under Five in Padang Lawas Regency

The determination of stunting in children under five is based on standardized anthropometric measurements using Z-scores. The frequency distribution of stunting incidence among children under five in Padang Lawas Regency is presented in the following table:

Table 2. Frequency Distribution of Stunting Incidence Among Children Under Five in Padang Lawas Regency

Stunting Incidence Among Children	Frequency	Percentage
Non stunting	263	68.5
Stunting	121	31.5
Total	**384**	**100.0**

According to table 2, the frequency distribution of stunting incidence among children under five shows that 121 children (31.5%) were classified as stunted, while 262 children (68.5%) were not stunted.

Household Food Security in Padang Lawas Regency

The frequency distribution of household food security in Padang Lawas Regency is presented as follows:

Table 3. Frequency Distribution of Household Food Security in Padang Lawas Regency

Food Security	Frequency	Percentage
Good food security	246	64.1
Moderate food security	116	30.2
Poor food security	22	5.7
Total	**384**	**100.0**

According to Table 3, the frequency distribution of household food security in Padang Lawas Regency indicates that 246 families (64.1%) had good food security (food secure), 116 families (30.2%) had moderate food security (food insecure but vulnerable), and 22 families (5.7%) had poor food security (food insecure).

Differences in Food Security Based on Family Income in Padang Lawas Regency

The analysis of differences in food security based on family income in Padang Lawas Regency is presented as follows:

Table 4. Analysis of Differences in Food Security Based on Family Income in Padang Lawas Regency

Food Security	n	Mean	SD	p-*value*
Good	246	3,853,658.54	1,148,364.77	
Moderate	116	3,124,137.93	303,206.25	0.001
Poor	22	3,113,636.36	214,466.01	

According to Table 4, the average family income for households with good (food secure) food security was IDR 3,853,658.54, with a standard deviation of IDR 1,148,364.77. The average family income for households with moderate (vulnerable) food security was IDR 3,124,137.93, with a standard deviation of IDR 303,206.25. Meanwhile, the average family income for households with poor (food insecure) food security was IDR 3,113,636.36, with a standard deviation of IDR 214,466.01. The statistical test results showed a p-value of 0.001, indicating a significant difference in family income across different levels of food security (good, moderate, and poor).

The Effect of Food Security on Stunting Incidence Among Children Under Five in Padang Lawas Regency

Data analysis was conducted using a simple logistic regression test. The results of the analysis on the effect of food security on stunting incidence among children under five in Padang Lawas Regency are presented as follows:

Table 5. The Effect of Food Security on Stunting Incidence Among Children Under Five in Padang Lawas Regency

	β	Exp B	Confidence Interval (95% CI) for Exp B		p-*value*
			Lower	Upper	
Food Security	1.524	4.591	1.872	11.259	0.001
Constant	2.632	13.908			0.001

According to Table 5, the effect of food security on stunting incidence among children under five in Padang Lawas Regency shows an Exp(B) of 4.591. This indicates that food security influences stunting incidence by 5 times in children under five in Padang Lawas Regency. The statistical test results yielded a p-value of 0.001, leading to the conclusion that there is a significant effect of food security on stunting incidence among children under five in Padang Lawas Regency.

DISCUSSION

Padang Lawas Regency still has a high prevalence of stunting cases, with 121 children under five (31.5%) experiencing stunting. The findings of this study indicate that one of the risk factors for stunting among children under five is poor household food security. Household food security in Padang Lawas Regency is influenced by various factors, which are similar to those found in other regions of Indonesia, as part of a developing country. The results of this study suggest that household food security is primarily affected by poverty or low family income, making food security highly dependent on household income. Low household income indirectly affects household food security, which in turn can contribute to nutritional deficiencies, one of which is the occurrence of stunting in children under five. The persistently high rate of stunting in Padang Lawas Regency, coupled with the low economic status of the population, constitutes a significant issue contributing to food insecurity.

Household food security refers to the ability of a household to consistently provide its members with adequate, diverse, and nutritionally balanced food in sufficient quantity and quality to support a healthy and productive life (Onyeaka et al., 2024). An increase in individual or household income generally corresponds with an improvement in economic well-being (Okwulu et al., 2024). Income serves as a primary determinant influencing consumption behavior; higher household income levels are typically associated with enhanced welfare and improved capacity to access essential goods and services (Saiful, 2024).

Household income significantly influences consumption patterns and the availability of food for family members (Kenney et al., 2024). It directly affects the allocation of financial resources required to procure adequate food (Wang et al., 2024). Low-income households often face challenges in meeting the nutritional needs of all family members, rendering them particularly vulnerable to food insecurity (Febrianti et al., 2024).

The study found that 116 families (30.2%) had moderate food security (vulnerable food security), while 22 families (5.7%) had poor food security (insecure food security). The results also indicate a significant difference in food security levels based on family income in Padang Lawas Regency, with a p-value of 0.001. This suggests that household income determines whether food security is categorized as good, moderate, or poor. Poor household food security reduces food availability within the household.

A large number of families in Padang Lawas Regency rely on agriculture as their primary source of income, leading to financial instability due to unpredictable earnings, which in turn contributes to poor food security. Additionally, field observations revealed that some households depend on government assistance or support from relatives to obtain food.

The results of this study align with the findings of Aprilia & Budiono (2024), which state that farming households generally have a family income below the Regency or City Minimum Wage, affecting their ability to meet daily needs. Consequently, household food security is influenced by family income. These findings are further supported by Susanti (2024), who found that economic conditions significantly impact a group's ability to fulfill its needs and access effective healthcare services. Children under five from financially disadvantaged families are at a higher risk of experiencing digestive disorders due to prolonged inadequate nutritional intake, ultimately increasing the likelihood of stunting.

According to Budiawati (2024), poverty is one of the key indicators used to assess household access to food, indicating that poverty has a significant impact on food security. The higher the number and percentage of impoverished individuals, the more limited their purchasing power, which in turn reduces household access to quality food.

According to UNICEF (2023), conceptual framework, low household income and poverty indirectly affect children's nutritional status through compromised food security. Income constraints and poverty can lead to inadequate dietary patterns due to limited resources, thereby impeding both the production and accessibility of food particularly nutritious food. In many contexts, healthier diets tend to be more expensive than energy-dense but nutrient-poor alternatives. The severity of these effects is often exacerbated in regions with high poverty rates or existing vulnerabilities.

Poor food security results in inadequate food availability in a given area, restricted access to food, improper food utilization, and unstable food supply, all of which contribute to stunting among children under five. The findings of this study confirm the influence of food security on stunting among children under five in Kabupaten Padang Lawas. Poor food security is often associated with overall low food intake, including inadequate nutrient consumption. A lack of proper nutrition in children can lead to long-term linear growth retardation. Therefore, food security and stunting in children under five are closely related.

Households with adequate food security typically have reliable access to sufficient quantities and quality of food, which in turn supports the fulfillment of children's nutritional needs and contributes to achieving optimal nutritional status (Wallingford et al., 2024; Rashid et al., 2024). In contrast, children from food-insecure households are at increased risk of growth delays due to limited food access (Patriota et al., 2024). In such households, food portions are often reduced and shared among family members, further compromising the child’s nutritional intake (Purwanti et al., 2024).

The results of this study are consistent with the findings of Fabanjo et al. (2024), who conducted research on the relationship between food security status and stunting in children under five. Their study demonstrated that food security significantly influences the occurrence of stunting in young children.

CONCLUSIONS

Based on the research findings and discussion, it can be concluded that there is a significant difference in food security based on household income in Padang Lawas Regency, and food security has an impact on the stunting among children under five in Padang Lawas Regency.

As a recommendation, the Padang Lawas Regency Government is encouraged to improve the local economic system by creating more job opportunities for the community. Additionally, efforts to enhance access to and affordability of food should be implemented, such as organizing periodic low-cost markets that are accessible to lower-income households. These initiatives can help support balanced nutrition fulfillment within families and improve household food security status.

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