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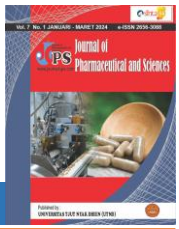

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Factors Associated with the Incidence of Stunting in Early Childhood Children in the Working Area of Buhit Community Health Centre, Pangururan District, Samosir Regency, 2024

Faktor-Faktor yang Berhubungan Dengan Kejadian Stunting pada Anak Usia Dini di Wilayah Kerja Puskesmas Buhit Kecamatan Pangururan Kabupaten Samosir Tahun 2024

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Abstract

Background: Stunting is a health problem resulting from chronic malnutrition over a long period. Although it serves as the district capital, Pangururan Sub-District still has a relatively high stunting prevalence, with 154 out of 2,460 measured toddlers (6.26%) affected. Identifying associated factors is necessary to design targeted interventions. **Objective:** This study aims to analyse the factors associated with the incidence of stunting in early childhood children in the working area of Buhit Community Health Centre, Pangururan Sub-District, Samosir Regency. **Methods:** This study used a cross-sectional design conducted in the working area of Buhit Community Health Centre. The study population consisted of mothers with toddlers in the area, with a sample size of 96 mothers selected using accidental sampling. Data were collected through questionnaires and anthropometric measurements and analysed using the Chi-Square test and logistic regression. **Results:** Bivariate analysis results showed significant relationships between maternal nutritional status (p=0.000), parenting patterns (p=0.000), maternal education level (p=0.000), family income level (p=0.003), and exclusive breastfeeding (p=0.029) with the incidence of stunting. Multivariate analysis indicated that maternal education level was the most dominant variable (p=0.013; OR=12.814), meaning that mothers with low education levels had a 12.8 times higher risk of having stunted children. **Conclusion:** Maternal nutritional status, parenting patterns, maternal education, family income, and exclusive breastfeeding were significantly associated with stunting, with maternal education level being the dominant factor. Therefore, stunting prevention efforts in this region should prioritise health education targeting mothers with low educational backgrounds.

Keywords*: *Stunting, Buhit, Education Level, Exclusive Breastfeeding.

Abstrak

Latar Belakang: Stunting merupakan masalah kesehatan akibat kekurangan gizi kronis dalam jangka panjang. Meskipun menjadi ibu kota kabupaten, Kecamatan Pangururan masih memiliki prevalensi stunting yang cukup tinggi, yaitu 154 balita dari 2.460 balita (6,26%) yang diukur. Identifikasi faktor-faktor yang berhubungan diperlukan untuk merancang intervensi yang tepat sasaran. **Tujuan:** Penelitian ini bertujuan untuk menganalisis faktor-faktor yang berhubungan dengan kejadian stunting pada anak usia dini di wilayah kerja Puskesmas Buhit, Kecamatan Pangururan, Kabupaten Samosir. **Metode:** Penelitian ini menggunakan desain cross-sectional yang dilaksanakan di wilayah kerja Puskesmas Buhit. Populasi penelitian adalah ibu yang memiliki balita di wilayah tersebut dengan jumlah sampel sebanyak 96 ibu, yang diambil menggunakan teknik accidental sampling. Data dikumpulkan melalui kuesioner dan pengukuran antropometri, kemudian

dianalisis menggunakan uji Chi-Square dan regresi logistik. **Hasil:** Hasil analisis bivariat menunjukkan terdapat hubungan yang signifikan antara status gizi ibu (p=0,000), pola asuh (p=0,000), tingkat pendidikan ibu (p=0,000), tingkat pendapatan keluarga (p=0,003), dan pemberian ASI eksklusif (p=0,029) dengan kejadian stunting. Analisis multivariat menyatakan bahwa tingkat pendidikan ibu merupakan variabel paling dominan (p=0,013; OR=12,814), yang berarti ibu dengan pendidikan rendah memiliki risiko 12,8 kali lebih tinggi untuk memiliki anak stunting. **Kesimpulan:** Faktor status gizi ibu, pola asuh, pendidikan ibu, pendapatan keluarga, dan ASI eksklusif berhubungan signifikan dengan stunting, dengan tingkat pendidikan ibu sebagai faktor dominan. Oleh karena itu, upaya pencegahan stunting di wilayah ini perlu memprioritaskan pendidikan kesehatan yang menyasar ibu dengan latar belakang pendidikan rendah.

Kata Kunci: *Stunting, Buhit, Tingkat Pendidikan, Asi Eksklusif.*

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Introduction

Stunting is one of the most serious global health problems, particularly in developing countries. This condition is characterised by children's height being below the standard for their age due to chronic malnutrition over a prolonged period. [1,2]. WHO estimated that in 2020, approximately 149.2 million children under five experienced stunting, or about 22% of the global child population. Of these, around 36% were from Africa and 56% from Asia, making these regions the most affected by stunting[2]. WHO also considers stunting prevalence rates of ≥20% a serious public health problem [2].

Indonesia continues to face significant challenges in tackling stunting. In 2018, the national stunting prevalence was recorded at 30.8% [3], placing Indonesia as the fifth-highest country for stunting in the world [4]. Although there has been an improvement, with prevalence decreasing from 27.7% in 2019 to 24,4% in 2021 [4]. The figure remains above the threshold set by WHO. More recent data indicate a further decline in 2022–2023, yet stunting remains a top priority in national health development.[5].

Stunting prevalence also varies across regions. In North Sumatra, stunting prevalence dropped from 25.8% in 2021 to 21.1% in 2022 [6,7]. However, several districts still report high rates. For example, Samosir Regency ranked eighth highest in the province, with a prevalence of 36.7% in 2021. Although this figure declined to 22.4% in 2023, the number of stunting cases in the region remains a serious concern, particularly in Pangururan District, where 154 stunted children were recorded out of a total of 2,460 under-fives (6.26%) [8].

Stunting is a multifactorial condition influenced by biological, socioeconomic, environmental, and healthcare factors. Biological factors include low birth weight, recurrent infections, and malnutrition during the first 1,000 days of life. [9–12]. Socioeconomic factors, such as low maternal education, limited household income, and poor access to sanitation, also significantly contribute to the risk of stunting. [13]. Furthermore, suboptimal feeding practices, including low rates of exclusive breastfeeding, exacerbate the problem. A study by Black et al. (2013) found that infants who received exclusive breastfeeding had a lower risk of malnutrition, including stunting, since breast milk provides essential nutrients for optimal growth and strengthens the immune system, thereby reducing infections such as diarrhoea and pneumonia [14].

At the community health service level, primary healthcare Centres (puskesmas) play an essential role in promotive and preventive programs, including nutrition counselling, integrated health posts (posyandu), and parenting education [15,16]. However, the effectiveness of stunting prevention programs in puskesmas is

still challenged by limited human resources, low community participation, and unfavourable socioeconomic conditions [17].

Although many previous studies have examined stunting risk factors at national and provincial levels, research focusing on local contexts remains limited, particularly in Samosir Regency, which has a high prevalence and distinct socioeconomic characteristics compared to other regions. Understanding the determinants of stunting in this area is crucial for designing more targeted intervention strategies. This study aims to analyse the risk factors associated with stunting among children under five in the working area of Buhit Primary Health Centre, Pangururan District, Samosir Regency, in 2024.

Experimental Section

Research Design

This study used a quantitative method with a cross-sectional design, where measurements of the independent variables (maternal nutritional status, childcare patterns, maternal education level, family income level, exclusive breastfeeding) and the dependent variable (stunting incidence) were conducted simultaneously at relatively the same time. This study was conducted in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency in 2024.

Population and Sample

The population in this study was 2,460 mothers with toddlers in the Buhit Community Health Centre, Pangururan District, Samosir Regency. The research sample was determined using the Slovin formula, resulting in a sample size of 96 mothers. The sampling technique used was accidental sampling, with mothers and toddlers who attended the integrated health post (Posyandu) in the Buhit Community Health Centre in 2024 being selected as the research sample.

Research Variables

The variables in this study consist of independent and dependent variables. The independent variables include maternal nutritional status, parenting patterns, maternal education level, family income, and exclusive breastfeeding. Meanwhile, the dependent variable is the incidence of stunting in early childhood.

Operational Definition of Variables

The operational definition of variables in this study was prepared to ensure the measurability of each variable. The dependent variable was the incidence of stunting as measured by height for age using the Health Card (KMS), with the categories of stunting (z-score <-2 SD) and not stunting (z-score ≥ -2 SD). The independent variables included: (1) maternal nutritional status as measured by the Body Mass Index (BMI) and categorized into good nutrition and poor nutrition; (2) childcare patterns as measured by a questionnaire and categorized into good and poor; (3) maternal education level categorized as low (≤ junior high school) and high (≥ senior high school); (4) family income level categorized as > UMK or ≤ UMK Samosir Regency of Rp2,583,697; and (5) exclusive breastfeeding categorized as exclusive and non-exclusive.

Data Collection

Data collection was conducted using primary and secondary data. Primary data were obtained from respondents using questionnaires, measurements, and direct observation. These data covered maternal nutritional status, childcare practices, maternal education level, family income, and exclusive breastfeeding. Secondary data were obtained from official institutions, including the number of toddlers, the number of mothers with toddlers, the prevalence of stunting, and other relevant data to support the research.

Validity and Reliability Test

Validity testing was conducted to determine the extent to which the research instrument could measure what it was intended to measure. Validity testing in this study included content validity and construct validity. Content validity was obtained through expert judgment, namely the assessment of the supervising lecturer and public health experts regarding the suitability of the questionnaire items to the research indicators. Furthermore, construct validity was conducted using the Pearson Product-Moment correlation

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test, where a questionnaire item is declared valid if the calculated r value is greater than the table r value at a significance level of 0.05.

Reliability testing was conducted to determine the consistency of the research instrument. An instrument is considered reliable if the Cronbach's Alpha value exceeds 0.6. This study conducted validity and reliability tests on mothers of toddlers in the Sirait Community Health Centre, Nainggolan District, Samosir Regency, which has characteristics similar to those of the central research location.

Data Management and Measurement Aspects

Data management was carried out through several stages, namely editing to ensure the completeness of the questionnaire, coding to assign a numeric code to each answer, data entry by entering data into a computer program, tabulating to present data in tabular form, and data cleaning to check and correct possible errors. Measurement aspects were carried out according to variables, including maternal BMI measurement, parenting questionnaires, the last level of formal education, family income compared to the minimum wage (UMK), exclusive breastfeeding through interviews, and measuring the incidence of stunting using the KMS.

Data analysis

This study's data analysis was conducted in three stages: univariate, bivariate, and multivariate. Univariate analysis aimed to explain or describe the characteristics of each studied variable. In this stage, the analysis was conducted by describing the frequency distribution of maternal nutritional status, childcare patterns, maternal education level, family income, exclusive breastfeeding, and stunting incidence.

Furthermore, bivariate analysis was used to determine the relationship between the independent variables (maternal nutritional status, childcare patterns, maternal education level, family income level, and exclusive breastfeeding) and the dependent variable (stunting incidence). The statistical test used was Chi-Square, because all research variables were categorical. The basis for decision-making was determined based on the probability value (p-value), with the criteria that if the p-value $<\alpha$ (0.05), then it is stated that there is a significant relationship. In contrast, if the p-value $>\alpha$ (0.05), then it is indicated that there is no significant relationship.

Multivariate analysis simultaneously tests the effect of more than one independent variable on a dependent variable. The technique used is logistic regression because the dependent variable is binary categorical data (stunting or not stunted). Before conducting the multivariate analysis, a bivariate analysis is first performed to filter independent variables that are significantly related to the dependent variable. The logistic regression model will include only independent variables that meet the requirements ($p < 0.25$ in the bivariate test). This multivariate analysis allows researchers to understand how various factors collectively influence the probability of stunting with a 95% confidence level.

Results and Discussion

Results

The results of the study will present data on the description of the research location, univariate analysis (describing the frequency distribution of variables of maternal nutritional status, child care patterns, maternal education level, family income level, exclusive breastfeeding and the incidence of stunting) and bivariate analysis (the relationship between maternal nutritional status, child care patterns, maternal education level, family income level, exclusive breastfeeding with the incidence of stunting) as well as the dominant variables that influence the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency in 2024.

Description of Research Location

This research was conducted in the working area of the Buhit Community Health Centre, Pangururan District. Administratively, Pangururan District is located in the Samosir Regency government area of North Sumatra Province. In 2003, the Toba Samosir Regency was divided into two regencies, Toba Samosir Regency and Samosir Regency, through Law No. 36/2003. Samosir Regency includes sub-districts on Samosir Island and part of the mainland of Sumatra Island. Pangururan District is one of the sub-districts in Samosir Regency, which also serves as the centre of government (capital city) of Samosir Regency. Its strategic position on Samosir Island makes this area a central point for the Lake Toba area's government, economic, and tourism

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activities. Pangururan District is located at around 2°54′ – 2°55′ N and 99°01′ – 99°02′ E. These coordinates indicate the location of the sub-district in the central part of Samosir Island.

Located in the middle of Lake Toba, this area has a distinctive topography, with highlands and several hills. The altitude of the area around Pangururan ranges from 900 to 1,000 meters above sea level. This condition provides a relatively cool climate compared to the surrounding lowlands. Lake Toba, which surrounds Samosir Island, influences the climate and environment in Pangururan District. This area tends to experience high rainfall and cool air, making it one of the attractive natural tourist destinations in the Lake Toba area..

Stunting remains a major child health issue in Pangururan District. Data as of August 2024 showed the stunting rate reached 12.08%. Despite the decline, stunting remains a priority in Samosir Regency, which aligns with national guidelines. The Buhit Community Health Centre (Puskesmas) in Pangururan District, Samosir Regency, has implemented various strategies and programs to address stunting in the region. These efforts include improving maternal and child health (MCH) services, providing complete basic immunisations (IDL), providing vitamin A, essential for supporting child growth and development and preventing stunting, monitoring the nutritional status of toddlers, and improving the quality of health services. The Buhit Community Health Centre actively addresses stunting in Pangururan District, Samosir Regency, through these programs and efforts.

Univariate Analysis

Univariate analysis presents the results of the research variables descriptively. The variables in this study are the independent variables (maternal nutritional status, child-rearing patterns, maternal education level, family income level, exclusive breastfeeding) and the dependent variable (stunting incidence).

Frequency Distribution of Maternal Nutritional Status

Maternal nutritional status is obtained based on BMI, which results from calculating Maternal Weight (Kg) divided by the square of Maternal Height (M). Maternal nutritional status will be categorised into Poor Nutrition (BMI < 18.5 kg/m²) or > 25.0–29.9 kg/m²) and Good Nutrition (BMI 18.5–24.9 kg/m²). The frequency distribution of the nutritional status of mothers who have toddlers in the working area of Buhit Health Centre, Pangururan District, Samosir Regency will be presented in Table 1 below.

Table 1. Distribution of the Frequency of Nutritional Status of Mothers with Toddlers in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

No	Maternal Nutritional Status	n	%
1	Good	73	76,0
2	Not good	23	24,0
	Amount	**96**	**100,0**

Based on Table 1 above, the frequency distribution of nutritional status of mothers who have toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, is highest in the good category, 73 mothers (76.0%), and lowest in the poor category, 23 mothers (24.0%).

Distribution of Parenting Patterns

The distribution of the frequency of child-rearing patterns carried out by mothers who have toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, will be presented in Table 2 below.

Table 2. Distribution of the Frequency of Parenting Patterns for Children with Toddlers in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

No	Parenting Patterns	n	%
1	Good	78	81,3
2	Less Good	18	18,7
	Amount	96	100,0

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Based on Table 2 above, the distribution of the frequency of childcare patterns carried out by mothers who have toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, is highest in the good category, 78 mothers (81.4%), and lowest in the bad category, 18 mothers (18.7%).

Frequency Distribution of Education Level

The frequency distribution of the education level of mothers who have toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, will be presented in Table 3 below.

Table 3. Distribution of the Education Level of Mothers with Toddlers in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

No	Level of education	n	%
1	Higher Education (High School, University)	82	85,4
2	Low (Did not finish elementary school, primary school, junior high school)	14	14,6
	Amount	**96**	**100,0**

Based on Table 3 above, the frequency distribution of the education level of mothers who have toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, is highest in the high category, 82 mothers (85.4%), and lowest in the low category, 14 mothers (14.6%).

Frequency Distribution of Income Levels

The frequency distribution of income levels of families with toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, will be presented in Table 4 below.

Table 4. Frequency Distribution of Income Levels of Families with Toddlers in the Working Area of Buhit Health Centre, Pangururan District, Samosir Regency

No	Family Income Level	n	%
1	> Minimum Wage	77	80,2
2	≤ UMK	19	19,8
	Amount	**96**	**100,0**

Based on Table 4 above, it can be seen that the frequency distribution of income levels of families with toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, is highest in the > UMK category, namely 77 mothers (80.2%) and lowest in the ≤ UMK category, namely 19 mothers (19.8%).

Distribution of Exclusive Breastfeeding Frequency

The distribution of the frequency of exclusive breastfeeding by mothers with toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, will be presented in Table 5 below.

Table 5. Distribution of Exclusive Breastfeeding Frequency in Mothers with Toddlers in the Working Area of Buhit Community Health Centre, Pangururan District, Samosir Regency

No	Exclusive Breastfeeding	n	%
1	exclusive breastfeeding	34	35,6
2	Not exclusive breastfeeding	62	64,4
	Amount	**93**	**100,0**

Based on Table 5 above, the distribution of the frequency of exclusive breastfeeding by mothers who have toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, is highest in the category of not providing exclusive breastfeeding, 62 mothers (64.4%), and lowest in the category of providing exclusive breastfeeding, 34 mothers (35.6%).

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Distribution of Stunting Incident Frequency

The distribution of the frequency of stunting incidents in children of mothers who have toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, will be presented in Table 6 below.

Table 6. Distribution of the Frequency of Stunting Incidents in Children of Mothers with Toddlers in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

No	Stunting Incident	n	%
1	Clumsy	13	13,5
2	No Stunting	83	86,5
	Amount	**93**	**100,0**

Based on Table 6 above, the distribution of the frequency of stunting incidents in children of mothers who have toddlers in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency, is highest in the non-stunting category, 83 mothers (86.5%), and lowest in the stunting category, 13 mothers (13.5%).

Bivariate Analysis

Bivariate analysis presents the results of statistical analysis of the relationship between independent variables (maternal nutritional status, childcare patterns, maternal education level, family income level, exclusive breastfeeding) and the dependent variable (stunting incidence) in the working area of the Buhit Health Centre, Pangururan District, Samosir Regency.

The Relationship between Maternal Nutritional Status and the Incidence of Stunting in the Working Area of Buhit Community Health Centre, Pangururan District, Samosir Regency

The results of the study on the relationship between maternal nutritional status and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency, are presented in Table 7 below.

Table 7. The Relationship between Maternal Nutritional Status and the Incidence of Stunting in the Working Area of Buhit Community Health Centre, Pangururan District, Samosir Regency

Maternal Nutritional Status	Stunting Incident				Total		Sig..
	Stunting	%	No Stunting	%	n	%	
Good	4	5,5	69	94,5	73	100,0	0,000
Not good	9	39,1	14	60,9	23	100,0	
Total	13		83		96		

Based on Table 7 above, it can be seen that of the 73 mothers with good nutritional status, four mothers (5.5%) had children who experienced stunting, and 69 mothers (94.5%) did not experience stunting. Of the 23 mothers with poor nutritional status, 9 (39.1%) had children who experienced stunting, and 14 (60.9%) did not experience stunting. The results of statistical tests using the chi-square test showed a significance value (sig.) of 0.000. This value is smaller than the degree of error (α = 0.05), so it can be concluded that there is a relationship between maternal nutritional status and the incidence of stunting in the Working Area of the Buhit Health Centre, Pangururan District, Samosir Regency.

The Relationship Between Parenting Patterns and the Incidence of Stunting in the Work Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

The results of the study on the relationship between parenting patterns and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency, are presented in Table 8 below.

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Table 8. The Relationship Between Parenting Patterns and the Incidence of Stunting in the Work Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

Parenting Patterns	Stunting Incident			Total			Sig..
	Stunting	%	No Stunting	%	n	%	
Good	2	2,6	76	97,4	78	100,0	0,000
Not good	12	61,1	5	38,9	18	100,0	
Total	13		83		96		

Based on Table 8 above, it can be seen that of the 78 mothers with good parenting patterns, two mothers (2.6%) have children who experience stunting, and 76 mothers (97.4%) do not experience stunting. Of the 18 mothers who have poor parenting patterns, 12 (61.1%) have children who experience stunting, and 5 (38.9%) do not experience stunting. The results of statistical tests using the chi-square test show a significance value (sig.) of 0.000. This value is smaller than the degree of error (α = 0.05), so it can be concluded that there is a relationship between mothers' parenting patterns and the incidence of stunting in the Working Area of the Buhit Health Centre, Pangururan District, Samosir Regency.

The Relationship Between Education Level and the Incidence of Stunting in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

The results of the study on the relationship between maternal education level and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency, are presented in Table 9 below.

Table 9. The Relationship Between Maternal Education Level and the Incidence of Stunting in the Working Area of Buhit Community Health Centre, Pangururan District, Samosir Regency

Level of education	Stunting Incident			Total			Sig..
	Stunting	%	No Stunting	%	n	%	
High	4	4,9	78	95,1	82	100,0	0,000
Low	9	64,3	5	35,7	14	100,0	
Total	13		83		96		

Based on Table 9 above, it can be seen that of the 82 mothers with a high level of education, four mothers (4.9%) had children who experienced stunting, and 78 mothers (95.1%) did not experience stunting. Of the 14 mothers with a low level of education, 9 (64.3%) mothers had children who experienced stunting, and 5 (35.7%) did not experience stunting. The results of statistical tests using the chi-square test showed a significance value (sig.) of 0.000. This value is smaller than the degree of error (α = 0.05), so it can be concluded that there is a relationship between maternal education level and the incidence of stunting in the Working Area of the Buhit Health Centre, Pangururan District, Samosir Regency.

The Relationship Between Family Income Level and the Incidence of Stunting in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

The results of the study on the relationship between family income levels and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency, are presented in Table 10 below.

Based on Table 10 above, it can be seen that of the 77 mothers whose family income is > UMK, six mothers (9.1%) have children who experience stunting, and 71 mothers (90.9%) do not experience stunting. Of the 12 mothers whose family income is ≤ UMK, 7 (36.8%) mothers have children who experience stunting, and 12 (63.2%) do not experience stunting. The results of statistical tests using the chi-square test show a significance value (sig.) of 0.003. This value is smaller than the degree of error (α = 0.05), so it can be concluded that there is a relationship between family income levels and the incidence of stunting in the Working Area of the Buhit Health Centre, Pangururan District, Samosir Regency.

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Table 10. The Relationship Between Family Income Level and the Incidence of Stunting in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

Income level	Stunting Incident				Total		Sig..
	Stunting	%	No Stunting	%	n	%	
> Minimum Wage	6	9,1	71	90,9	77	100,0	0,003
≤ UMK	7	36,8	12	63,2	19	100,0	
Total	13		83		96		

The Relationship Between Exclusive Breastfeeding and the Incidence of Stunting in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

The results of the study on the relationship between exclusive breastfeeding and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency, are presented in Table 12 below.

Table 11. The Relationship between Exclusive Breastfeeding Conditions and the Incidence of Stunting in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

Exclusive Breastfeeding	Stunting Incident				Total		
	Stunting	%	No Stunting	%	n	%	Sig..
Give	1	2,9	33	97,1	34	100,0	
NoGive	12	19,4	50	80,6	62	100,0	0,029
Total	13		83		96		

Based on Table 11 above, it can be seen that of the 34 mothers who provided exclusive breastfeeding, one mother (2.9%) had a child who experienced stunting, and 33 mothers (97.1%) did not experience stunting. Of the 62 mothers who did not provide exclusive breastfeeding, 12 (19.4%) had children who experienced stunting, and 50 (80.6%) did not experience stunting. The results of statistical tests using the chi-square test showed a significance value (sig.) of 0.029. This value is smaller than the degree of error ($\alpha = 0.05$), so it can be concluded that there is a relationship between providing exclusive breastfeeding and the incidence of stunting in the Working Area of the Buhit Health Centre, Pangururan District, Samosir Regency.

Multivariate Analysis

Bivariate Selection

After bivariate analysis, a multivariate analysis is conducted to determine the most dominant relationship between the independent variables and the dependent variable. The initial stage of multivariate analysis is determining the potential independent variables (multivariate candidate variables) that will be included in the multivariate analysis, namely, variables from the bivariate analysis results that have a p-value <0.25 [18]. The multivariate analysis used in this study is the t-test. *Logistic Regression is simple.* For more details, see Table 12.

Table *12.Candidate Variables for Multivariate (Simple Logistic Regression)*

No	Variables	*p-value* (<0,25)	Information
1.	Maternal nutritional status	**0,000**	**Candidate**
2.	Parenting patterns	**0,000**	**Candidate**
3.	Mother's education level	**0,000**	**Candidate**
4.	Family income level	**0,003**	**Candidate**
5	Exclusive breastfeeding	**0,029**	**Candidate**

From Table 12 above, the results of the analysis between the independent variables and the dependent variables can be seen, showing that all independent variables have a P value <0.25. These variables are maternal nutritional status, childcare patterns, maternal education, family income, and exclusive breastfeeding.

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Final Modeling

The second stage in multivariate analysis is to perform a complete model by including all candidate variables for analysis. Multivariate analysis aims to find the best model to determine the factors contributing to stunting in children. In this case, all candidate variables are tested simultaneously. For more details, see Table 13.

Table 13. Final Model of Multiple Logistic Regression Multivariate Analysis on the Variables of Maternal Nutritional Status, Childcare Patterns, Maternal Education Level, Family Income Level, Exclusive Breastfeeding, and the Incidence of Stunting

Variables		**B**	*Sig.*	*Exp*	*95% C. I for*	*EXP (B)*
					Lower	*Upper*
Level	Level of education	2.551	0.013	12.814	1.700	96.571
End	Parenting	-3.537	0.001	0.029	0.004	0.224
	Maternal Nutritional Status	2.019	0.048	7.531	1.021	55.564

From table 4 it is known that the final results of modeling using multiple logistic regression tests (*logistic regression*) shows that all final variables have a significant value of p<0.005, so it can be concluded that the results of the variable analysis with the binary regression test (*logistic regression*) it is known that the most dominant variable is the mother's education level with a significant value of 0.013 with an Exp B value of 12.814. It is concluded that a mother with a low level of education will have a 12.8 times greater chance of having a stunted child compared to a mother with a high level of education.

Discussion

The Relationship between Maternal Nutritional Status and the Incidence of Stunting in the Working Area of Buhit Community Health Centre, Pangururan District, Samosir Regency

The statistical test results that examined the relationship between maternal nutritional status and the incidence of stunting using the chi-square test showed a significance value (sig.) of 0.000. This value is smaller than the degree of error (α = 0.05), so it can be concluded that there is a relationship between maternal nutritional status and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency.

Maternal nutritional status significantly influences the incidence of stunting because maternal dietary conditions during pregnancy and after childbirth can affect the growth and development of the fetus and infant during the first 1,000 days of life. Insufficient or inadequate nutrition during pregnancy can cause fetal malnutrition. This inhibits the development of vital organs and tissues, including the brain and immune system. Maternal nutritional deficiencies, such as protein, calories, iron, and folic acid, can cause low birth weight and increase the risk of stunting. Maternal nutritional status before and during pregnancy plays a crucial role in determining a child's nutritional status and growth, including the risk of stunting. Stunting is a condition of growth failure due to chronic malnutrition, especially in the first 1,000 days of life (HPK), from conception to age two. Mothers with poor nutritional status (malnutrition) or micronutrient deficiencies are at risk of giving birth to low birth weight (LBW) babies, which then increases the likelihood of stunting in children. [14].

Research by Alfarisi et al. (2022) shows that maternal nutritional status during pregnancy can cause toddler stunting. [19]. Bivariate analysis using the Chi-square test showed a significant relationship between maternal nutritional status during pregnancy and stunting in toddlers aged 6-59 months (p-value 0.005). Research by Baiq Reni Pratiwi (2024) also found a strong and significant relationship between maternal nutritional status during pregnancy and stunting in toddlers aged 24 months in Kuta Village, Pujut District, Central Lombok Regency. The Chi-Square test value showed a significance value of 0.000 and an Odds Ratio (OR) of 51.6, indicating a significant relationship between maternal nutritional status during pregnancy and stunting. [20].

Another study by Widya Pradani and Indarti (2023) showed a relationship between maternal nutritional status during pregnancy and the incidence of stunting in toddlers aged 2-3 years at the Teritip Community Health Centre in Balikpapan. The chi-square analysis showed a p-value of 0.042, indicating a significant relationship between maternal nutritional status during pregnancy and toddler stunting. [21].

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Research by Azzahro (2024), which aims to determine the relationship between maternal nutritional status during pregnancy and the incidence of stunting in infants aged 0-12 months in the Pegandon Community Health Centre work area, Kendal Regency, shows that there is a significant relationship between maternal nutritional status during pregnancy and the incidence of stunting in infants aged 0-12 months. [22].

Various research results indicate that maternal nutritional status during pregnancy significantly influences the incidence of stunting in toddlers. Mothers with poor or suboptimal dietary status during pregnancy are at higher risk of giving birth to children with stunting. Maternal nutritional status is essential during pregnancy and after delivery, particularly during breastfeeding. Undernourished mothers can have insufficient milk production or poor quality. Therefore, monitoring and improving the nutritional status of pregnant women is crucial to preventing stunting in children.

The Relationship Between Parenting Patterns and the Incidence of Stunting in the Work Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

The statistical test results examining the relationship between parenting patterns and stunting incidence using the chi-square test showed a significance value (sig.) of 0.000. This value is smaller than the error rate (α = 0.05), so it can be concluded that there is a relationship between parenting patterns and stunting incidence in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency. Parenting patterns include how parents care for, feed, and provide stimulation to their children. Good parenting patterns can create an environment that supports a child's physical and mental growth, while poor parenting patterns can increase the risk of stunting.

Research findings have found that parenting patterns involving active parental attention to providing nutritious food and health care are strongly associated with a reduced risk of stunting in children in rural Indonesia. Parents who take their children to integrated health posts (Posyandu) more frequently and provide highly nutritious food tend to have children with better height. [23–25]. Another study revealed that poor parenting practices, such as late or insufficiently nutritious complementary feeding, are directly linked to increased stunting. This study also showed that families with parenting practices that pay little attention to their children's nutritional needs are more likely to have children with stunting. [26]. Similarly, research has shown that parenting practices supporting healthy eating habits in children aged 6–24 months are associated with a lower prevalence of stunting. The study also highlights the importance of parental involvement in providing nutritious food and educating children about healthy eating habits.s [27–30].

Research has shown that inappropriate parenting patterns, such as the use of unhealthy processed foods and a lack of child development stimulation, are associated with high stunting rates. Other studies indicate that positive parental interactions, including appropriate food portions and emotional support, can reduce the risk of stunting. Families with parenting patterns that are more responsive to children's nutritional and health needs tend to show lower stunting rates. [31,32].

Furthermore, parenting practices that lack stimulation can negatively impact a child's growth and development, including increasing the risk of stunting. Insufficient stimulation, such as minimal verbal interaction, play, and emotional responses from parents, can hinder a child's cognitive, social, and motor development, ultimately impacting nutritional status and health. Children who do not receive sufficient stimulation tend to experience delays in brain development and cognitive function, which are closely linked to stunted physical growth. Furthermore, stress and an unsupportive home environment, such as a lack of attention and affection, can increase levels of the stress hormone (cortisol), which contributes to impaired metabolism and nutrient absorption, thus exacerbating stunting. [33]. Therefore, parenting practices that involve active communication, stimulating play, and positive interactions between parents and children are crucial to supporting optimal growth and preventing stunting. Based on the above research, it can be concluded that parenting patterns involving attention to nutritious food, exclusive breastfeeding, and good cognitive and emotional stimulation are highly influential in preventing stunting. Good parenting helps create optimal conditions for child growth, while poor parenting patterns, such as indifference to a child's nutritional needs or lack of healthcare, can increase the risk of stunting.

The Relationship Between Maternal Education Level and the Incidence of Stunting in the Working Area of Buhit Community Health Centre, Pangururan District, Samosir Regency

The statistical test results examining the relationship between maternal education level and the incidence of stunting using the chi-square test showed a significance value (sig.) of 0.000. This value is smaller than the degree of error (α = 0.05), so it can be concluded that there is a relationship between maternal

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education level and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency. The level of education is also the most dominant variable influencing the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency.

The relationship between maternal education and the incidence of stunting in children is a crucial issue in public health studies, particularly because maternal education plays a significant role in determining parenting patterns, food choices, and understanding of children's health. Research shows that higher maternal education is often associated with a reduced incidence of stunting in children, as more educated mothers tend to have better knowledge about nutrition and child health care. Research consistently demonstrates a significant relationship between maternal education level and the risk of stunting in children. Mothers with lower levels of education are more likely to have stunted children due to limited knowledge of nutrition, parenting practices, and access to healthcare services. In contrast, mothers with higher education levels are better equipped to obtain information related to nutrition and childcare, thereby reducing the risk of stunting. [34,35].

Susilawati et al. (2024) emphasised that mothers with low education often have a limited understanding of the crucial role of nutrition in child growth, which affects their decisions in meeting nutritional needs. [34]. This aligns with the findings of Sutarto et al. (2020), who reported a higher prevalence of stunting among children of less educated mothers. [36]. Furthermore, Husnaniyah et al. (2020) noted that higher educational attainment is associated with improved nutritional knowledge, the provision of nutritious food, and closer monitoring of child growth. [37]. Similar findings were also reported by Tobing et al. (2021), who showed that highly educated mothers are more likely to provide exclusive breastfeeding and maintain regular child health check-ups, both of which significantly contribute to reducing stunting rates. [38]. In addition, Arafat et al. (2022) highlighted that children's dietary patterns are strongly influenced by maternal nutritional knowledge, which is directly linked to stunting incidence. [39].

On the other hand, several studies indicate that mothers with low education often face difficulties accessing accurate nutritional information, thereby increasing the risk of nutritional and health problems in children. [40,41]. Rahayu et al. (2021) also revealed that inappropriate parenting practices, inconsistent with nutritional standards, are more common among mothers with lower education levels. [42]. Overall, this body of evidence underscores the critical role of maternal education in shaping knowledge, caregiving behaviour, and access to healthcare services, which significantly influence the risk of stunting in children. [43].

Based on these studies, it can be concluded that maternal education significantly influences the incidence of stunting in children. Mothers with higher education have better knowledge about nutrition, good parenting practices, and better access to health services. This contributes to a reduced risk of stunting in their children. Conversely, mothers with less education tend to have a limited understanding of nutrition and child health care, which can increase the risk of stunting. Education is not only important for the mother. Education is also crucial for the child to prevent stunting. Children who drop out of school are at greater risk of stunting for several reasons. First, dropping out of school often occurs due to low family economic conditions, which also impacts the lack of access to nutritious food. [44]. Second, children who drop out of school miss opportunities to acquire knowledge about health and nutrition that could help them maintain good nutritional status.

The Relationship Between Family Income Level and the Incidence of Stunting in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

The statistical test results examining the relationship between family income levels and stunting incidence using the chi-square test showed a significance value (sig.) of 0.003. This value is smaller than the degree of error ($\alpha = 0.05$), so it can be concluded that there is a relationship between family income levels and stunting incidence in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency.

Family income also plays a significant role in the incidence of stunting in children. Low family income is often associated with limited access to nutritious food, adequate healthcare, and a supportive environment for child development. Research shows that families with lower incomes tend to have greater difficulty meeting their children's nutritional needs, which increases the risk of stunting.

Several studies have shown that low-income families are at a higher risk of having stunted children due to limited access to nutritious food, healthcare services, and poor sanitation. Ryadinency et al. (2020) reported that low-income families are 6.30 times more likely to have stunted children compared to higher-income

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families. [45], while Metasari et al. (2023) emphasised that restricted access to nutritious food is a major contributing factor [46].

Furthermore, Siramaneerat et al. (2024) and Picauly et al. (2023) highlighted that limited healthcare access and poor sanitation conditions exacerbate stunting prevalence. [47,48]. Globally, Danaei et al. (2016) reported that approximately 7.2 million stunting cases are linked to inadequate sanitation. [49]. Research by Purwita (2022), McGovern et al. (2017), and Kamuri et al. (2023) underscores the critical role of family income in stunting prevention, indicating that interventions focused on strengthening household economies, improving access to nutrition, and ensuring healthcare services are urgently needed. [50–52]. Based on these studies, it can be concluded that family income level significantly influences the incidence of stunting. Low-income families often struggle to provide nutritious food, access adequate healthcare, and create an environment conducive to child growth and development. All of these factors contribute to the high prevalence of stunting in children in low-income families. Therefore, efforts to reduce stunting must involve increasing family income, improving access to healthcare, and educating parents on proper nutrition.

The Relationship Between Exclusive Breastfeeding and the Incidence of Stunting in the Working Area of the Buhit Community Health Centre, Pangururan District, Samosir Regency

The statistical test results examining the relationship between access to clean water and the incidence of stunting using the chi-square test showed a significance value (sig.) of 0.029. This value is smaller than the degree of error (α = 0.05), so it can be concluded that there is a relationship between exclusive breastfeeding and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency. Exclusive breastfeeding for the first 6 months of life is a crucial intervention in preventing malnutrition and infectious diseases in infants. Although stunting (height significantly below the standard for age) is influenced by various factors—such as the quality and safety of complementary foods, environmental sanitation, and family socioeconomic status—several studies have indicated that exclusive breastfeeding indirectly protects against stunting.

Exclusive breastfeeding provides complete nutrition, antibodies, and immunological factors that protect infants from infections, particularly gastrointestinal and respiratory infections. Frequent infections during infancy can interfere with nutrient absorption and increase metabolic demands, potentially leading to chronic malnutrition that contributes to stunting. Therefore, exclusive breastfeeding can help support optimal child growth by preventing infections. A landmark study by Victora et al. (2016) in The Lancet showed that exclusive breastfeeding reduces infection rates and supports better child growth. While the study did not specifically measure the impact of exclusive breastfeeding on stunting, the results indicate that the protection from infection and improved health status provided by exclusive breastfeeding can indirectly reduce the risk of stunting. [53].

The WHO has recommended exclusive breastfeeding for 6 months as part of its global strategy for infant and young child feeding. The document "Global Strategy for Infant and Young Child Feeding" [54,55]. Emphasises that exclusive breastfeeding is an essential measure in preventing malnutrition, which can reduce the risk of stunting in children. Although the direct relationship between exclusive breastfeeding and stunting prevention is multifactorial, the nutritional support and protection from infection provided by exclusive breastfeeding are essential components of this effort. Stunting results from a complex interaction between nutritional intake, the frequency and quality of infections, appropriate complementary feeding, and environmental and economic factors. Therefore, although exclusive breastfeeding significantly benefits child health and growth, stunting prevention efforts must be carried out holistically, considering other aspects such as providing nutritious complementary foods, good sanitation, and improving family economic status.

Overall, existing evidence supports that exclusive breastfeeding for the first 6 months can reduce the risk of infection and support optimal child growth, thereby indirectly helping to reduce the incidence of stunting. However, intervention approaches must encompass various aspects supporting child health and nutrition to achieve maximum stunting prevention.

Conclusion

Based on the results of the statistical tests, this study shows a significant relationship between several factors and the incidence of stunting in the working area of the Buhit Community Health Centre, Pangururan District, Samosir Regency. These factors include maternal nutritional status, education level, family income,

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and exclusive breastfeeding. Of the various variables analysed, maternal education level emerged as the most dominant factor with an Exp B value of 12.813. This indicates that mothers with low levels of education are 12.8 times more likely to have children with stunting than mothers with higher levels of education. This finding confirms that maternal education plays a significant role in determining the nutritional status and growth of children, so increasing access to and quality of education for women can be a key strategy in efforts to prevent stunting in the region.

Conflict of Interest

The author declares no competing interests and asserts that the research was conducted autonomously, safeguarding the impartiality and validity of the results.

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Supplementary Materials

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