



# Fish Consumption Pattern And Stunting In Toddlers In Gunungkidul Regency

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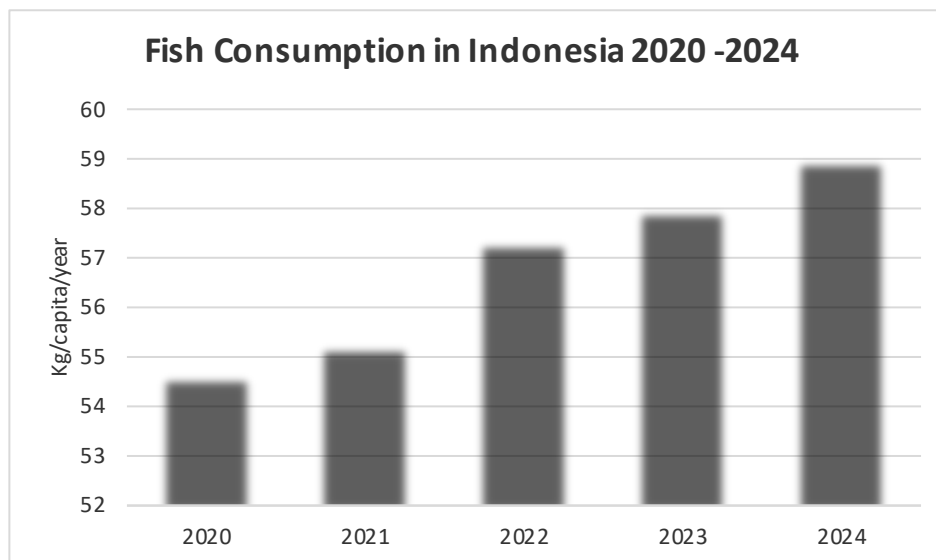
## ABSTRACT

This study aims to analyze the relationship between fish consumption patterns and stunting in toddlers in Gunungkidul Regency, Special Region of Yogyakarta. The study design uses a cross-sectional approach with cluster sampling techniques in two areas with the highest (Patuk 1) and lowest (Purwosari) prevalence of stunting. The total sample consisted of 309 toddlers aged 6–59 months, comprising 201 respondents in Patuk 1 and 108 in Purwosari. Independent variables included fish consumption frequency, portion size, fish type, and sociodemographic factors such as family income, maternal education, number of children, infectious diseases, sanitation, and area of residence. Data analysis was performed using logistic regression with Stata 14 software to identify factors significantly associated with stunting. The results showed that fish type was significantly associated with stunting, while frequency and portion size of consumption were not significantly associated. Other factors significantly associated with stunting were the mother's education level, number of children, and history of infectious diseases. Meanwhile, income, area of residence, and sanitation did not show a significant relationship. These findings confirm that the quality of fish consumed by toddlers has a greater impact on the risk of stunting than the frequency or portion size of consumption. Maternal education and child health are key protective factors. The results of this study are expected to form the basis for policies to increase consumption of nutritious fish and family nutrition education as strategies for preventing stunting based on local foods.

## INTRODUCTION

The consumption patterns of Indonesians continue to change in line with increasing awareness of the importance of balanced nutrition and the availability of nutritious food. Fish is one of the most important sources of animal protein for meeting the nutritional needs of the community. Fish contains high-quality protein, omega-3 fatty acids, iodine, iron, and various essential vitamins and minerals that play an important role in supporting child growth and development (Rahma et al., 2024). The Indonesian government, through the Movement to Promote Fish Consumption (Gemarikan) program initiated by the Ministry of Maritime Affairs and Fisheries (KKP), continues to encourage increased fish consumption among all levels of society. This effort is being undertaken not only to improve national food security, but also to improve the nutritional status of the population, especially children during their growth years.

**Figure 1. Fish consumption trends in Indonesia from 2020 to 2024**



Source: Ministry of Maritime Affairs and Fisheries (KKP) of the Republic of Indonesia

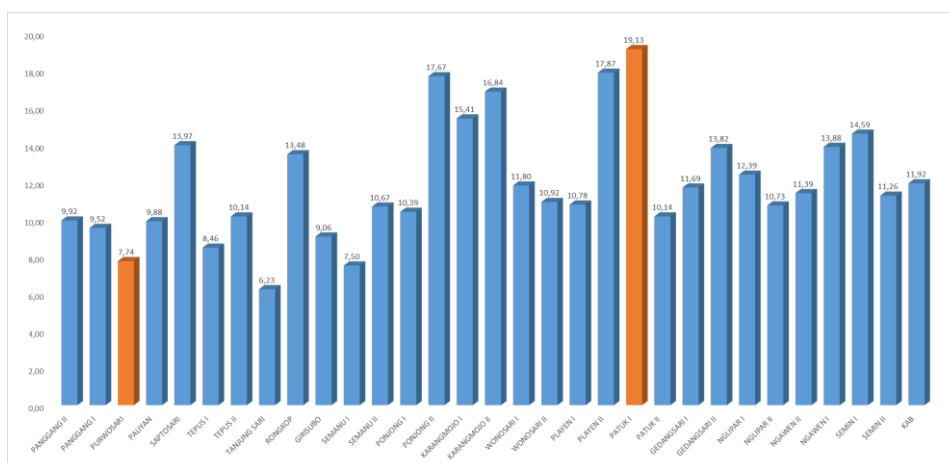
Data from the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia (KKP RI) shows that national fish consumption has increased from 54.5 kg/capita/year in 2020 to 58.9 kg/capita/year in 2024 (KKP, 2024). This figure reflects the positive results of various campaigns and programs to increase fish consumption. However, this increase has not been evenly distributed across all regions of Indonesia. The disparity in consumption between provinces is still quite striking, with provinces in the eastern region such as Maluku, Papua, and North Sulawesi having the highest fish consumption rates (more than 75 kg/capita/year), while western and central Indonesia, including the Special Region of Yogyakarta (DIY), still record fish consumption below 40 kg/capita/year. These differences indicate that geographical, social, economic, and cultural factors play a major role in determining the fish consumption patterns of the Indonesian people.

Fish consumption patterns are not only influenced by availability and price, but also by community habits and preferences regarding types of processed fish. In many regions, including DIY, fish is more often consumed in processed forms such as fried fish, battered fish, salted fish, or ready-to-eat processed products. Processing methods involving high temperatures, oil, or high salt content can reduce nutritional quality, particularly protein and essential fatty acid content (Nursia et al., 2024). As a result, even though fish consumption has increased quantitatively, the nutritional value obtained is not always optimal. This phenomenon highlights

the importance of paying attention not only to the frequency and quantity of fish consumption but also to the type of processed fish consumed as an indicator of household nutritional quality.

The disparity in fish consumption patterns is particularly evident in the Special Region of Yogyakarta, especially in Gunungkidul District. This region has great potential in the marine fisheries sector because it borders the Indian Ocean and has a long coastline. However, the level of fish consumption among the community is still relatively low compared to other coastal areas (Antriyandarti et al., 2023). Based on data from the Gunungkidul District Health Office (2025), there are striking differences in consumption levels and nutritional status between health center areas. The Patuk 1 Health Center recorded the highest prevalence of stunting at 19.13%, while the Purwosari Health Center recorded the lowest prevalence at 7.74%. However, both areas have relatively equal access to fishery resources. This condition indicates that stunting in this area may not only be influenced by food availability but also by fish consumption behavior, including the types of processed fish consumed by families.

**Figure 2. Stunting graph for 30 community health centers in Gunungkidul District**



Source: Gunungkidul District Health Office, 2025

Stunting is one of the main indicators of chronic malnutrition in children, reflecting growth failure due to prolonged malnutrition. Children who experience stunting have a height below the age standard (TB/U z-score < -2 SD) and are at risk of cognitive, immune, and productivity disorders in adulthood (Organization, 2018). Based on data from the Indonesian Nutrition Status Survey (SSGI), the national stunting rate has decreased from 30.8% in 2018 to 19.8% in 2024, although it has not yet reached the national target of 14%. This suboptimal decline indicates that improvements in community nutrition must consider behavioral factors related to consumption and food selection, not just the quantity of consumption.

Previous studies have shown that regular fish consumption can help prevent stunting due to its high protein content and ease of absorption by the body (Fauziah et al., 2023; Rachim & Pratiwi, 2017). However, other studies have revealed that the relationship between fish consumption and stunting is not always significant if the type of fish consumed does not have high nutritional value (Azkia et al., 2020). This shows that the quality of fish processing is a key factor that affects the effectiveness of fish consumption in preventing stunting. In addition, sociodemographic factors such as maternal education level, family income, number of children, sanitation conditions, and history of infectious diseases have also been shown to influence children's nutritional status (Fitriami & Huriah, 2019; Mustikaningrum et al., 2016; Nurhayani, 2025). Mothers with higher education tend to have better nutritional awareness and are able to choose foods with high nutritional value for their children, while families with many children or low income are at greater risk of limited nutritional intake.

Theoretically, this study is based on consumption theory, social cognitive theory, human capital theory, and poverty theory. Consumption theory emphasizes that household consumption decisions are influenced by income, prices, and individual preferences. Social cognitive theory explains how knowledge and social environment factors influence eating behavior. Human capital theory views nutritional intake as an investment to improve the quality of human resources, while poverty theory highlights economic constraints as a major barrier to access to nutritious food. The integration of these four theories provides a conceptual framework for understanding how fish consumption behavior and family socioeconomic conditions can influence stunting in toddlers.

Based on the above explanation, it can be concluded that there are still gaps in research on identifying the relationship between processed fish consumption patterns and stunting, especially considering the variety of processed types and sociodemographic factors. Most previous studies have only emphasized the frequency of fish consumption, without considering the type and quality of processed fish that can reduce nutritional value. Therefore, this study aims to analyze the relationship between fish consumption patterns and stunting in toddlers in Gunungkidul Regency, taking into account social, economic, health, and family environmental factors. The results of this study are expected to contribute theoretically to nutrition studies based on consumption behavior and serve as a basis for policies to increase nutritious fish consumption as a strategy to prevent stunting at the regional level.

## **LITERATURE REVIEW**

### **Fish Consumption As A Critical Nutritional Determinant In Early Childhood Development**

Fish consumption has been widely acknowledged as a strategic component in improving child nutritional status, particularly in developing countries where access to high-quality animal protein remains uneven. Fish provides a unique combination of macronutrients and micronutrients, including high biological value protein, omega-3 fatty acids (DHA and EPA), iodine, zinc, and vitamin D, all of which are essential for supporting linear growth, cognitive development, and immune system function in early childhood (Rahma et al., 2024; Andhikawati et al., 2021). These nutrients are especially crucial during the first 1,000 days of life, a period that determines long-term physical and cognitive outcomes.

From a physiological perspective, fish protein is more easily digested and absorbed compared to plant-based protein, making it particularly effective in supporting tissue growth and bone mineralization. Moreover, omega-3 fatty acids play a vital role in brain development and neural connectivity, while iodine and zinc contribute to hormonal regulation and immune resilience. However, recent literature increasingly highlights that the benefits of fish consumption are not solely determined by intake levels but are strongly influenced by the type of fish consumed and the method of preparation.

In practice, many households report adequate fish consumption in terms of frequency or portion size, yet fail to achieve expected nutritional outcomes. This discrepancy suggests that measuring consumption quantitatively may not fully capture its nutritional impact. Instead, qualitative dimensions—such as fish type, freshness, and processing method—must be considered to understand the true contribution of fish to child growth. This perspective is particularly relevant in regions like Gunungkidul, where fish availability does not necessarily translate into optimal nutritional utilization.

### **Stunting As A Complex And Multidimensional Public Health Problem**

Stunting represents one of the most persistent forms of chronic malnutrition, characterized by impaired linear growth resulting from prolonged nutritional deficiencies and recurrent health stressors. According to WHO standards, stunting is defined as a height-for-age

z-score below  $-2$  SD, reflecting long-term growth failure rather than acute nutritional deprivation (Organization, 2018).

Despite significant policy efforts, Indonesia continues to face challenges in reducing stunting prevalence to targeted levels. The decline from 30.8% in 2018 to 19.8% in 2024 demonstrates progress, yet the remaining gap indicates that current interventions have not fully addressed the underlying structural and behavioral determinants. Stunting is increasingly understood as a multifactorial condition influenced by dietary quality, caregiving practices, socioeconomic status, environmental sanitation, and child health conditions.

In the context of Gunungkidul, variations in stunting prevalence across different health center areas—ranging from low to relatively high rates—cannot be explained solely by differences in food availability or geographic access. Instead, these disparities point toward differences in household behavior, particularly in food selection, processing practices, and health management. This reinforces the argument that stunting is not merely a problem of food insufficiency but a complex interaction between biological, behavioral, and environmental factors.

Thus, addressing stunting requires an integrated approach that goes beyond increasing food supply, focusing instead on improving dietary quality, health conditions, and parental knowledge.

### **Theoretical And Empirical Perspectives On Fish Consumption And Stunting**

The relationship between fish consumption and stunting can be better understood through an integration of multiple theoretical frameworks. Consumption theory suggests that household food choices are influenced by income, prices, and preferences, yet empirical evidence indicates that economic capacity alone does not guarantee improved nutritional outcomes (Abduh et al., 2023). Social cognitive theory adds a behavioral dimension, emphasizing that dietary practices are shaped by knowledge, social environment, and observational learning, particularly maternal influence in child feeding practices.

Human capital theory further conceptualizes child nutrition as a long-term investment, highlighting the economic consequences of early-life malnutrition (Fitriami & Huriah, 2019). Meanwhile, poverty theory underscores structural constraints that limit access to nutritious food and healthcare services. The interaction of these theories suggests that nutritional outcomes are the result of both economic and behavioral dynamics.

Empirical findings on the fish consumption–stunting relationship remain inconclusive. Some studies demonstrate that regular fish consumption significantly reduces stunting risk, particularly in coastal areas with better access to fresh fish (Fauziah et al., 2023). However, other studies reveal that frequency alone is not a reliable predictor of improved nutritional status, especially when fish is consumed in processed or nutritionally degraded forms (Azkia et al., 2020).

This inconsistency is reflected in the findings of this study, where fish type emerges as a significant determinant of stunting, while frequency and portion size show no significant relationship. This indicates that the effectiveness of fish consumption depends more on its quality and nutritional content than on its quantity, challenging conventional assumptions in nutrition research.

### **The Role Of Fish Type, Processing Methods, And Nutritional Quality**

The nutritional impact of fish consumption is strongly influenced by both the type of fish and the method of processing. Marine fish are widely recognized as having superior nutritional profiles compared to freshwater and processed fish products, particularly due to their higher content of omega-3 fatty acids, iodine, and zinc—micronutrients directly associated with linear growth and cognitive development (Andhikawati et al., 2021).

In contrast, freshwater fish tend to have lower concentrations of these essential nutrients, while processed fish products often experience nutrient degradation due to additives and high-temperature cooking methods. Nursia et al. (2024) reported that deep-frying can reduce protein content by up to 30% and significantly decrease the levels of essential fatty acids and vitamins. This is particularly concerning in contexts where frying is the dominant cooking method, as it reduces the biological value of fish as a nutritional source.

The findings of this study confirm that fish type is a significant predictor of stunting, highlighting that not all fish consumption contributes equally to child growth. Furthermore, limited access to fresh marine fish due to distribution challenges, such as inadequate cold chain infrastructure, leads many households to rely on freshwater or processed fish, which are more accessible but less nutritious.

This condition underscores the importance of shifting the focus of nutritional interventions from increasing consumption volume to improving consumption quality, including promoting the intake of nutrient-rich fish and healthier processing methods.

### **Sociodemographic, Health, And Behavioral Determinants Of Stunting: Toward An Integrated Understanding**

Stunting is influenced not only by dietary factors but also by a range of sociodemographic and health-related determinants. Maternal education has consistently been identified as one of the most significant protective factors, as it influences nutritional knowledge, food selection, and caregiving practices (Nurhayani, 2025). Mothers with higher education levels are more likely to understand the importance of nutritional quality and apply appropriate feeding practices.

Household structure, particularly the number of children, also plays a critical role. Larger families tend to experience resource constraints that limit dietary diversity and reduce the allocation of high-quality protein sources to young children. This study shows that the number of children significantly increases the risk of stunting, reflecting the impact of intra-household resource distribution.

In addition, health conditions, especially infectious diseases, are a major biological pathway influencing stunting. Recurrent infections impair nutrient absorption and increase metabolic demands, thereby exacerbating growth failure (Fitriami & Huriah, 2019). The findings of this study confirm that infectious diseases significantly increase stunting risk, highlighting the importance of integrating nutrition and health interventions.

Interestingly, economic factors such as income do not always show a direct relationship with stunting. This suggests that dietary behavior is not solely determined by purchasing power but is also shaped by cultural preferences, habits, and knowledge. Therefore, improving child nutrition requires a holistic approach that integrates dietary quality, health management, and behavioral change strategies.

Overall, this integrated perspective emphasizes that stunting is not the result of a single factor but rather the outcome of complex interactions between food consumption patterns, household characteristics, and child health conditions. This study contributes to the literature by demonstrating that improving nutritional outcomes requires a shift from quantity-oriented approaches to quality-focused and behavior-driven interventions.

## **METHODS**

### **Types and sources of data**

The research method used was a quantitative approach with a cross-sectional design to determine the relationship between fish consumption patterns and stunting in toddlers in Gunungkidul Regency. A quantitative approach was chosen because it produces objective measurements of the variables studied and statistical analysis to identify factors suspected of being related to stunting. A cross-sectional design was used because data collection was

conducted at a single point in time, providing a snapshot of the current situation in a short period of time and at an efficient cost (Abduh et al., 2023). The study was conducted from March to November 2025.

The types of data sources used were primary and secondary data. Primary data was obtained through structured questionnaires filled out by mothers with toddlers aged 6-59 months, covering information on income, maternal education, area of residence, number of children, infectious diseases, sanitation, frequency of fish consumption, portion size, and type of fish. In addition, secondary data was obtained from the Gunungkidul Health Office, the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia, the Central Statistics Agency, the Patuk 1 Community Health Center, and the Purwosari Community Health Center.

### Location

The research was conducted in Gunungkidul Regency, Special Region of Yogyakarta, which administratively consists of 18 subdistricts, 144 villages, and 30 community health centers. The location selection technique used was cluster sampling, which is the selection of analysis units based on groups (community health centers) that have high stunting rates, even though they are still in the same regency. Cluster sampling is used when the population is geographically dispersed over a wide area, making it logistically and cost-efficient (Farida, 2025). Of the 30 health centers in Gunungkidul, two clusters were selected based on the highest and lowest stunting rates in 2025, namely the Patuk 1 Health Center with the highest stunting rate of 19.13% and the Purwosari Health Center with the lowest stunting rate of 7.74%.

### Population And Sample

The target population included all children aged 6–59 months, because at this age range, family eating patterns and fish consumption begin to be introduced to children. Based on data from both health centers, the number of children aged 6–59 months was 782 in Patuk 1 and 879 in Purwosari. The research sample was determined using proportionate simple random sampling in two clusters of health center working areas that have different stunting characteristics, namely the Patuk 1 Health Center and the Purwosari Health Center in Gunungkidul District. The minimum sample size was calculated using the Cochran formula with a 95% confidence level and a 5% margin of error, then adjusted with finite population correction. The sample calculation formula using the Cochran formula is as follows: Cochran's formula (initial, without population correction)

$$n_0 = \frac{Z^2 \cdot p (1 - p)}{e^2}$$

Correction for finite populations

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Description:

$n_0$  = Initial sample size

n = Required sample size

Z = Z value based on confidence level (1.96 for 95% CI)

p = Percentage of stunting in each region

e = 0.05 (margin of error)

N = Total population of children aged 6-59 months in each region

Based on the results of the above formula, the minimum sample size is 183 respondents for Patuk 1 and 98 respondents for Purwosari. However, to anticipate non-response and incomplete data, a 10% reserve was added, bringing the final sample size to 201 respondents in Patuk 1 and 108 respondents in Purwosari, with a total of 309 toddlers from both locations needed for the research sample. Respondents were selected randomly from a list of valid toddlers in each village, which had been previously proportionalized so that the sample distribution represented the regional variation in each cluster.

### Variable and Analysis Technique

The dependent variable was stunting. Stunting was defined as toddlers with a height-for-age z-score (TB/U) of less than  $-2$  standard deviations based on the WHO Child Growth Standards (Organization, 2018). The grouping of stunting status was done dichotomously: the "stunting" category for TB/A values  $< -2$  SD, and "not stunting" for TB/A  $\geq -2$  SD. The stunting data in this study was not measured directly by the researchers. However, it was obtained from secondary data through measurements that had been taken during weighing at health posts in the Patuk I and Purwosari Community Health Center areas, so that the data quality was guaranteed in accordance with national anthropometric standard procedures.

The independent variables used nine variables, namely the mother's education level (ordinal: elementary school = 1, junior high school = 2, senior high school = 3, college = 4), area of residence (dichotomy: Patuk 1 = 1, Purwosari = 0), household income (ordinal:  $< 2$  million = 1,  $> 2$  million - 4 million = 2,  $> 5$  million = 3), number of children (dichotomous: ideal family 1-2 children, coded 1, large family  $> 3$  children coded 2), infectious disease (dichotomous: sick in the last 6 months = 1, no = 0), sanitation (dichotomous: simple = 1, good = 2), as well as three fish consumption variables, including frequency of fish consumption (dichotomous: low = 1, high = 2), portion size (ordinal: small = 1, medium = 2, large = 3), and type of fish (dichotomous: saltwater fish = 1, freshwater fish = 2, others = 3).

The analysis technique was carried out in several stages, including descriptive tests to describe the characteristics of the respondents, bivariate tests to ensure that there were no strong correlations between variables, and logit modeling using the logit command in the Stata 14 analysis tool to obtain coefficient values, odds ratios (OR), significance levels, and confidence intervals. The logit formula used was:

$$\text{Log}(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \varepsilon$$

Description:

P = Probability of stunting

$\beta_0$  = constant

$\beta_1$  to  $\beta_9$  = regression coefficients for each independent variable.

X1 = Income

X2 = Mother's education level

X3 = Area of residence

X4 = Number of children

X5 = Infectious diseases

X6 = Sanitation

X7 = Frequency of fish consumption (per week)

X8 = Amount of fish consumption (grams/week)

X9 = Type of fish

$\varepsilon$  = Error

This logit regression model was chosen because the dependent variable was dichotomous data (stunting=1, no stunting=0), so that logistic regression could estimate the probability of stunting based on changes in the predictor variables. The model was evaluated using model suitability tests (LR chi-square), pseudo  $R^2$ , and partial significance, so that the analysis results could provide a strong picture of the factors contributing to the prevalence of stunting at the study site.

## RESULTS

### Distribution of Respondent Characteristics

The results show the distribution of respondent characteristics, including the identity of toddlers and the socioeconomic status of their families. The data were obtained from questionnaires completed by respondents who were mothers of toddlers aged 6–59 months in Gunungkidul District. These respondent characteristics are very important in providing an overview of the distribution of basic variables that could potentially influence stunting. This information serves as a starting point for understanding the social, economic, and demographic context of the study population before further bivariate and multivariate analyses are conducted.

**Table 1. Distribution of Respondent Characteristics**

Characteristics	n	%
Toddler's gender		
Women	140	45,3
Men	169	54,7
Toddler Nutritional Status		
Stunting	47	15,2
No stunting	262	84,8
Income		
Low	201	65,0
Intermediate	101	32,7
Tall	7	2,3
Mother's Education Level (bps)		
Elementary School Graduated/Equivalent	13	4,3
Middle School Graduated/Equivalent	74	24,0
High School Graduated/Equivalent	195	63,0
College Graduated	27	8,7
Residential Area		
Patuk 1	201	65,0
Purwosari	108	35,0
Number of children		
Ideal (1-2)	272	88,0
Not ideal (>2)	37	12,0
Infectious Diseases (past 6 months)		
Yes	38	12,3
No	271	87,7
Sanitation		
Simple	44	14,2
Good	265	85,8

Characteristics of processed fish consumption patterns		
Frequency of processed fish consumption		
Low (Less than 3 times/week)	289	93,5
High (More than 3 times/week)	20	6,5
Portion size of processed fish consumption		
Low <500 grams/week	135	43,8
Sufficient 500-1000 grams/week	168	54,2
High >1000	6	2,0
Types of fish		
Saltwater fish	171	55,4
Freshwater fish	103	33,3
Others	35	11,3

Source: Primary data, 2025

Table 1 shows that male toddlers dominate the respondent group with a proportion of 54.7%, while female toddlers account for 45.3%. In terms of nutritional status, the majority of children are in the normal (not stunted) category with a percentage of 84.8%, while the other 15.2% are in the stunted category. In terms of socioeconomic conditions, the respondents' families generally had low income levels (65.0%) and the mothers' education levels were at the secondary level, namely high school or equivalent (63%). Meanwhile, from a demographic perspective, most families had an ideal number of children, namely one to two children (88.0%), and only 12.0% had more than two children.

Based on the distribution of residential areas, more than half of the respondents (65%) lived in areas with the highest stunting rates, with household sanitation conditions generally classified as good (85.8%). In addition, most toddlers (87.7%) had not experienced infectious diseases in the past six months, reflecting relatively well-maintained environmental health conditions in the study area. Based on the characteristics of fish consumption patterns, it appears that although this region has abundant fishery potential, the utilization of fish as a primary source of protein is not yet optimal. Most respondents have a low frequency of fish consumption (<3 times/week) with a percentage reaching 95.3%, and nearly half of them consume less than 500 grams of fish per week. Seafood is 55.4% more commonly consumed by toddlers in Gunungkidul.

### Bivariate Test Results

Bivariate tests were used to analyze whether there was a relationship between each independent variable and the occurrence of stunting before being included in the multivariate model. This analysis served to identify variables that had a significant initial association, so that they could be considered in the next stage of logistic regression. The bivariate test results are shown in Table 2.

**Table 2. Bivariate Test Result**

Variabel	Stunting		No Stunting		p-value
	n	%	n	%	
<b>Income</b>					0,112
Low	39	12,6	162	52,4	
Intermediate	12	3,9	89	28,8	
Tall	0	0	7	2,3	

<b>Mother's Education Level</b>					
Graduated from elementary school	6	1,9	7	2,3	0,008
Graduated from junior high school	16	5,2	58	18,8	
Graduated from high school	27	8,7	168	54,4	
Graduated from College	2	0,6	25	8,1	
<b>Residential area</b>					
Patuk 1	37	12,0	164	53,1	0,329
Purwosari	14	4,5	94	30,4	
<b>Number of children</b>					
Ideal	34	11,0	238	77,0	0,000
Not ideal	17	5,5	20	6,5	
<b>Infectious disease</b>					
Yes	13	4,2	25	8,1	0,023
No	38	12,3	233	75,4	
<b>Sanitation</b>					
Simple	9	2,9	35	11,3	0,494
Good	42	13,6	223	72,2	
<b>Frequency of fish consumption</b>					
Low	48	15,5	241	78,0	0,707
Tall	3	1,0	17	5,5	
<b>Portion of fish consumption</b>					
Small	27	8,7	108	35,0	0,158
Currently	22	7,1	146	47,3	
Big	2	0,6	4	1,3	
<b>Types of fish</b>					
Sea food	14	4,5	157	50,8	0,048
Freshwater fish	26	8,4	77	24,9	
Other	11	3,6	24	7,8	

Source: Primary data, 2025

Table 2. Bivariate test results show that several variables have a significant relationship with stunting, namely fish type, maternal education, number of children, and infectious diseases. Fish type has a positive relationship with stunting, indicating that consumption patterns based on certain types of processed fish may increase the risk of growth disorders. Maternal education has a negative relationship with stunting, confirming that improving maternal nutrition literacy and knowledge contributes to reducing risk. In addition, the number of children in the family and history of infectious diseases were found to increase the incidence of stunting. On the other hand, the frequency and portion size of fish consumption, income, region, and sanitation did not show a significant relationship in the bivariate test. Therefore, these variables were further analyzed in a multivariate model using logistic regression to ensure consistency of their effects.

### Logistic Regression Test Results

The logistic regression test in this study was applied to analyze the simultaneous relationship between all independent variables and the incidence of stunting in toddlers, with the aim of identifying factors that remain influential after the effects between variables are statistically controlled. Unlike bivariate tests, which only evaluate the relationship between two variables separately, logistic regression tests provide more accurate risk estimates through a logistic regression model. The results of the logistic regression analysis are presented in Table 3.

**Table 3. Logistic Regression Test Result**

Variables	Odds Ratio	p-value	(95%CI)
Income	0,686	0,309	0,332 – 1,418
Mother's education level	0,414	0,001	0,245 – 0,699
Residence area	1,604	0,232	0,739 – 3,481
Number of children	6,593	0,000	2,846 – 15,272
Infectious diseases	3,943	0,003	1,608 – 9,669
Sanitation	1,069	0,890	0,415 – 2,756
Frequency of fish consumption	0,554	0,425	0,129 – 2,365
Portion size of fish consumed	0,719	0,317	0,377 – 1,371
Type of fish	1,827	0,025	1,079 – 3,094

CI = *Confidence interval*

Source: Primary data, 2025

Table 3. Logistic regression results show that there are several variables that remain significant after controlling for all other factors, namely type of fish, mother's education, number of children, and infectious diseases. The type of fish consumed remains a factor that increases the risk of stunting, indicating that suboptimal consumption patterns can reduce the nutritional benefits that should be obtained from fish. Maternal education acts as a protective factor because the higher the education, the better the mother's ability to manage toddler intake and health. The number of children also has a significant effect, where the more children in the family, the higher the risk of stunting due to limited allocation of nutrition, attention, and

household resources. Meanwhile, infectious diseases show a strong relationship with an increased risk of stunting, emphasizing that repeated health disorders can inhibit nutrient absorption.

### **Types Of Fish Consumed And Stunting**

The results of logistic regression analysis show that fish type is a significant factor associated with stunting in toddlers in Gunungkidul District (OR = 1.827;  $p = 0.025$ ). This odds ratio value indicates that toddlers who consume certain types of fish have a 1.8 times higher risk of stunting compared to toddlers who consume other types of fish. In other words, not all types of fish provide optimal nutritional benefits for child growth. In this study, fish types were divided into three categories: marine fish, freshwater fish, and other processed fish types. These findings confirm that the pattern of fish type selection plays an important role in determining the nutritional quality received by toddlers. Based on the results of the field survey, around 50.8% of toddlers in Gunungkidul consume marine fish, while the rest consume more freshwater fish or other types of fish.

Biologically, saltwater fish have better nutritional content than freshwater fish and other processed fish products. Saltwater fish contain higher levels of protein and are enriched with polyunsaturated fatty acids (omega-3 and DHA), which are essential for bone growth and central nervous system development. In addition, marine fish are also rich in micronutrients such as iodine and zinc, which are essential for linear growth and the prevention of chronic growth disorders. On the other hand, freshwater fish, which are more commonly consumed by low-income households, have a lower nutritional density, especially in terms of omega-3 and iodine (Andhikawati et al., 2021). Processed fish products even experience a 20–30% decrease in protein content due to frying or the addition of fillers such as flour (Nursia et al., 2024). This explains why quantitative fish consumption does not always correlate negatively with stunting; the quality of the fish consumed is the main determining factor in the nutritional benefits received by children.

The Gunungkidul region has unique geographical characteristics, namely a combination of coastal and hilly areas. Although there is an abundant supply of marine fish in the southern coastal area, its distribution to the region is still limited due to the lack of cold chain facilities and transportation. As a result, people in non-coastal areas more often consume farmed freshwater fish or processed instant fish, which are more easily accessible. In addition, the perception among housewives that children prefer savory and crispy processed fish also reinforces the pattern of consuming processed fish over fresh marine fish. This consumption pattern reduces the quality of children's animal protein and micronutrient intake, contributing to the high prevalence of stunting in the region. Therefore, the necessary intervention is not only to increase the frequency of fish consumption but also to change the pattern of fish selection towards the consumption of fresh, nutrient-rich marine fish, accompanied by education on healthier fish processing so that the nutritional benefits remain optimal.

### **Frequency and Portion Size Of Fish Consumption and Stunting**

The frequency and portion size of fish consumption by toddlers has no significant relationship with the incidence of stunting. This finding provides important insight that stunting is not only influenced by how often children consume fish or how large the portions are, but is more related to the type of fish and its nutritional quality. The sample of toddlers in Gunungkidul shows that 47.3% of toddlers consume fish less than three times a week, with 50.8% consuming sea fish with suboptimal nutritional content. This explains why high frequency does not necessarily reduce the risk of stunting. As explained by (Rachim & Pratiwi, 2017), high consumption frequency dominated by processed fish with low protein and omega-3 content

does not provide significant benefits for child growth.

The amount or portion of fish consumption does not guarantee that children's nutritional needs will be met if the type of fish consumed is not appropriate. (Hendrawati, 2017) stated that even though the portion of fish consumption is quite large, its benefits for children's nutritional status will be reduced if the protein content decreases due to the frying process or repeated use of oil. In a sample in Gunungkidul, 47.3% of toddlers consumed 500-1000 grams of fish per week, but the processing method was predominantly frying. As a result, most of the nutritional value of fish, such as essential fatty acids, vitamin D, and zinc, was significantly reduced. This reinforces the finding that quantity of consumption will not have a positive impact without being balanced by the quality of processing and the selection of the right type of fish.

### **Income and Stunting**

The results show that family income has no significant relationship with stunting in toddlers in Gunungkidul District (OR = 0.68; p = 0.309). This insignificance indicates that income level is not always directly proportional to improvements in fish consumption or children's nutritional status. Theoretically, higher income should increase families' ability to meet their children's nutritional needs, including consumption of animal protein such as fish. However, these results show that economic factors are not the only determinants; rather, it is how households use their income for healthy and nutritious food. In many cases, increased income is followed by a shift in consumption patterns toward convenient and ready-to-eat foods, including processed fish products that are low in nutritional density.

These results are in line with the findings of (Antriyandarti et al., 2023), who reported that in the coastal areas of Yogyakarta, income levels do not significantly affect fish consumption levels, as habits, taste preferences, and culinary traditions are more dominant factors.

The research results show that 52.4% have a high income level above 5 million per month, with a fish consumption frequency of more than 3 times per week only amounting to 5.5%. This indicates that improving the nutritional status of toddlers cannot be achieved solely through improving family economic conditions, but requires an educational approach that emphasizes the importance of choosing highly nutritious fish and proper processing methods. Community-based nutrition intervention programs need to be directed not only at economic assistance but also at nutrition literacy education and healthy consumption behaviors so that the income families have is truly allocated to nutritious food needs that support optimal child growth.

### **Maternal Education and Stunting**

Maternal education has a significant relationship with the incidence of stunting in toddlers in Gunungkidul District, with an odds ratio of 0.414 (p = 0.001). This OR value indicates that mothers with higher levels of education are 41% less likely to have toddlers who experience stunting compared to mothers with low levels of education. This shows that maternal education is a very important protective factor in preventing stunting, as it directly influences how mothers understand, choose, and manage food for their children. Mothers with higher education generally have better nutritional knowledge, are able to distinguish the quality of animal protein, and understand the nutritional differences between saltwater fish, freshwater fish, and processed fish. With this knowledge, they tend to regulate their children's consumption patterns so that they obtain high-quality animal protein sources, not just the cheapest or easiest to prepare.

Education also influences mothers' ability to plan household finances and make decisions related to food consumption. Mothers with good nutritional literacy are better able to allocate family income to purchase highly nutritious foods, including fresh seafood rich in omega-3, DHA, iodine, and zinc. They also better understand the importance of proper processing methods so

that the nutritional content of fish is not lost. Conversely, mothers with low levels of education tend to choose convenient foods. This consumption pattern causes children to consume more low-nutrient fish and lose out on quality protein intake, which is important for linear growth. This condition shows how education affects not only what is consumed, but also how to process and serve healthy food for children.

### **Insignificance of the Regional and Stunting**

The results of the study indicate that the variable of residential area has no significant relationship with the incidence of stunting in toddlers in Gunungkidul District. This insignificance indicates that the difference in stunting rates between the area with the highest prevalence, namely Patuk 1, and the area with the lowest prevalence, namely Purwosari, is not determined by geographical factors alone. Although empirically Purwosari has a lower stunting rate than Patuk 1, this advantage does not stem from the location of the area or natural conditions, but rather from differences in family consumption practices, particularly the quality of fish consumed by toddlers. This means that consumption behavior is far more decisive than spatial conditions in influencing children's nutritional status.

These findings indicate that the community in Purwosari tends to have a more appropriate and varied fish consumption pattern, both in terms of type and method of preparation. Based on the questionnaire results, families in this area relatively more often consume fresh sea fish and freshwater fish using simple processing methods such as steaming or pepes, which help preserve the protein and essential fatty acid content of the fish. In contrast, the Patuk 1 area, which has a higher prevalence of stunting, shows a tendency toward less appropriate fish consumption, with most households preferring fried fish. Repeated processing using cooking oil causes a decline in the nutritional quality of fish (Nursia et al., 2024). This explains why, even though food access is relatively similar between the two regions, differences in consumption quality result in significant disparities in stunting rates.

### **Number of Children and Stunting**

Number of children is the most significant factor associated with an increased risk of stunting in toddlers in Gunungkidul District (OR = 6.593;  $p = 0.000$ ). This odds ratio value indicates that families with more than two children are nearly 6.5 times more likely to have toddlers who are stunted compared to families with the ideal number of children (1–2 children). This finding illustrates that the more family members there are, the greater the pressure faced by households in providing nutritious food, including animal protein sources such as fish. In households with many children, food allocation is often uneven; toddlers tend to get smaller portions of fish or types of fish with lower nutritional quality. As a result, there is an imbalance in the distribution of nutrition within the family, which has a direct impact on early childhood growth.

The quality of food consumed also declines as the number of children increases. Large households tend to choose more affordable and easier-to-prepare foods to meet the needs of all family members. This results in a shift in consumption patterns from fresh seafood or fish with high nutritional value to cheaper freshwater fish or ready-to-eat processed fish products such as nuggets, fish balls, and breaded fried fish. Although these products are practical, their protein and essential fatty acid content is much lower than that of fresh fish. Mothers with many children also face a greater burden of time and energy in caring for their children, so they tend to choose foods that are quick to prepare without considering their nutritional value. These results indicate that the risk of stunting in large families is not only caused by a decrease in fish consumption, but mainly by a decline in the quality of fish given to toddlers. These findings are in line with the research by (Rahma et al., 2024), which confirms that the number of children has a

significant relationship with the risk of stunting due to increased economic burdens and reduced attention to children's nutritional intake.

### **Infectious Diseases and Stunting**

The history of infectious diseases shows a significant association with stunting in toddlers in Gunungkidul District, with an odds ratio of 3.943 ( $p = 0.003$ ). These findings indicate that children who experience recurrent infections, particularly diarrhea and upper respiratory tract infections (URTI), have an almost four times greater risk of stunting compared to children who do not have a history of infection. Recurrent infections not only cause a decrease in appetite and impaired nutrient absorption in the digestive tract, but also affect changes in children's consumption patterns. Toddlers who are frequently ill tend to consume smaller amounts of food, refuse solid foods such as fish, and are more often given soft or instant processed foods that are low in nutrition by their parents. This pattern leads to a significant reduction in animal protein intake, including from fresh fish, thereby worsening the child's nutritional status.

When repeated infections are not balanced with improved nutritional intake, particularly animal protein from fish containing complete essential amino acids, the body's tissue repair process cannot function optimally. Research conducted by (Fitriami & Huriah, 2019) shows that children who have experienced diarrhea more than twice in the last three months have a risk of stunting that is almost four times higher, and this condition is exacerbated by low consumption of animal protein. These findings are in line with the results of a WHO study (2021), which states that the combination of chronic infection and low nutritional intake is the main cause of growth faltering in the first two years of life.

In the Gunungkidul region, the relationship between infectious disease history and fish consumption patterns is very important. Although fish is widely available, children who are frequently ill tend to be unable to maximize their protein intake due to a decreased appetite and digestive disorders that hinder nutrient absorption.

### **Sanitation and Stunting**

The results of the study indicate that household sanitation variables do not have a significant relationship with stunting in toddlers in Gunungkidul District. This insignificance indicates that sanitation is not a direct factor affecting stunting, but rather an indirect factor that operates through infectious disease pathways. Although poor sanitation can increase the risk of infectious diseases such as diarrhea and respiratory tract infections, its effect on child growth will only appear if the infection actually occurs. Because infectious disease variables have been included in the model and proven to be significant, the direct effect of sanitation is "masked" or reduced through the mediation mechanism of infection. Sanitation still plays an important role in the environmental health system, but its role is preventive and indirect in relation to stunting.

Theoretically, sanitation affects children's nutritional status through the mechanism of environmental enteric dysfunction (EED), which is a condition of micro damage to the intestines caused by exposure to germs from an unclean environment, resulting in suboptimal nutrient absorption. However, this effect is generally only seen when the infection is chronic or recurrent. In Gunungkidul, 85.8% of respondent households had access to basic sanitation facilities such as healthy toilets equipped with septic tanks, with 12.3% of toddlers showing signs of infectious disease. These findings are in line with the research by (Sinatrya & Muniroh, 2019), which shows that sanitation has no direct relationship with stunting after controlling for infectious disease variables. However, these results do not mean that sanitation improvements can be ignored. On the contrary, good sanitation is an important foundation in preventing infectious diseases, which are a major factor in stunting.

## CONCLUSION

This study aims to determine the relationship between fish consumption patterns and stunting in toddlers in Gunungkidul Regency. The results of the study conclude that stunting in Gunungkidul Regency is not only influenced by the amount of processed fish consumption, but more by the quality of the fish, the health condition of toddlers, and family characteristics. The type of fish consumed has been shown to increase the risk of stunting because toddlers tend to consume processed fish that is less nutritious. Maternal education acts as a protective factor, because the higher the level of education, the better the mother's ability to select and process quality fish.

Conversely, the number of children and history of infectious diseases significantly increase the risk of stunting because they inhibit the distribution of nutritious food and reduce the body's ability to absorb nutrients. Other variables measured, including income, area of residence, sanitation, frequency, and portion size of fish products consumed by toddlers, did not show significance. Stunting is more influenced by the quality of fish consumption than by location, income, or the amount of fish consumed. Overall, this study confirms that stunting prevention requires interventions focused on nutrition education, appropriate fish selection, and toddler health protection.

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