Journal of Nutrition Explorations
Vol. 3, No. 2, May 2025, pp. 132~141
e-ISSN: 2987-761X
DOI: 10.36568/jone.v3i2.183

Overview of Protein Energy Intake and Infectious Diseases of Stunting Toddlers in Klitik Village, Geneng District, Ngawi Regency

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ARTICLE INFO

Article History:
Received August 15th, 2022
Revised form August 15th, 2023
Accepted June 14th, 2025
Published online June 22th, 2025

Keywords:
Stunting
Energy Intake
Protein Intake
Infectious disease

ABSTRACT

Background stunting is still a serious problem in Indonesia, including in Klitik Village, Geneng District, Ngawi Regency, with a fairly high prevalence rate. **Purpose** This study aims to determine the description of energy intake, protein and infectious diseases of stunted toddlers in Klitik village, Geneng district, Ngawi regency. **Method:** This study is a descriptive study with 28 stunted toddlers as a sample. Energy and protein intake data were obtained through 24-hour recall, and infectious disease data through interviews using questionnaires; The analysis was carried out univariate and bivariate (cross table). **Result** The results showed that the majority of the stunted toddlers in Klitik Village are male and are in the age group of 48–59 months. As many as 67.8% of toddlers have less energy intake and 64.3% have less protein intake. Most also had a history of infectious diseases (60.8%), including diarrhea (82.1%) and ISPA (67.9%). Bivariate analysis showed a tendency that toddlers with less energy and protein intake developed infectious diseases, which can worsen stunting conditions. **Conclusion** Therefore, nutritional interventions accompanied by efforts to prevent and handle infectious diseases need to be the focus in overcoming stunting in the region.

INTRODUCTION

Stunting is a malnourished condition due to chronic malnutrition, characterized by a child's height or body length that is lower than the standard age. According to WHO, stunting is measured based on the Z-score of TB/U or PB/U below -2 SD[1]. According to Sari (2016), stunting is caused by a lack of nutritional intake, especially protein and animal food, as well as chronic malnutrition[2]. Infectious diseases such as ISPA and diarrhea also play a role, as they reduce children's appetite. Angina (2019) found that 93.3% of stunted toddlers had diarrhea and 83.3% were affected by ISPA[3].

Based on Riskesdas 2018, the prevalence of stunting in Indonesia reached 30.8%, still relatively high with a target of decreasing to 14%. Children aged 0–59 months with stunting based on PB/U were 67.2%, and 19.9% were very undernourished. The highest prevalence of stunting occurred at the age of 6–11 months (78.6%)[4]. In Ngawi Regency, the prevalence was 30.24%, with Geneng District 25%, and Klitik Village 22.2%[5].

Stunting can have an impact on cognitive impairment, increasing the risk of long-term nutritional and health problems such as low birth weight, infections, and decreased quality of life and productivity[6–10]. According to Fikawati (2017), stunted children tend to have low energy intake, so they are more susceptible to illness and experience metabolic disorders[11,12].

Therefore, this study is important to identify the direct factors that cause stunting, especially nutritional intake and infection history, to support targeted and sustainable interventions in areas with high prevalence such as Klitik Village.

MATERIALS AND METHODS

This study is a descriptive study that aims to describe energy intake, protein, and history of infectious diseases in stunted children under five in Klitik Village, Geneng District, Ngawi Regency. The research was carried out from January to May 2022. The population in this study amounted to 192 stunted toddlers. Sampling was carried out using probability sampling techniques with a simple random sampling approach. However, the number of samples obtained was 28 children under five, adjusted to the willingness of respondents who had given informed consent. This research has obtained permission from the authorities.

Data collection was carried out through interviews using structured questionnaires. Energy and protein intake data were collected using the 24-hour recall method, while data on the history of infectious diseases was obtained through questions in questionnaires. Data analysis was conducted univariate to describe the distribution of each variable, as well as bivariate analysis using cross-tabulation to provide a preliminary picture of the possible relationship between energy intake, protein, and infectious diseases in stunting toddlers. Although descriptive, this study also contains bivariate analyses to strengthen the interpretation of the results and as a basis for further further research.

RESULT

1. Respondent Characteristics

Table 5. 1 Number of Stunting Toddlers by Gender

Gender	n	%
Male	16	57.2%
Female	12	42.8%
Total	28	100%

Source : Primary Data in 2022

Based on table 5.1 Of the total 28 stunted toddlers in Klitik Village, the majority are male as many as 16 children (57.2%), while women are 12 children (42.8%). This shows that the prevalence of stunting is more common in boys under five.

Table 5. 2 Number of Stunting Toddlers by Age

Age (Months)	n	%
12-23	5	17.9%
24-35	6	21.4%
36-47	8	28.6%
48-59	9	32.1%
Total	28	100%

Source : Primary Data in 2022

Based on the table above, most of the stunting toddlers in Klitik Village are in the age group of 48-59 months as many as 9 children (32.1%), followed by the age group of 36-47 months as many as 8 children (28.6%), 24-35 months as many as 6 children (21.4%), and the least age group of 12-

23 months as many as 5 children (17.9%). This pattern suggests that the prevalence of stunting tends to increase with age, possibly due to the duration of exposure to inadequate nutritional intake.

2. Energy Intake

Table 5. 3Stunting *Toddler Energy Intake*

Energy Intake	n	%
Good	9	32.2%
Less	19	67.8%
Total	28	100%

Source : Primary Data in 2022

From table 5.3 above of the 28 stunted toddlers studied, as many as 19 children (67.8%) had poor energy intake, while only 9 children (32.1%) had good energy intake. This shows that most of the stunted toddlers in Klitik Village experience an energy deficit, which can be a direct factor in causing stunting because the body does not get enough energy to grow and develop optimally.

3. Protein Intake

Table 5. 4Stunting *Toddler Protein Intake*

Protein Intake	n	%
Good	10	35.7%
Less	18	64.3%
Total	28	100%

Source : Primary Data in 2022

From table 5.4 above, as many as 18 out of 28 toddlers (64.3%) had a low protein intake, while only 10 toddlers (35.7%) had a good protein intake. These findings show that the majority of stunted toddlers in Klitik Village are deficient in protein, which is an essential nutrient for the growth and repair of body tissues. Long-term protein deficiency can inhibit linear growth and worsen stunting conditions.

4. Infectious Diseases

Table 5. 5 Distribution of Frequency of *Stunting Toddler Infectious Diseases*

History of Infectious Diseases	n	%
Once	17	60.8%
Never	11	39.2%
Total	28	100%

Source : Primary Data in 2022

From table 5.5 above, most of the samples are known to have a history of infectious diseases, namely as many as 17 stunted children at 60.8% of which 11 stunted children have disease, 39.2% of which have no history of disease. The high number of toddlers who have been infected shows that infectious diseases play a major role in worsening children's nutritional status. Infections can decrease appetite, interfere with nutrient absorption, and increase energy requirements, all of which can contribute to the incidence of stunting.

Table 5. 6 Distribution of Frequency of Diarrheal Infectious Diseases in Stunting Toddlers

Diarrheal	n	%
Once	23	82.1%

Never	5	17.9%
Total	28	100%

Source : Primary Data in 2022

From table 5.6 above, it is known that 82.1% of toddlers have a history of diarrhea out of a total of 23 stunted toddlers, as many as 17.9% of stunted toddlers have never experienced diarrhea. This shows that diarrhea is one of the most common infectious diseases experienced by stunted toddlers, and has the potential to be a direct causative factor in stunting. Diarrhea can result in the loss of essential fluids and nutrients, as well as interfere with the absorption of nutrients in the gastrointestinal tract, which has an impact on impaired children's growth.

Table 5. 7 Distribution of Frequency of Infectious Diseases of Stunting Toddlers

ISPA	**n**	**%**
Once	19	67.9%
Never	9	32.1%
Total	28	100%

Source : Primary Data in 2022

From table 5.7 above, it is known that 67.9% of 19 toddlers who have a history of ISPA infection and 32.1% of stunted toddlers who do not have a history of ISPA infection. The high proportion of toddlers with a history of ISPA shows that upper respiratory tract infections are one of the factors that often accompany stunting conditions. ISPA can reduce appetite, increase the body's energy needs, and weaken the immune system, which can overall worsen nutritional status and inhibit children's growth.

5. Overview of Energy Intake with Infectious Diseases

Table 5. 8 Overview of Energy Intake of Stunting Toddlers with Infectious Diseases

Energi Intake	Infectious Diseases				Total	
	Never		Once			
	n	%	n	%	n	%
Good	4	14.3%	5	17.8%	9	32.1%
Less	7	25%	12	42.9%	19	67.9%
Total	11	39.3%	17	60.7%	28	100%

Source : Primary Data in 2022

From table 5.8 above of 28 stunted toddlers, there are 17 toddlers who have a history of infectious diseases, of which 12 (63.2%) also have insufficient energy intake. Meanwhile, of the 11 children under five who had no history of infection, 7 children (63.6%) also experienced insufficient energy intake. Although the percentage difference is small, this table shows that most toddlers with or without a history of infection tend to have less energy intake. These findings indicate that lack of energy can have a direct impact on susceptibility to infection and conversely, infection can also worsen the nutritional status of children, so the two are interrelated in aggravating stunting conditions.

6. Overview of Protein Intake with Infectious Diseases

Table 5. 9 Overview of Protein Intake of *Stunting Toddler* with Infectious Diseases

Protein Intake	Infectious Diseases				Total	
	Never		Once			
	n	%	n	%	n	%
Good	8	28.6%	2	7.1%	10	35.7%
Less	3	10.7%	15	53.6%	18	64.3%
Total	11	39.3%	17	60.7%	28	100%

Source : Primary Data in 2022

From table 5.9 above of 28 stunted toddlers, as many as 17 children had a history of infectious diseases, and among them, 15 children (83.3%) had insufficient protein intake. In contrast, of the 11 toddlers who had no history of infection, 8 children (72.7%) had good protein intake. This data shows that toddlers with less protein intake are more likely to have had an infection, while toddlers with good protein intake are more likely to never be infected. This reinforces the suspicion that a lack of protein intake can increase susceptibility to infection, which ultimately worsens stunting.

DISCUSSION

1. Respondent Characteristics

This study was conducted to determine the characteristics of stunted toddler respondents based on gender categories and age categories of 12-60 months. According to the results of the study, the number of boys under 5 years old is 16, which is 57.2% and the number of girls and girls under 5 years old is 42.8% of 12 babies. Research (Tsaralatifah, 2020) shows that stunted children have a 40% higher risk of stunting in boys under five than girls[13].

For toddlers, the highest rate of *stunting sufferers* is in the age group of 45-60 months, which is 50%. This is in accordance with research (Natasha & Yunita, 2020) that "stunting children are more often experienced. children aged 4-5 years or 48-60 months, with a percentage of 37.5%. There are more children under five who experience *stunting* with an adult age than toddlers with an age below them, this can be due to the slow growth of toddler height that is not balanced with the increase in age of toddlers"[8].

This study was conducted in Klitik Village, Geneng District, Ngawi City to measure the height of stunted children under five and to provide questions to mothers under five regarding the frequency of energy and protein intake of stunted children under five in Klitik Village, Geneng District, Ngawi Regency.

2. Energy Intake

From the results of interviews using the SQ FFQ form, it shows that 67.8% of the sample of toddlers with less energy intake are toddlers with less consumption of staple foods such as rice,

because toddlers prefer to consume *snacks* and snacks that contain little energy. Insufficient energy intake of stunted toddlers can be caused by the frequency of eating toddlers 1-2 times a day, therefore the energy value of toddlers is less than the recommended energy value, not only that the low energy intake of stunted toddlers is also caused by mothers of toddlers who are less proactive in providing varied food to *stunted* toddlers.

This is in accordance with the research conducted by (Khairani, 2018) showing that "*stunted* toddlers with low energy intake are as many as 21 toddlers (46.7%), this shows that *stunted* toddlers are often found in the category of less energy intake than good and more energy intake of toddlers"[14]. This is due to the intake of toddlers who do not meet their needs, the selection of the wrong type of food and the lack of variety of family food and the lack of parenting and activeness of mothers under five in providing food[15].

3. Protein Intake

From the results of interviews using the SQ FFQ form, it shows that a higher percentage, namely 64.3%, are toddlers with deficit protein intake, because toddlers do not or rarely consume animal protein such as chicken and fish meat with a frequency of 1-2 per week. Consuming vegetable side dishes such as tofu and tempeh whose biological value is lower than animal protein with a frequency and amount that is not much 1-2 pieces per day (not routine every day). Side dishes that are often consumed by toddlers are snacks and *crackers* that do not contain high protein so that toddlers feel full and the frequency of eating becomes 1-2 times a day.

According to research (Pratama, 2019), "protein plays an important role in the child's growth process, namely in body processes (the formation of hormones and enzymes), the protection of body tissues, into body structures, bone development. and increase weight and immunity"[16].

4. Infectious Diseases

From the results of the examination of the history of infectious diseases, it can be seen that *stunted* toddlers with a history of infectious diseases are more common than *stunted toddlers* without a history of infectious diseases. This is because *stunted* toddlers with a history of infectious diseases have fewer antibodies compared to children with normal nutritional status, *stunted* children are more susceptible to diseases that affect food intake, so a lack of protein, energy and micronutrients can inhibit the growth of children under five[17,18].

This is in accordance with research (Maulidiah, 2019) that "*stunted* children have a history of more infectious diseases than children with normal nutritional status"[19]. According to Stephen, children under five with a history of infectious diseases are more prone to malnutrition because the food or nutrients they consume are not absorbed properly[20]. Infectious diseases in toddlers can cause malnutrition[21]. This is caused by the creation of inappropriate energy functions, where the energy needed for growth is diverted to the body's ability to fight infections[22].

From the results of this study, it is known that toddlers with a history of infectious diseases tend to eat less energy, possibly because stunted toddlers are not sufficiently supervised by mothers under five, their diet is less varied, and the types of food are less diverse. This is in accordance with research (Khairani, 2018) that *stunted* toddlers are more likely to be in a lower energy group than children who are healthy and have good energy intake[14].

Toddlers with a history of infectious diseases can also be caused by low protein intake, which is a substance that can increase antibodies if the protein intake is low, it has an impact on their immunity so that they are susceptible to infectious diseases, if the protein intake is good, then children under five are not easily affected by infectious diseases[23,24]. This is also similar to the study (Winni, 2020) that toddlers with good protein intake tend to experience *stunting* , while toddlers with low protein intake have a lower chance of *stunting*[25].

Nevertheless, it is important to acknowledge the limitations in this study. First, the descriptive research design does not allow for in-depth exploration of causal relationships. Second, the use of the 24-hour recall method has the potential for recall bias, especially since data is obtained from parents or caregivers who may not accurately record what the child consumes. Third, the number of samples is relatively small (28 children under five), so the results cannot be generalized to the wider population.

To overcome bias, follow-up studies should use an observational analytical approach (e.g., cross-sectional or cohort) with a larger sample size and nutritional data collection using a 3–7-day food record. The use of more objective assessment of infection status tools such as medical examinations is also necessary.

Overall, the results of this study confirm that the problem of stunting is a multifactorial phenomenon, which is not enough to be handled only from the nutritional aspect. An integrated approach is needed that includes improving nutritional intake, improving environmental sanitation, nutrition education for mothers, and strengthening basic health services in detecting and handling infections in toddlers early and completely.

CONCLUSION

This study found that most of the stunted toddlers in Klitik Village experienced a lack of energy intake (67.8%) and protein (64.3%), and had a history of infectious diseases (60.8%), especially diarrhea and ISPA. Male toddlers and those aged 48–59 months are the most affected groups. These findings show a complex interaction between nutrition and infectious diseases in worsening stunting conditions.

Insufficient energy and protein intake causes an imbalance between nutritional needs and supplies, thus hindering the child's growth and development process. Meanwhile, infections interfere

with nutrient absorption and increase energy requirements, creating a cycle that worsens nutritional status. A strong link between poor protein intake and a high history of infection suggests that a child's weakened immune system is the gateway to stunting.

Therefore, stunting is not enough to be treated with additional feeding alone. Efforts must include holistic nutrition interventions, increased education for mothers under five, and sustainable prevention and treatment of infectious diseases. This conclusion underscores the urgency of cross-sectoral collaboration to comprehensively prevent and reduce stunting incidence in areas with high prevalence.

SUGGESTION

Based on the results of the study, it is recommended that parents increase their knowledge and practice of providing balanced nutritious food to toddlers, especially those that contain energy and high protein, such as animal protein sources that are given regularly. In addition, it is important to get used to visits to posyandu to monitor children's growth and development and detect nutritional problems early. Health and nutrition workers are expected to actively provide education about children's diet, the importance of food hygiene, and the prevention of infectious diseases through clean and healthy living behaviors. Specific and sensitive nutrition intervention programs need to be expanded and adapted to local needs. Local governments also need to strengthen cross-sectoral coordination in stunting prevention, including increasing access to clean water, sanitation, and basic health services. An integrated approach involving families, health workers, and the government is essential to break the cycle of malnutrition and infections that exacerbate stunting.

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