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Correlation of Animal and Vegetable Protein Intake with the Risk of Stunting at an Early Age

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ABSTRACT

Stunting is a chronic nutritional problem that has a long-term impact on the quality of human resources. Although the prevalence of stunting in Indonesia shows a downward trend, the figure still exceeds the WHO threshold. One important determinant of stunting is the adequacy and quality of protein intake in early childhood. This study aims to explore parents' understanding of animal and vegetable protein consumption and its relationship to the risk of stunting. A qualitative approach with a phenomenological method was used to capture the subjective experiences of parents with children aged 0–5 years in areas at high risk of stunting. Data were collected through semi-structured in-depth interviews and analyzed using the Colaizzi thematic technique. The results showed that parents' understanding of the importance of protein quality, especially from animal sources, is still low. Economic factors, cultural perceptions, and low nutritional literacy are the main obstacles in providing balanced nutritious food for children. Vegetable protein tends to be the main choice because it is more affordable, although biologically less optimal. This study emphasizes the need for contextual and community-based nutritional interventions, as well as multi-sector policy support to improve community access and understanding of the importance of a combination of animal and vegetable protein in preventing stuntings

INTRODUCTION

Stunting is one of the chronic nutritional problems that is still a major challenge in health development in Indonesia. Based on data from the 2022 Indonesian Nutritional Status Survey (SSGI), the national prevalence of stunting was at 21.6%, although there was a decrease compared to previous years, the figure is still above the threshold set by WHO, which is 20%. Stunting in early childhood indicates a disruption in linear growth due to chronic malnutrition that lasts a long time, especially in the first 1,000 days of life (Sholikhah & Dewi, 2022). This problem not only reflects the low quality of nutritional intake, but is also related to socio-economic factors, parenting patterns, and access to basic health services. In the midst of the government's efforts to target a reduction in the prevalence of stunting to 14% by 2024, identifying direct and indirect determinants of this problem is becoming increasingly important, one of which is through a study of the protein consumption patterns of early childhood.

The impact of stunting goes far beyond just delayed physical growth. Research shows that children who experience stunting have a higher risk of experiencing impaired cognitive development, decreased learning ability, and metabolic disorders that can increase susceptibility to non-communicable diseases in adulthood (Rahmawati, 2023). In addition, according to UNICEF (2020), children who experience stunting tend to have lower levels of productivity and income potential as adults. This shows that stunting is not only an individual problem, but also a structural obstacle in the development of a nation's human resources. Therefore, a comprehensive approach is needed to overcome stunting, including a more in-depth investigation into the contribution of the quality and quantity of nutritional intake, especially protein from animal and vegetable sources, in determining children's growth status. Focusing on this nutritional factor is crucial, considering that protein requirements during rapid growth are very high and play a direct role in the formation of body tissue and maintenance of the immune system.

Protein is an essential macronutrient that plays a key role in the growth and development of children, especially at an early age which is a critical period for the formation of organs and body tissues. In this context, animal protein sources such as meat, fish, eggs, and milk contain a more complete essential amino acid profile and higher bioavailability compared to vegetable protein (Yuliantini et al., 2022). Essential amino acids such as lysine, methionine, and tryptophan are essential for the body because they cannot be synthesized by themselves and play an important role in the synthesis of structural and enzymatic proteins that support cellular development. According to the World Health Organization (WHO, 2007), a deficiency of just one essential amino acid can inhibit overall body protein synthesis, which ultimately has an impact on disrupting the child's linear growth. This is reinforced by research by Apriluana & Fikawati, 2018) which shows that interventions based on foods high in animal protein significantly increase children's height, especially in developing countries with a high prevalence of stunting.

However, economic constraints and food access are often the main barriers to meeting animal protein needs, especially in rural areas and low-income communities. In this context, vegetable protein such as that from nuts, tofu, tempeh, and grains can be an important alternative to close the nutritional gap, although in terms of biological quality it is still lower than animal protein. Therefore, a combination of protein consumption from these two sources is highly recommended to achieve a balanced and optimal protein intake. This strategy not only increases total protein intake but can also improve the amino acid profile in children's diets through the principle of protein complementarity. Several studies such as those conducted by Monica et al (2024) show that interventions that combine animal and vegetable proteins can reduce the incidence of stunting more effectively than consuming only one type of protein. Thus, a nutritional approach that considers the quality and diversity of protein sources is very important in preventive efforts against the risk of stunting at an early age.

The differences in nutritional content between animal and vegetable protein pose challenges as well as opportunities in the strategy of fulfilling the nutritional needs of early childhood. Animal protein, although superior in terms of amino acid completeness and digestibility, is relatively expensive and its availability is uneven, especially in areas with low socio-economic conditions. In contrast, vegetable protein such as nuts and soy products (tempeh and tofu) are more easily accessible to the wider community, but have less complete amino acid content, especially in terms of lysine and methionine. According to FAO (2013), the biological value of vegetable protein tends to be lower due

to the presence of anti-nutritional compounds such as phytate and tannin which can inhibit the absorption of important nutrients. Therefore, in the context of overcoming stunting, a single approach based on vegetable protein consumption alone is not enough, especially if it is not accompanied by efforts to improve nutritional quality through diversification of food sources that can complement each other's deficiencies.

Furthermore, the importance of synergy between animal and vegetable protein is not only related to biochemical aspects, but also related to food policies and community consumption behavior. In many regions, carbohydrate-based diets are still very dominant, while protein intake, both animal and vegetable, is still far from the recommended daily nutritional adequacy. A study by Aritonang et al (2020) revealed that animal protein consumption has significantly decreased in poor households, and this directly contributes to the high prevalence of stunting. Therefore, nutrition education that emphasizes the importance of a combination of animal and vegetable protein consumption needs to be strengthened through community-based interventions, nutritious food assistance programs, and the development of sustainable local food systems. This not only aims to improve children's nutritional status in the short term, but also build community nutritional resilience in the long term. Without an integrative strategy that considers the economic, social, and cultural dimensions of consumption, efforts to reduce the risk of stunting will only be partial and less effective.

Lack of public understanding of the importance of balanced protein intake from animal and vegetable sources is often an obstacle to achieving optimal nutrition in early childhood. Many families, especially in areas with low levels of education and limited access to information, do not yet understand the fundamental differences between the quality of animal and vegetable protein and the importance of both in children's diets. As a result, protein consumption is often not considered in terms of quantity or quality, and children's diets tend to be unbalanced, especially more dominant in carbohydrates with little protein variation. Research from Martony (2023) confirms that unhealthy dietary transitions, coupled with minimal nutrition education, contribute to the high burden of double nutrition, including stunting and hidden malnutrition. In this context, the lack of awareness of the role of quality protein in children's linear growth creates a vicious cycle that is difficult to break, especially when feeding practices are not adjusted to the child's physiological needs during the golden period of growth and development.

The public's ignorance of the concept of complementary proteins, namely how plant and animal proteins can complement each other's amino acid deficiencies, also worsens the situation. For example, tempeh and tofu, which are widely consumed, have high levels of lysine but low levels of methionine, while eggs and meat are the opposite. Without this understanding, many parents rely on only one type of protein source, so that children's essential amino acid intake becomes unbalanced. This reinforces the importance of local research that not only describes the statistical relationship between protein consumption and stunting, but also explores community understanding and the cultural and economic factors that influence food choices. As stated by Jusliani & Syamsuddin (2024), nutritional interventions that are based on local evidence and tailored to the socio-economic context have been shown to be more effective in reducing the prevalence of stunting. Therefore, in-depth research is needed on the correlation between animal and plant protein consumption patterns and the risk of stunting, in order to produce policies that are not only nutritionally appropriate but also socially and culturally relevant.

METHODOLOGY

This study uses a qualitative approach with a phenomenological study type that aims to deeply understand the subjective experiences of parents in providing food intake to early childhood, especially related to their understanding of animal and vegetable protein and perceptions of the risk of stunting. The research subjects were selected by purposive sampling, namely parents or primary caregivers of children aged 0–5 years who live in areas with a fairly high prevalence of stunting. Participants are estimated to number between 8 and 12 people, with the provision that data collection stops when it reaches the point of information saturation (data saturation). Data were collected through semi-structured in-depth interviews that allowed for free but directed exploration of informants' experiences and views. Interviews were conducted face-to-face or online with the consent of the informant, and all conversations were recorded and transcribed verbatim for analysis purposes.

Data analysis was conducted using the phenomenological thematic analysis method according to Colaizzi, which includes several stages starting from reading the entire transcript to understand it thoroughly, identifying significant statements, formulating the meaning of the statements, to grouping the meaning into main themes that describe the essence of the parents' experiences. Furthermore, the description of the phenomenon was compiled comprehensively and the results of the analysis were validated through member checking with several informants to ensure the appropriateness of the data interpretation. To increase the credibility of the research, triangulation of data sources was also carried out by comparing information from various participants and recording the researcher's reflections through field notes. This approach is expected to produce a rich and authentic understanding of the factors that influence protein consumption patterns and the risk of stunting in early childhood from the perspective of the community that is the subject of the research.

RESULTS AND DISCUSSION

Parents' Understanding and Perception of Animal and Vegetable Protein Intake in the Context of Stunting Prevention in Early Childhood

1. Knowledge Gap about Protein Quality and Function in Child Feeding Practices

The gap in knowledge about the quality and function of protein in child feeding practices is one of the important factors that affect the nutritional status of children in various levels of society. Many parents do not yet understand that not all proteins have the same quality, especially in terms of essential amino acid content. Animal proteins such as meat, eggs, fish, and milk contain all essential amino acids in a composition that is appropriate for the body's needs, while vegetable proteins often lack one or more of these essential amino acids. Unfortunately, most parents still assume that all sources of protein, both animal and vegetable, provide equal nutritional benefits. As a result of this misconception, child feeding practices tend not to consider the biological quality of protein, so that many children do not get optimal nutritional intake even though the quantity seems sufficient. This condition is reflected in the statement of a housewife in Payo Selincah Village, Jambi:

> *"So far, I thought that if children had eaten tofu, tempeh, or nuts, that would be enough protein. The problem is that we rarely could buy meat or fish because it was expensive." (Interview, 2024).*

This statement shows that ignorance of protein quality, combined with economic constraints, makes families tend to rely on cheaper vegetable protein sources, without considering the adequacy of essential nutrients for child growth and development. In fact, according to research conducted by Zain & Kurniasari (2023), animal protein plays a crucial role in encouraging height growth, brain development, and improving the immune system in early life. In their study, it was stated that animal protein is easier to digest and has a more complete amino acid profile than vegetable protein. Lack of quality protein intake in the long term can cause linear growth disorders and increase the risk of stunting.

This lack of understanding has direct implications for children's daily eating habits, where animal protein is often not a top priority on the family menu. This is not only caused by economic factors, but also by the lack of nutritional education received by parents, especially mothers as the main person responsible for providing food to children. In a study conducted by Kartika (2023), it was found that low nutritional literacy in mothers was highly correlated with poor feeding patterns for toddlers, including inaccuracy in choosing types of protein sources. When the need for high-quality protein is not met, the child's growth and development process is not optimal, especially in the golden age period which really requires complete and balanced nutrition.

Low intake of quality protein can inhibit linear growth, reduce cognitive function, and increase the risk of infection due to a child's weak immune system. This condition is exacerbated by limited public access to correct nutritional information and the uneven distribution of health education, especially in remote areas or those with limited resources. A nutrition officer at a Community Health Center in Jambi City stated:

> *"We often find mothers who do not understand that animal protein is very important. They focus more on carbohydrates, because they fill you up faster. In fact, what children need is not just to be full, but to have enough nutrition."* (Interview, 2024)

Information that should be a guide for parents is often not available in a form that is easy to understand and applicable. On the other hand, nutrition education at the community level is also not standardized and has not touched on important substances such as differences in protein quality. According to UNICEF (2022), community-based nutrition education that directly targets housewives has a significant impact on preventing stunting, but its implementation at the local level still faces many challenges, especially in terms of human resources and program sustainability.

This knowledge gap ultimately becomes a structural factor that contributes to the high stunting rate in Indonesia. Children who do not receive consistent quality protein intake are more susceptible to long-term growth and development disorders. Therefore, comprehensive interventions are needed through increasing community nutritional literacy, providing accurate and easily accessible information, and policy support that facilitates access to animal protein sources, especially for groups at high risk of nutritional problems. Educational programs combined with food interventions, such as subsidies for nutritious food ingredients and strengthening integrated health post services, are expected to be able to narrow the knowledge gap while improving the quality of protein consumption of Indonesian children.

2. Social and Cultural Perceptions of Animal Food: Between Nutrition and Social Status

In the context of fulfilling family nutritional needs, especially during the growth and development of children, animal protein consumption plays a very important role. Various scientific studies confirm that animal protein has advantages in terms of more complete essential amino acid content and higher bioavailability compared to vegetable protein. A study by Auditna et al (2019) in the journal The Lancet showed that sufficient consumption of animal protein can reduce the risk of stunting and support optimal cognitive development in children. However, in various communities, especially those in the lower middle socioeconomic class, animal foods such as meat, eggs, and fish are not always positioned as daily staples based on nutrition. In fact, these foods are often perceived as symbols of social status or luxuries that are only suitable for consumption at special moments such as holidays, family parties, or traditional events.

This was confirmed by a housewife in the coastal area of Jambi in an interview:

"Children do like to eat eggs and fish, but we usually give them on Fridays or when there are events. If we give them every day, we can't afford to buy them. I think that kind of food is for people who are better off."

This quote reflects how the perception of nutritious food is still heavily influenced by the social construction that attaches animal foods as a marker of social class. Consequently, even though parents are actually aware of the nutritional value of these foods, they still refrain from serving them every day due to economic pressures and ingrained cultural norms.

Another cultural aspect that inhibits increasing animal protein intake is a monotonous and minimally varied diet, which is passed down from generation to generation. In many agrarian or coastal communities, the daily menu tends to remain unchanged from generation to generation, with the main focus being on staple foods (such as rice) and simple vegetable side dishes. In fact, there are also certain customary beliefs that prohibit the consumption of certain types of animals for reasons related to myths or spiritual values. For example, in an ethnographic study conducted by Saptari (2015), it was found that some people in the interior of Sumatra avoid consuming goat meat because it is believed to cause internal heat or "make children naughty", a belief that is not scientifically based but persists because it is culturally inherited.

This phenomenon shows a gap between normative knowledge about nutrition and actual practice at the household level. Information about the importance of consuming animal protein has actually been conveyed through various government health programs, such as Posyandu and nutrition counseling at Puskesmas. However, because the approach used is often one-way, technical, and does not consider local socio-cultural values, these messages are not fully absorbed by the community. In this case, the nutritional intervention approach needs to be adjusted to the local context, by utilizing informal communication channels that are more trusted by the community, such as traditional figures, religious leaders, and Posyandu cadre mothers.

Cultural-sensitive nutrition interventions have been shown to be more effective in changing eating behavior than technocratic, instructional approaches. According to Uli et al (2025), the success of a nutrition program is highly dependent on the ability to understand and integrate local cultural values into the intervention design. In practice,

this can be done through various strategies, such as training local cadres who understand the local cultural context, developing nutritious recipes with affordable local ingredients, and counseling that involves active community participation. Thus, the community will be better able to accept nutrition messages as part of everyday life, not as a foreign concept that is difficult to reach.

In conclusion, social and cultural perceptions of animal foods are still a major barrier to efforts to improve the nutritional quality of the community, especially children. This perception is not only influenced by economic factors alone, but also by cultural values that shape the way people view food. Therefore, effective nutritional intervention strategies must be holistic, not only conveying information, but also building collective awareness through an approach that respects local wisdom. By bridging the gap between knowledge and practice, and expanding access to affordable and culturally acceptable animal protein sources, improvements in nutritional quality can be achieved sustainably.

Factors Influencing Protein Feeding Practices and Their Implications for Stunting Risk: A Parent's Perspective

1. Economic Inequality and Food Accessibility as Barriers to Fulfilling Quality Protein

Economic inequality and limited food accessibility are two crucial obstacles in meeting children's need for quality protein, especially among the poor and vulnerable. In in-depth interviews with several parents in urban and semi-urban areas, statements emerged that reflect this condition in real terms. A housewife in a densely populated area stated,

> *"If the money is only enough to buy rice and noodles, that's what we buy. Meat is for the rich, not for us, the important thing is to be full first."*

This statement reflects the reality where limited income forces families to choose between being full or nutritious, and the choice almost always falls on cheap, high-carbohydrate, low-protein foods. The price of animal protein sources such as chicken, fish, eggs, and milk is considered too expensive and unaffordable for daily consumption. This is in line with the findings of Fatimah & Siregar (2020) which state that household income has a significant correlation with protein consumption patterns, where low-income households tend to avoid consuming animal protein for cost reasons.

On the other hand, barriers are not only economic, but also related to the geographical and physical accessibility of nutritious food. In some remote areas, access to traditional markets or fresh food stores is very limited, either due to long distances, damaged road infrastructure, or uneven food distribution. A respondent in a rural area said,

> *"If you want to buy fresh fish, you have to go to the district market, which is two hours away by motorbike. In the village, you can find instant noodles or salted fish, and even that is sometimes expensive."*

This testimony illustrates a situation where the availability of nutritious food is not only determined by purchasing power, but also by distribution and infrastructure factors. According to FAO analysis (2020), physical access to food is an important dimension of

food security; without adequate distribution infrastructure, poor groups will find it increasingly difficult to obtain quality food, despite limited financial capacity.

This situation is exacerbated by the tendency for high consumption of ultra-processed foods in poor communities. Fast food, instant noodles, and cheap snacks are often alternatives due to their low prices, long shelf life, and easy access at local stalls. In fact, these types of foods are generally high in salt, sugar, and trans fats, but low in micronutrients and quality protein. Research by Diba (2025) shows that high consumption of ultra-processed foods is strongly associated with an increased prevalence of hidden malnutrition, obesity, and metabolic disorders in low-income populations. In the context of children, inadequate animal protein intake during the first 1,000 days of life can disrupt linear growth, cause stunting, and inhibit brain and immune system development (WHO & UNICEF, 2021).

When economic inequality meets physical barriers to access to nutritious food, what happens is a vicious cycle of malnutrition that is difficult to break. Children who grow up in conditions lacking quality protein will have a higher risk of stunting, which not only affects body posture but also learning ability and productivity as adults. Ultimately, this low productivity reinforces intergenerational poverty. According to Nugroho et al (2021), children who experience stunting are more likely to fail to complete basic education and have lower incomes as adults than children who grow up healthy. Therefore, interventions to this problem are not enough through a health approach alone, but also require multisectoral policies that include nutritious food subsidies, development of food distribution infrastructure in disadvantaged areas, family economic empowerment programs, and nutrition education to increase awareness of the importance of animal protein consumption in children's growth and development.

2. The Role of Education Level and Nutritional Literacy in Household Food Decision Making

The level of education of parents, especially mothers as the main person responsible for providing food in the family, plays an important role in determining the quality of household food consumption. Higher education often opens wider access to information, and improves the ability to understand and filter nutritional messages received from various sources, including mass media, health workers, and the social environment. In contrast, parents with low educational backgrounds tend to have limited understanding of the importance of balanced nutrition, especially in terms of fulfilling protein for child growth. A housewife in an interview stated,

> *"I didn't know that children needed to eat animal protein every day, as long as they were full it was enough, especially if shopping money was limited."*

This statement clearly illustrates that understanding of the role of protein in supporting children's physical and cognitive development is still low, especially among people with low education.

This low nutritional literacy has a direct impact on monotonous and less varied food consumption habits. People tend not to have the initiative to explore alternative sources of affordable but still nutritious protein, such as a combination of tempeh and eggs, which are actually easily accessible in local markets. In this context, scientific literature supports that nutritional literacy has a positive relationship with the quality of household diets. Research by Amrindono et al (2023) emphasizes that health literacy including nutritional

literacy helps individuals to obtain, understand, and use information to make the right decisions about their health, including in choosing food. Meanwhile, a study by Anggraeny et al (2025) also showed that interventions to improve nutritional literacy in mothers significantly increased the frequency of nutritious food consumption in toddlers.

Another problem is the low awareness that stunting is not only caused by genetic factors or sanitation, but is also greatly influenced by daily diets that are inadequate in terms of nutritional quality. Many parents do not yet understand that chronic lack of intake of essential nutrients such as protein, iron, and zinc can inhibit linear growth and brain development in children.

> *"I think stunting is because the child is sick or small from birth, not because of their food,"*said a father in a focus group discussion in a suburban area.

In fact, WHO (2021) firmly states that stunting is a form of chronic malnutrition that is closely related to inadequate diet, especially in the first thousand days of life.

This condition shows the need for contextual and adaptive nutritional education interventions to the socio-economic background of the community. Nutrition education cannot be delivered with a one-way approach and is purely theoretical. Communicative, practical, and experience-based methods are needed, for example through cooking training, counseling at integrated health posts, or community-based education so that the information provided is not only understood, but also applied in everyday life. Effective nutrition education must pay attention to the cognitive, affective, and behavioral aspects of students, and provide messages that are relevant to the reality of their lives.

By increasing nutritional literacy through a participatory and contextual approach, it is hoped that food decision-making in households will transform from being based solely on habits or economic limitations to conscious, planned actions that are oriented towards fulfilling the nutritional needs of families, especially children during critical growth periods.

CONCLUSION

The conclusion of this study shows that parents' understanding and perception of animal and vegetable protein intake is still limited and unequal, especially in the context of preventing stunting in early childhood. Many parents do not yet understand that animal protein has a higher biological quality than vegetable protein because of its more complete essential amino acid content. This ignorance is exacerbated by economic limitations that make families rely more on cheaper vegetable protein sources. In addition, social and cultural perceptions also influence the practice of consuming animal foods; nutritious foods such as meat, fish, and eggs are often seen as symbols of social status, not as children's daily needs. Monotonous eating patterns that are passed down from generation to generation and certain traditional beliefs also contribute to obstacles. Existing nutritional interventions are not yet fully effective because they do not consider the local socio-cultural context and are still minimal in delivering applicable education. Therefore, a holistic approach is needed that integrates nutritional education, economic interventions, and cultural approaches so that parents can understand the importance of protein quality and are able to provide adequate nutritional intake for their children to prevent stunting sustainably

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