



(RESEARCH ARTICLE)



## Key factors and interventions for stunting in Kelurahan Tombula: A study on nutrition, infections, socioeconomic status, and parental posture

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### Abstract

**Overview:** This study aims to identify the factors contributing to stunting in Kelurahan Tombula, focusing on nutritional patterns, diseases/infections, socioeconomic conditions, and parental body posture. Stunting, an indicator of impaired child growth, can be influenced by various interconnected factors.

**Body of Knowledge:** Stunting is often caused by inadequate nutritional patterns, recurrent infections, poor socioeconomic conditions, and parental body posture that may reflect past nutritional deficiencies. This research explores the impact of these factors on stunting prevalence among toddlers in the study area.

**Methods:** The study employed a quantitative approach with primary data analysis collected through surveys and interviews with parents of toddlers in Kelurahan Tombula. Data were analyzed to determine the prevalence of stunting and the relationship between the identified causative factors.

**Results:** The findings reveal that 65% of toddlers have inadequate nutritional patterns, 75% are affected by infections, 70% come from families with poor socioeconomic conditions, and 20% of mothers have a short body posture. All these factors significantly contribute to the incidence of stunting.

**Recommendations:** The study recommends implementing nutrition education programs for parents, improving access to healthcare services, interventions to enhance socioeconomic conditions, and strengthening health programs for pregnant women. A comprehensive approach involving local community engagement is also essential to reduce the prevalence of stunting in Kelurahan Tombula.

**Keywords:** Stunting; Nutritional Patterns; Infections; Socioeconomic Status; Parental Body Posture

### 1. Introduction

The neonatal stage, encompassing the period from birth to 28 days, is marked by significant transformations as the newborn adapts from intrauterine to extrauterine life. During this critical time, almost all organ systems undergo substantial development, highlighting the importance of physiological adaptation for the neonate's survival in the external environment (1). Infants less than one month old are highly vulnerable to various health complications, which, if not properly managed, can lead to fatal outcomes. This vulnerability is primarily due to an increased risk of infections that can trigger serious illnesses (2). Emphasize that physiological adaptations, including enhanced respiratory function, blood circulation, thermoregulation, and glucose production, are crucial for the neonate's survival outside the womb (3).

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Toddlers, as defined (4), are children within the age range of 0-59 months. This phase is critical as it is characterized by significant physical and cognitive development. The nutritional intake received by toddlers has a substantial impact on their overall well-being. Proper nutrition plays a vital role in shaping the immune response, which subsequently affects the child's susceptibility to various diseases (5).

Stunting refers to a physiological condition observed in children under five years old, characterized by impaired growth due to chronic malnutrition. This condition manifests as a reduced height compared to the child's chronological age (6). malnutrition often begins during pregnancy and continues into childhood, with symptoms typically becoming evident after the child reaches two years of age. stunting as a condition in children under five years old with a z-score below -2SD (stunted) or even below -3SD (severely stunted) (7).

The age range of 24-59 months is recognized as a critical period for the development of high-quality human resources (8). The first two years of a child's life are particularly crucial for achieving optimal brain growth and development. Malnutrition during this period is identified as one of the key contributors to the low quality of human resources in Indonesia. Chronic malnutrition can lead to suboptimal linear growth, commonly referred to as stunting, which has significant short-term and long-term consequences (9,10)

Several factors have been identified as major contributors to stunting. These factors include maternal history, such as short stature, closely spaced pregnancies, high parity, advanced maternal age, and adolescent pregnancies (under 20 years old) (11,12). Additional risks include the potential for delivering low birth weight (LBW) babies and inadequate nutritional intake during pregnancy. Furthermore, factors such as the failure to implement Early Initiation of Breastfeeding (IMD), insufficient exclusive breastfeeding, and early weaning practices also play a role in the issue. Socioeconomic conditions and sanitation problems are also significant contributing factors to stunting (13,14). Stunting has serious consequences, including impaired cognitive, motor, and verbal development, increased morbidity and mortality, suboptimal adult height (short stature), and reduced learning capacity and academic achievement during school years (15).

According to the latest data from the World Health Organization (WHO), in 2023, the global prevalence of stunting among children under five years old remains a serious issue, with approximately 22% of the global population, or about 149 million children, affected by stunting (16,17). In Southeast Asia, Indonesia has a higher prevalence of stunting compared to neighboring countries such as Vietnam (22%), Thailand (13%), and Malaysia (15%). In 2022, the prevalence of stunting in Indonesia was recorded at 30.8%, a decrease from previous years, yet still above the WHO-recommended threshold of 20% (18–20).

Specifically, in Southeast Sulawesi Province, the stunting prevalence in 2022 was reported to be 29.9%, reflecting a downward trend similar to the national level. In Kendari City, the prevalence of stunting was recorded at 31.7% in the same year, indicating that despite the decrease, stunting remains a significant health issue in the region (21).

In Muna Regency, the prevalence of stunting in 2021 was recorded at 33.52%. The latest data from Tongkuno Health Center in 2023 shows that 59 children in the area were recorded as stunted, including 20 out of 134 children in Tombola Village (22). Given this situation, the researcher is interested in studying the factors influencing stunting among toddlers in Tombola Village, Tongkuno Subdistrict, Muna Regency, in 2023.

### **1.1. Statement of the Problem**

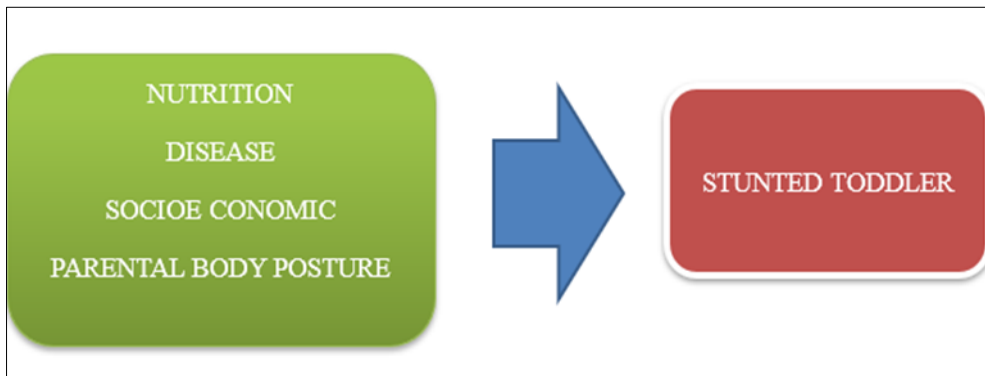
In the context of public health, stunting among children under five remains a significant issue in Indonesia, with prevalence rates still far above the threshold set by the World Health Organization (WHO). Despite various efforts to reduce stunting rates, data indicates that the prevalence of stunting in certain regions, including Muna Regency, remains alarmingly high. In the Tongkuno Health Center area, the rate of stunting among children under five reached a concerning level, with 59 cases recorded in 2023. This situation suggests that the factors contributing to stunting in this area have not been fully understood and addressed. Therefore, this study aims to describe and analyze the factors influencing the occurrence of stunting among children under five in Tombola Village, Tongkuno Subdistrict, Muna Regency in 2023, with the hope of providing deeper insights and recommendations for more effective interventions.

### **1.2. Purpose of the study**

This study aims to identify and analyze the factors influencing the occurrence of stunting among toddlers in Tombola Village, Tongkuno Subdistrict, Muna Regency in 2023. Through this research, it is expected to gain a deeper understanding of the risk factors contributing to the prevalence of stunting in the area, thereby providing more targeted recommendations for effective interventions in the prevention and management of stunting.

### 1.3. Conceptual Framework

The conceptual framework for this research integrates several key variables that are interrelated in influencing the incidence of stunting in toddlers. Firstly, nutrition plays a crucial role in determining the nutritional status of toddlers, where inadequate nutrient intake can lead to impaired growth. Disease, is also a critical factor, as infections or chronic illnesses can disrupt nutrient absorption and exacerbate stunting. Socioeconomic factors affect access to nutritious food and healthcare services, which can impact the health and growth of toddlers. Additionally, parental body posture can reflect genetic factors and overall health conditions that influence a child's growth. By linking these four variables, this conceptual framework aims to identify the complex relationships affecting stunting in toddlers and provide deeper insights into factors that should be considered in efforts to prevent and address stunting, as illustrated by the arrows in Figure 1.



**Figure 1** Conceptual Framework of the Study

### 1.4. Significance of the Study

This study holds significant importance in the context of public health, particularly in efforts to prevent and address stunting in toddlers. By identifying and analyzing the factors that influence the incidence of stunting, such as nutrition, disease, socioeconomic conditions, and parental body posture, the results of this research are expected to provide valuable insights for policymakers, healthcare professionals, and other relevant stakeholders. This study can also serve as a foundation for formulating more effective and evidence-based interventions to reduce the prevalence of stunting in Indonesia. Additionally, the findings from this study can contribute to the development of more comprehensive maternal and child health programs, and support government efforts in achieving national and global health development targets.

## 2. Material and method

### 2.1. Study Design

This study employs a descriptive research method, which is one of the research methods used to objectively and systematically describe a situation or phenomenon. The purpose of this method is to provide a clear and detailed picture of the variables being studied without influencing or manipulating the existing conditions. In the context of this research, the descriptive approach is used to collect relevant data, analyze it, and present it in an easily understandable form, thereby offering deeper insights into the phenomenon under investigation. This descriptive method also allows the researcher to identify specific patterns or trends within the collected data and relate them to existing theories or literature, ensuring that the research findings make a meaningful contribution to the field of study (23).

### 2.2. Research site

This study will be conducted in Kelurahan Tombula, Kecamatan Tongkuno, Kabupaten Muna, in June 2023. The selection of this location is based on the high prevalence of stunting in the area, making it a relevant site for this study. Additionally, Kelurahan Tombula has a significant population of toddlers, allowing the research to obtain representative data related to the factors influencing stunting incidence. The social and economic environment, as well as access to healthcare services in the area, are also important considerations in assessing how these factors contribute to stunting in toddlers. Therefore, this location is chosen to provide an appropriate context and enable an in-depth analysis of the issue being studied.

### 2.3. Population, sample and sampling procedure

The population in this study consists of all stunted toddlers in Kelurahan Tombula, Kecamatan Tongkuno, Kabupaten Muna, totaling 40 toddlers. The sample for this study was taken using the incidental/accidental sampling technique, as described by Sugiyono (2016), which is a sampling method based on chance. This means that any toddler who happens to meet the researcher and is deemed suitable as a data source can be included as a sample. Therefore, the sample size in this study is 40 toddlers. This sampling procedure allows the researcher to collect data from participants who are available and meet the study criteria during the data collection period, ensuring that the study results reflect the conditions of the stunted toddler population in Kelurahan Tombula.

### 2.4. Data Analysis

Data analysis in this study is carried out through several important stages. First, editing, is performed to check and ensure that the questionnaires filled out by respondents are not incomplete, incorrect, or questionable, thus ensuring that the answers are complete and valid. Next, during the coding stage, responses are classified and coded to facilitate data processing. After that, data is entered into a computer program during the entry data, stage for further processing. The tabulating, process organizes the data into tables according to the type of variable being studied. For data analysis, the frequency distribution formula is used:  $f = \frac{f}{n} \times k$  (Sugiyono, 2020), where  $f$  represents the variable being analyzed,  $n$  is the sample size,  $f$  is the number of respondents based on the variable, and  $k$  is the constant 100%. This stage aims to analyze the frequency distribution of the variables under study, providing relevant information about patterns or trends in the data.

### 2.5. Ethical Considerations

This research took ethical aspects into account by obtaining permission from the leadership and the research site before conducting interviews and filling out questionnaires by respondents. Informed consent was obtained from respondents before data collection, ensuring the confidentiality of the information provided and explaining the purpose of data collection. The study avoided pressuring respondents to participate and respected individual privacy according to ethical guidelines.

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## 3. Results

The following findings and discussion are presented according to set research objectives:

### 3.1. Overview of the Research Location

Kelurahan Tombula is one of the villages located in the Kecamatan Tongkuno, with an area of 482.90 hectares and consisting of three neighborhoods: Neighborhood I (Wabangkele) with 119 Heads of Families (KK), Neighborhood II (Kapogau) with 186 KK, and Neighborhood III (Rumbia) with 89 KK. In 2023, the population of Kelurahan Tombula reached 1,524 people, with a total of 393 KK. The population in each neighborhood is as follows: Neighborhood I with 470 people, Neighborhood II with 735 people, and Neighborhood III with 319 people, comprising both males and females. This data provides an overview of the population distribution and demographic structure relevant to the research.

### 3.2. Results

The primary data used in this research were obtained through questionnaires administered to each household in the Kelurahan Tombula, Kecamatan Tongkuno area. The sample for this study consisted of 40 toddlers, and the data collected are presented in the following tables with detailed explanations.

### 3.3. Nutritional Patterns

The table below shows the distribution of respondents based on nutritional patterns affecting the incidence of stunting in Kelurahan Tombula:

**Table 1** Distribution of Nutritional Patterns Among Toddlers in Kelurahan Tombula, Kecamatan Tongkuno, 2023

| Nutrition  | f  | %   |
|------------|----|-----|
| Adequate   | 14 | 35  |
| Inadequate | 26 | 65  |
| Total      | 40 | 100 |

Source: Primary Data 2023

The table 1 indicates that the majority of toddlers, 26 (65%), have an inadequate nutritional pattern, while 14 (35%) have an adequate nutritional pattern. This suggests that inadequate nutrition is a major factor contributing to stunting in this area.

### 3.4. Diseases/Infections

The distribution of respondents based on the types of diseases or infections affecting the incidence of stunting in Kelurahan Tombula is shown in the table below:

**Table 2** Distribution of Diseases Among Toddlers in Tombula Village, Tongkuno Subdistrict, 2023.

| Disease                           | f  | %   |
|-----------------------------------|----|-----|
| Acute Respiratory Infection (ARI) | 2  | 5   |
| Diarrhea                          | 6  | 15  |
| Typhoid Fever                     | 1  | 2.5 |
| Congenital Defects                | 1  | 2.5 |
| Others                            | 30 | 75  |
| Total                             | 40 | 100 |

Source: Primary Data 2023

The table 2, The analysis shows that most toddlers suffer from other types of infections (75%), while ARI and diarrhea are present in 5% and 15% of the respondents, respectively. Other infections may contribute more significantly to stunting compared to specific infections.

### 3.5. Socioeconomic Status

The table below shows the distribution of respondents based on socioeconomic status affecting the incidence of stunting in Kelurahan Tombula:

**Table 3** Distribution of Respondents Based on Socioeconomic Status Affecting the Incidence of Stunting in Kelurahan Tombula, 2023

| Socioeconomic Status | f  | %   |
|----------------------|----|-----|
| Adequate IMR         | 12 | 30  |
| Inadequate IMR       | 28 | 70  |
| Total                | 40 | 100 |

Source: Primary Data 2023

The table 3, The results indicate that 70% of toddlers come from families with socioeconomic conditions that do not meet the IMR (Index of Material Resilience), while 30% come from families with conditions that do meet the IMR. Inadequate socioeconomic conditions play a significant role in the incidence of stunting.

### 3.6. Parents' Body Posture

The distribution of respondents based on parents' body posture affecting the incidence of stunting in Kelurahan Tombula is displayed in the table below:

**Table 4** Distribution of Parents' Body Posture Affecting the Incidence of Stunting in Kelurahan Tombula, 2023

| <b>Father's Posture</b> | <b>f</b> | <b>%</b> | <b>Mother's Posture</b> | <b>f</b> | <b>%</b> |
|-------------------------|----------|----------|-------------------------|----------|----------|
| Normal                  | 40       | 100      | Normal                  | 32       | 80       |
| Short                   | 0        | 0        | Short                   | 8        | 20       |
| Total                   | 40       | 100      | Total                   | 40       | 100      |

Source: Primary Data 2023

The table 4 shows that all fathers (100%) have a normal body posture, while 80% of mothers also have a normal body posture. In contrast, 20% of mothers have a short body posture. This data indicates that parents' body posture plays an important role in the incidence of stunting, with most toddlers coming from families with parents of normal body posture.

## 4. Discussion

### 4.1. Nutritional Patterns

The research findings indicate that inadequate nutritional patterns are the dominant factor in stunting incidence in Kelurahan Tombula, with 65% of toddlers experiencing insufficient nutritional patterns. This inadequate nutrition can be interpreted as a deficiency in the necessary food intake needed to support optimal growth and development in toddlers. Such deficiencies are often caused by various factors, including family economic status, parental knowledge, and irregular eating habits. Family economic capability plays a crucial role in determining children's dietary patterns. In many cases, low-income families face difficulties in accessing or purchasing nutritious food. They may opt for cheaper and more accessible food, but such food often fails to meet children's nutritional needs. This can result in a deficiency of proteins, vitamins, and minerals essential for healthy growth (24–26). Therefore, poor economic conditions can hinder a family's ability to provide the necessary food to prevent stunting.

Parental knowledge about children's nutritional needs is also very important. Parents lacking adequate information about nutrition may not realize the importance of providing a balanced and nutritious diet for their children. A lack of understanding about the types of food that can meet children's nutritional needs can lead to inadequate dietary patterns (27,28). Nutrition education for parents is crucial to ensure they can provide appropriate and beneficial food for their children's growth. In addition, irregular eating patterns contribute to stunting issues. Children who do not receive food consistently or experience a lack of variety in their diet may suffer from nutritional deficiencies (29,30). Irregular or monotonous food intake can impede the intake of essential vitamins and minerals needed to support physical growth and cognitive development. Thus, unstable eating patterns can exacerbate the risk of stunting in toddlers.

Stunting not only affects physical growth but can also impact cognitive development and learning abilities. Insufficient nutrition during early life can disrupt brain development, potentially affecting academic performance and social abilities in the future (31,32). This underscores the importance of timely interventions to address nutritional deficiencies early and prevent long-term developmental impacts on children. This research highlights the urgent need for nutrition-based interventions to improve toddlers' eating patterns. Nutrition education programs for parents should be implemented to enhance their understanding of the importance of balanced nutrition and how to achieve it. Additionally, programs that improve families' access to nutritious food are crucial to ensure all children have the opportunity to grow up healthy. Economic support for low-income families also plays a significant role in addressing stunting issues. Financial assistance or subsidies for purchasing nutritious food can help low-income families provide adequate nutrition for their children. Such interventions can alleviate the economic burden that hinders families' access to healthy food (33,34).

The importance of a comprehensive approach to tackling stunting cannot be overstated. Effective solutions require collaboration among various stakeholders, including the government, health organizations, and local communities. Through this integrated approach, efforts to reduce stunting can be carried out comprehensively, ensuring that all factors affecting dietary patterns and child health are properly addressed. This research provides a clear picture of how

inadequate nutritional patterns contribute to stunting in Kelurahan Tombula. Identifying the key factors affecting nutritional patterns and their impact on stunting is an important first step in designing effective interventions. By understanding and addressing these factors, efforts to reduce stunting can be carried out more efficiently and sustainably. It is essential to continue research and implement programs that can improve toddlers' eating patterns and enhance families' economic conditions. These efforts will help ensure that children receive the necessary nutrition for healthy growth and development and reduce the prevalence of stunting in the area.

#### 4.2. Diseases/Infections

The research findings indicate that the majority of toddlers in Kelurahan Tombula are affected by various types of infections, with 75% experiencing unspecified infections, while infections such as Acute Respiratory Infections (ISPA) and diarrhea affect 5% and 15% of respondents, respectively. This distribution highlights a crucial aspect of the stunting issue, where infections play a significant role in exacerbating nutritional deficiencies and hindering growth. The high prevalence of "other" infections among toddlers suggests that many cases may involve communicable diseases that are poorly identified or not well-diagnosed. These infections could include various diseases that are not always covered by standard diagnostic categories but still have a significant impact on the child's health and nutritional status. For example, chronic or recurrent infections that are not adequately addressed can disrupt normal nutrient absorption, leading to stunting (35,36).

Acute Respiratory Infections (ISPA) and diarrhea, although less prevalent in this study, are well-documented contributors to stunting. These conditions can severely affect a child's ability to maintain adequate nutrition. ISPA can cause increased metabolic demands and decreased appetite, while diarrhea can result in significant nutrient loss and dehydration. Effective management of these conditions is crucial to prevent their negative impact on growth. Infections, particularly when recurrent or severe, can compromise the body's ability to absorb and utilize nutrients from food. This creates a cycle where nutritional deficiencies lead to a weakened immune system, making children more susceptible to further infections (37,38). Therefore, addressing the root causes of these infections and ensuring prompt and appropriate medical care can help break this detrimental cycle and support better nutritional outcomes.

These findings emphasize the need for improved access to healthcare services and effective infection management strategies in Kelurahan Tombula. This includes ensuring that families have access to quality medical care, appropriate treatments, and preventive measures to reduce the incidence and impact of infections. Strengthening healthcare services and education on proper hygiene practices can also contribute to reducing the prevalence of infections among toddlers. Additionally, public health interventions aimed at improving sanitation and hygiene are essential. Poor sanitation conditions can lead to the spread of communicable diseases, including those that significantly impact the health and growth of toddlers (39,40). Programs promoting handwashing, safe food preparation, and clean drinking water can help minimize infection rates and their impact on child health.

Nutrition education for parents is also a critical component. Educating caregivers about the importance of maintaining a balanced diet and the role of healthcare in preventing and managing infections can enhance their ability to protect children from stunting. This education should also include recognizing signs and symptoms of common infections and knowing when to seek medical help (41). The study indicates that a multifaceted approach is necessary to address infection and stunting issues. This approach should include not only medical treatment but also preventive measures, education, and community support. By addressing infections through a comprehensive strategy, it may be possible to reduce their impact on stunting and improve overall child health.

Monitoring and evaluating infection trends and their impact on child growth can help identify emerging issues and adjust interventions as needed (42). Ongoing research and data collection are crucial for understanding the full scope of infection-related problems and developing targeted solutions. Although specific infections like ISPA and diarrhea contribute to stunting, the category of "other" infections highlights the need for improved diagnostic and treatment capabilities. Effective management of infections, combined with better healthcare access and preventive measures, can play a vital role in reducing stunting and promoting healthier growth among toddlers in Kelurahan Tombula.

#### 4.3. Socioeconomic Status

The research findings indicate that 70% of children under five in Kelurahan Tombula come from families with socioeconomic conditions that do not align with the IMR (Critical Period Index), while 30% come from families with conditions that meet the IMR standards. These findings highlight the significant role of socioeconomic factors in stunting, which often reflects lower quality of life and limited access to essential resources. Low socioeconomic conditions are frequently associated with limited access to nutritious food. Families with low incomes may struggle to purchase food that meets the nutritional standards necessary for optimal child growth. The food available to them is

often less varied and may not meet the required levels of protein, vitamins, and minerals. This nutritional deficiency can lead to impaired growth and increase the risk of stunting in young children (43,44).

Moreover, families with poor socioeconomic conditions often face difficulties accessing adequate healthcare services. Limited access to preventive and curative healthcare can result in inadequate management of health issues that impact child growth, such as infections and diseases. Poor health, especially when coupled with nutritional deficiencies, can exacerbate the risk of stunting and affect long-term child development. Education is also an important factor influenced by socioeconomic conditions. Families with lower socioeconomic status often have lower levels of education, which can affect their knowledge about child nutrition and health. This lack of knowledge may lead to errors in child feeding and health care practices, contributing to stunting (45,46). Therefore, educating parents and caregivers is crucial for improving their understanding of child nutrition and health needs.

Intervention programs designed to improve family socioeconomic conditions can have a significant impact on reducing stunting (6,12). Social assistance programs aimed at increasing family income, such as food subsidies or cash assistance, can help families purchase more nutritious food. Skill training programs that enhance job opportunities and family income are also important for overall socioeconomic improvement. Better access to healthcare should also be part of the intervention. Health programs that provide preventive and curative services to low-income families can help address health issues that may worsen stunting. This includes improving access to immunizations, basic healthcare, and education on child health care (47).

In the long term, efforts to improve family socioeconomic conditions should encompass various aspects, including enhancements in education, skill training, and healthcare access (48,49). With a comprehensive approach, it is possible to improve family quality of life and, in turn, reduce the prevalence of stunting among young children. Engaging the local community in stunting prevention efforts is also crucial. Programs involving active community participation, such as family support groups and community initiatives, can help raise awareness about the importance of child nutrition and health. Community support can reinforce intervention programs and ensure that aid reaches those in need.

Ongoing evaluation and monitoring of socioeconomic and health programs are essential to ensure their effectiveness. By collecting data on the impact of these programs on socioeconomic conditions and stunting rates, necessary adjustments can be made to enhance outcomes and ensure that efforts provide maximum benefit to the families in need. Socioeconomic factors play a vital role in stunting, and targeted interventions to improve family socioeconomic conditions can help reduce the prevalence of stunting (8,50). A comprehensive approach that includes enhancing access to nutritious food, healthcare, and education is key to achieving better results in addressing the stunting issue in Kelurahan Tombula.

#### **4.4. Parental Body Posture**

The study results indicate that all fathers in Kelurahan Tombula have a normal body posture, while 80% of mothers also have a normal body posture, and 20% of mothers have a short body posture. This data underscores the importance of parental body posture as a factor influencing stunting in their children. Parental body posture often reflects genetic factors and nutritional status throughout their lives, which can impact the health and development of their children (51). Normal body posture in fathers and the majority of mothers suggests that genetic factors may not be a primary concern in stunting cases within this community. However, the short body posture of 20% of mothers indicates a potential history of nutritional deficiencies or health issues during their growth periods. Such conditions can have implications for the nutritional status and health of their children, considering that mothers with short stature might have experienced inadequate nutrition or health issues affecting pregnancy and child development.

Nutritional deficiencies in mothers, especially during growth and pregnancy, can directly impact child health. Inadequate nutrition during critical periods can lead to deficiencies in children, contributing to stunting (52,53). Additionally, mothers with short stature may have insufficient nutritional reserves needed to support their children's growth during early life stages. Health programs focusing on improving nutrition before and during pregnancy are crucial in preventing stunting. Education and support to ensure that mothers receive adequate nutrition before and during pregnancy can reduce the risk of stunting in children. Such interventions should include guidance on balanced diets, essential vitamin and mineral intake, and regular health monitoring (53,54).

Monitoring maternal health during pregnancy also plays a crucial role. Regular health check-ups and appropriate medical support can help detect and address health issues that could affect child growth (55,56). Moreover, better access to prenatal health services can ensure that mothers receive necessary care to reduce the risk of stunting. Genetic factors can also affect body posture and parental nutritional status. However, environmental and dietary factors during



growth periods also contribute to body posture development (57,58). Therefore, interventions focusing on improving child nutrition from pregnancy through early childhood can help address the impacts of genetic and environmental factors.

In addition to nutritional interventions, community health programs targeting families are important. Education on healthy eating, the importance of regular health visits, and monitoring child development can enhance awareness and practices supporting optimal health and growth. Families should be encouraged to follow health guidelines that can help reduce the risk of stunting. In the long term, efforts to improve maternal and child health should include improvements in access to health services and education. Addressing nutritional and health issues at early life stages can prevent stunting and support better development. A comprehensive approach that includes education, health support, and environmental improvements can yield better results (59,60).

It is important to involve all stakeholders, including government, health agencies, and communities, in stunting prevention efforts. Programs that engage the community and offer support to families can strengthen intervention efforts and ensure that aid reaches those who need it. Continuous evaluation and monitoring of health programs aimed at improving maternal and child nutrition are essential (61,62). By collecting data on the impact of these programs, necessary adjustments can be made to enhance health outcomes and reduce the prevalence of stunting in the community. These efforts will help ensure that children receive the necessary nutrition and care for healthy and optimal growth.

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## 5. Conclusion

This study indicates that inadequate nutritional patterns, diseases or infections, poor socioeconomic conditions, and parental body posture significantly contribute to stunting in Kelurahan Tombula. The findings reveal that 65% of toddlers experience inadequate nutritional patterns, which is the dominant factor in stunting. Poor nutritional patterns are often due to family economic constraints, lack of parental knowledge about nutrition, and irregular eating habits. Additionally, 75% of toddlers are affected by infections that can exacerbate nutritional deficiencies and hinder growth. Socioeconomic conditions not meeting the IMR standards affect 70% of children in Kelurahan Tombula, limiting access to nutritious food and healthcare services. Parental body posture also plays a role, with 20% of mothers having a short body posture, which may indicate past nutritional deficiencies or health issues during their growth periods.

### *Recommendations*

- **Nutritional Interventions:** Nutrition education programs for parents are needed to improve their understanding of the importance of balanced diets. These programs should provide information on the types of food necessary for supporting child growth and how to provide nutritious food on a limited budget. Additionally, social assistance programs should be expanded to help low-income families access nutritious food.
- **Infection Management:** Health programs should focus on preventing and managing infections among toddlers. This includes improving access to quality healthcare services, education on healthy living habits and sanitation, and enhancing environmental sanitation to reduce the prevalence of infections impacting child health.
- **Improving Socioeconomic Conditions:** Intervention programs aimed at improving family socioeconomic conditions should be expanded. This can include food subsidies, cash assistance, and skill training programs to enhance job opportunities and family income. Access to healthcare should also be part of the intervention, providing preventive and curative services to low-income families.
- **Maternal Health Programs:** Focus on improving maternal nutrition before and during pregnancy. Provide education and support to ensure that mothers receive adequate nutrition and access to quality prenatal healthcare to reduce the risk of stunting in children.
- **Community Involvement:** Engage the local community in stunting prevention efforts through family support programs and community initiatives. Raising awareness about the importance of child nutrition and health at the community level can strengthen intervention efforts and ensure that aid reaches those in need.
- **Monitoring and Evaluation:** Continuous monitoring and evaluation of implemented programs are essential. Collect data on the impact of these programs on socioeconomic conditions and stunting rates to make necessary adjustments and ensure the effectiveness of the interventions.
- **Integrated Approach:** Implement a comprehensive approach involving various stakeholders, including government, health organizations, and local communities. This integrated approach will address all factors affecting dietary patterns and child health, effectively reducing the prevalence of stunting.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

## References

- [1] Anthony R, McKinlay CJD. Adaptation for life after birth: a review of neonatal physiology. *Anaesth Intensive Care Med* [Internet]. 2023;24(1):1–9. Available from: <https://www.sciencedirect.com/science/article/pii/S1472029922002715>
- [2] Makinde OA, Uthman OA, Mgbachi IC, Ichegebo NK, Sule FA, Olamijuwon EO, et al. Vulnerability in maternal, newborn, and child health in low- and middle-income countries: Findings from a scoping review. *PLoS One*. 2022;17(11):e0276747.
- [3] Lim CL. Fundamental Concepts of Human Thermoregulation and Adaptation to Heat: A Review in the Context of Global Warming. *Int J Environ Res Public Health*. 2020 Oct;17(21).
- [4] Hurley KM, Yousafzai AK, Lopez-Boo F. Early Child Development and Nutrition: A Review of the Benefits and Challenges of Implementing Integrated Interventions. *Adv Nutr*. 2016 Mar;7(2):357–63.
- [5] Munteanu C, Schwartz B. The relationship between nutrition and the immune system. *Front Nutr*. 2022;9:1082500.
- [6] WHO. World Health Organization. Reducing stunting in children: equity considerations for achieving the Global Nutrition Targets 2025. World Health Organization; 2018. 2018.
- [7] De Sanctis V, Soliman A, Alaaraj N, Ahmed S, Alyafei F, Hamed N. Early and Long-term Consequences of Nutritional Stunting: From Childhood to Adulthood. *Acta Biomed*. 2021 Feb;92(1):e2021168.
- [8] Beal T, Tumilowicz A, Sutrisna A, Izwardy D, Neufeld LM. A review of child stunting determinants in Indonesia. *Matern Child Nutr*. 2018 Oct;14(4):e12617.
- [9] Likhar A, Patil MS. Importance of Maternal Nutrition in the First 1,000 Days of Life and Its Effects on Child Development: A Narrative Review. *Cureus*. 2022 Oct;14(10):e30083.
- [10] Roberts M, Tolar-Peterson T, Reynolds A, Wall C, Reeder N, Rico Mendez G. The Effects of Nutritional Interventions on the Cognitive Development of Preschool-Age Children: A Systematic Review. *Nutrients*. 2022 Jan;14(3).
- [11] de Onis M, Branca F. Childhood stunting: a global perspective. *Matern Child Nutr*. 2016 May;12 Suppl 1(Suppl 1):12–26.
- [12] Vaivada T, Akseer N, Akseer S, Somaskandan A, Stefopoulos M, Bhutta ZA. Stunting in childhood: an overview of global burden, trends, determinants, and drivers of decline. *Am J Clin Nutr*. 2020 Sep;112(Suppl 2):777S–791S.
- [13] Arabzadeh H, Doosti-Irani A, Kamkari S, Farhadian M, Elyasi E, Mohammadi Y. The maternal factors associated with infant low birth weight: an umbrella review. *BMC Pregnancy Childbirth* [Internet]. 2024;24(1):316. Available from: <https://doi.org/10.1186/s12884-024-06487-y>
- [14] KC A, Basel PL, Singh S. Low birth weight and its associated risk factors: Health facility-based case-control study. *PLoS One*. 2020;15(6):e0234907.
- [15] Soliman A, Sanctis V, Alaaraj N, Ahmed S, Alyafei F, Hamed N, et al. Early and Long-term Consequences of Nutritional Stunting: From Childhood to Adulthood. *Acta bio-medica Atenei Parm*. 2021 Feb 16;92:2021168.
- [16] WHO. Stunting prevalence among children under 5 years of age. *J Nurs Pract Educ*. 2021;3(2):160–6.
- [17] UNICEF, WHO, Group WB. Levels and trends in child malnutrition: Key finding of the 2023 edition. *Asia-Pacific Popul J*. 2023;24(2):51–78.

- [18] Bloem MW, de Pee S, Hop LT, Khan NC, Lailou A, Minarto, et al. Key strategies to further reduce stunting in Southeast Asia: lessons from the ASEAN countries workshop. *Food Nutr Bull.* 2013 Jun;34(2 Suppl):S8-16.
- [19] Soekatri MYE, Sandjaja S, Syauqy A. Stunting Was Associated with Reported Morbidity, Parental Education and Socioeconomic Status in 0.5-12-Year-Old Indonesian Children. *Int J Environ Res Public Health.* 2020 Aug;17(17).
- [20] Suparji, Nugroho H, Surtinah N. Handling Stunting in Indonesia: Challenges, Progress and Recommendations. *Natl J Community Med.* 2024 Feb 1;15:161–4.
- [21] Kemenkes RI. Status Gizi SSGI 2022. BKKP Kemenkes RI [Internet]. 2022;1–156. Available from: [https://r.search.yahoo.com/\\_ylt=Awr1TXopzHjm13UHIgDLQwx.;\\_ylu=Y29sbwNzZzMEcG9zAzQEdnRpZAMEc2VjA3Ny/RV=2/RE=1718828202/RO=10/RU=https%3A%2F%2Fpromkes.kemkes.go.id%2Fpub%2Ffiles%2Ffiles52434Buku%2520Saku%2520SSGI%25202022%2520rev%25202010123.pdf/RK=2/RS=ua\\_K](https://r.search.yahoo.com/_ylt=Awr1TXopzHjm13UHIgDLQwx.;_ylu=Y29sbwNzZzMEcG9zAzQEdnRpZAMEc2VjA3Ny/RV=2/RE=1718828202/RO=10/RU=https%3A%2F%2Fpromkes.kemkes.go.id%2Fpub%2Ffiles%2Ffiles52434Buku%2520Saku%2520SSGI%25202022%2520rev%25202010123.pdf/RK=2/RS=ua_K)
- [22] Dinkes Kesehatan Muna. Profil Dinas Kesehatan Kabupaten Muna. 2023.
- [23] Sugiono. *Metode Penelitian Kuantitatif, Kualitatif, dan R&D.* Bandung : Alfabeta, CV. 2022;
- [24] Lee H. Family economic hardship and children’s behavioral and socio-emotional outcomes in middle childhood: Direct and indirect pathways. *Child Youth Serv Rev* [Internet]. 2022;138:106527. Available from: <https://www.sciencedirect.com/science/article/pii/S0190740922001633>
- [25] Grüning Parache L, Vogel M, Meigen C, Kiess W, Poulain T. Family structure, socioeconomic status, and mental health in childhood. *Eur Child Adolesc Psychiatry* [Internet]. 2024;33(7):2377–86. Available from: <https://doi.org/10.1007/s00787-023-02329-y>
- [26] Sano Y, Mammen S, Houghten M. Well-Being and Stability among Low-income Families: A 10-Year Review of Research. *J Fam Econ Issues.* 2021;42(Suppl 1):107–17.
- [27] Kostecka M, Kostecka J, Jackowska I, Howiecka K. Parental Nutritional Knowledge and Type of Diet as the Key Factors Influencing the Safety of Vegetarian Diets for Children Aged 12-36 Months. *Nutrients.* 2023 May;15(10).
- [28] Romanos-Nanclares A, Zazpe I, Santiago S, Marín L, Rico-Campà A, Martín-Calvo N. Influence of Parental Healthy-Eating Attitudes and Nutritional Knowledge on Nutritional Adequacy and Diet Quality among Preschoolers: The SENDO Project. *Nutrients.* 2018 Dec;10(12).
- [29] Mahmood L, Flores-Barrantes P, Moreno LA, Manios Y, Gonzalez-Gil EM. The Influence of Parental Dietary Behaviors and Practices on Children’s Eating Habits. *Nutrients.* 2021 Mar;13(4).
- [30] Alderman H, Headey DD. How Important is Parental Education for Child Nutrition? *World Dev.* 2017 Jun;94:448–64.
- [31] Suryawan A, Jalaludin MY, Poh BK, Sanusi R, Tan VMH, Geurts JM, et al. Malnutrition in early life and its neurodevelopmental and cognitive consequences: a scoping review. *Nutr Res Rev.* 2022 Jun;35(1):136–49.
- [32] Alam MA, Richard SA, Fahim SM, Mahfuz M, Nahar B, Das S, et al. Impact of early-onset persistent stunting on cognitive development at 5 years of age: Results from a multi-country cohort study. *PLoS One.* 2020;15(1):e0227839.
- [33] Gittelsohn J, Kasprzak CM, Hill AB, Sundermeir SM, Laska MN, Dombrowski RD, et al. Increasing Healthy Food Access for Low-Income Communities: Protocol of the Healthy Community Stores Case Study Project. *Int J Environ Res Public Health.* 2022 Jan;19(2).
- [34] Vos M, Deforche B, Van Kerckhove A, Michels N, Geuens M, Van Lippevelde W. Intervention strategies to promote healthy and sustainable food choices among parents with lower and higher socioeconomic status. *BMC Public Health.* 2022 Dec;22(1):2378.
- [35] Fauziah N, Aviani JK, Agrianfanny YN, Fatimah SN. Intestinal Parasitic Infection and Nutritional Status in Children under Five Years Old: A Systematic Review. *Trop Med Infect Dis.* 2022 Nov;7(11).
- [36] Bhutta ZA, Saeed MA. Childhood Infectious Diseases: Overview. *International Encyclopedia of Public Health.* 2008. p. 620–40.
- [37] Morales F, Montserrat-de la Paz S, Leon MJ, Rivero-Pino F. Effects of Malnutrition on the Immune System and Infection and the Role of Nutritional Strategies Regarding Improvements in Children’s Health Status: A Literature Review. *Nutrients.* 2023 Dec;16(1).

- [38] Allen B, Saunders J. Malnutrition and undernutrition: causes, consequences, assessment and management. *Medicine (Baltimore)* [Internet]. 2023;51(7):461–8. Available from: <https://www.sciencedirect.com/science/article/pii/S1357303923000981>
- [39] Velleman Y, Blair L, Fleming F, Fenwick A. Water-, Sanitation-, and Hygiene-Related Diseases BT - Infectious Diseases. In: Shulman LM, editor. New York, NY: Springer US; 2023. p. 189–219. Available from: [https://doi.org/10.1007/978-1-0716-2463-0\\_547](https://doi.org/10.1007/978-1-0716-2463-0_547)
- [40] Patlán-Hernández AR, Stobaugh HC, Cumming O, Angioletti A, Pantchova D, Lapègue J, et al. Water, sanitation and hygiene interventions and the prevention and treatment of childhood acute malnutrition: A systematic review. *Matern Child Nutr.* 2022 Jan;18(1):e13257.
- [41] Woźniak D, Podgórski T, Dobrzyńska M, Przystański J, Drzymała S, Drzymała-Czyż S. The Influence of Parents' Nutritional Education Program on Their Infants' Metabolic Health. *Nutrients.* 2022 Jun;14(13).
- [42] Selmani A, Coenen M, Voss S, Jung-Sievers C. Health indices for the evaluation and monitoring of health in children and adolescents in prevention and health promotion: a scoping review. *BMC Public Health.* 2021 Dec;21(1):2309.
- [43] Ohri-Vachaspati P, DeWeese RS, Acciai F, DeLia D, Tulloch D, Tong D, et al. Healthy Food Access in Low-Income High-Minority Communities: A Longitudinal Assessment-2009-2017. *Int J Environ Res Public Health.* 2019 Jul;16(13).
- [44] Karanja A, Ickowitz A, Stadlmayr B, McMullin S. Understanding drivers of food choice in low- and middle-income countries: A systematic mapping study. *Glob Food Sec* [Internet]. 2022;32:100615. Available from: <https://www.sciencedirect.com/science/article/pii/S2211912422000062>
- [45] Silverman DM, Hernandez IA, Destin M. Educators' Beliefs About Students' Socioeconomic Backgrounds as a Pathway for Supporting Motivation. *Personal Soc Psychol Bull* [Internet]. 2021 Dec 29;49(2):215–32. Available from: <https://doi.org/10.1177/01461672211061945>
- [46] Yan Y, Gai X. High Achievers from Low Family Socioeconomic Status Families: Protective Factors for Academically Resilient Students. *Int J Environ Res Public Health.* 2022 Nov;19(23).
- [47] Kusumawardani LH, Rasdianah R, Rachmawati U, Jauhar M, Rohana IG. Community-Based Stunting Intervention Strategies: Literature Review. *Dunia Keperawatan J Keperawatan dan Kesehat.* 2020 Aug 1;8:259.
- [48] McMaughan DJ, Oloruntoba O, Smith ML. Socioeconomic Status and Access to Healthcare: Interrelated Drivers for Healthy Aging. *Front public Heal.* 2020;8:231.
- [49] Zajacova A, Lawrence EM. The Relationship Between Education and Health: Reducing Disparities Through a Contextual Approach. *Annu Rev Public Health.* 2018 Apr;39:273–89.
- [50] Widyaningsih V, Mulyaningsih T, Rahmawati FN, Adhitya D. Determinants of socioeconomic and rural-urban disparities in stunting: evidence from Indonesia. *Rural Remote Health.* 2022 Mar;22(1):7082.
- [51] Armstrong-Carter E, Trejo S, Hill LJB, Crossley KL, Mason D, Domingue BW. The Earliest Origins of Genetic Nurture: The Prenatal Environment Mediates the Association Between Maternal Genetics and Child Development. *Psychol Sci.* 2020 Jul;31(7):781–91.
- [52] Lassi ZS, Padhani ZA, Rabbani A, Rind F, Salam RA, Bhutta ZA. Effects of nutritional interventions during pregnancy on birth, child health and development outcomes: A systematic review of evidence from low- and middle-income countries. *Campbell Syst Rev.* 2021 Jun;17(2):e1150.
- [53] Marshall NE, Abrams B, Barbour LA, Catalano P, Christian P, Friedman JE, et al. The importance of nutrition in pregnancy and lactation: lifelong consequences. *Am J Obstet Gynecol.* 2022 May;226(5):607–32.
- [54] Marshall NE, Abrams B, Barbour LA, Catalano P, Christian P, Friedman JE, et al. The importance of nutrition in pregnancy and lactation: lifelong consequences. *Am J Obstet Gynecol* [Internet]. 2022;226(5):607–32. Available from: <https://doi.org/10.1016/j.ajog.2021.12.035>
- [55] Naaz A, Muneshwar KN. How Maternal Nutritional and Mental Health Affects Child Health During Pregnancy: A Narrative Review. *Cureus.* 2023 Nov;15(11):e48763.
- [56] Alim A, Imtiaz MH. Wearable Sensors for the Monitoring of Maternal Health-A Systematic Review. *Sensors (Basel).* 2023 Feb;23(5).
- [57] Dauncey M. Nutrition, environment and gene expression: impact on health, welfare and production. 2014.

- [58] Brockmann GA, Tsaih S-W, Neuschl C, Churchill GA, Li R. Genetic factors contributing to obesity and body weight can act through mechanisms affecting muscle weight, fat weight, or both. *Physiol Genomics*. 2009 Jan;36(2):114–26.
- [59] Shahid SM, Bishop KS. Comprehensive Approaches to Improving Nutrition: Future Prospects. *Nutrients*. 2019 Jul;11(8).
- [60] Goudet SM, Bogin BA, Madise NJ, Griffiths PL. Nutritional interventions for preventing stunting in children (birth to 59 months) living in urban slums in low- and middle-income countries (LMIC). *Cochrane database Syst Rev*. 2019 Jun;6(6):CD011695.
- [61] Pereno A, Eriksson D. A multi-stakeholder perspective on sustainable healthcare: From 2030 onwards. *Futures*. 2020 Sep;122:102605.
- [62] Petkovic J, Magwood O, Lytvyn L, Khabsa J, Concannon TW, Welch V, et al. Key issues for stakeholder engagement in the development of health and healthcare guidelines. *Res Involv Engagem*. 2023 Apr;9(1):27.