

## Risk Factors for Stunting among Children in Indonesia: A Systematic Review

Hamidah Retno Wardani<sup>1</sup>

<sup>1</sup> Nursing Study Program, Universitas Bondowoso, Indonesia

Correspondence should be addressed to:  
Hamidah Retno Wardani  
[Hamidahretno15@gmail.com](mailto:Hamidahretno15@gmail.com)

### Abstract:

The incidence of short toddlers or commonly referred to as stunting is one of the nutritional problems experienced by toddlers in the world today, including Indonesia. Indonesia is a developing country with a stunting prevalence in 2022 of 21.6 percent. This figure is lower than the 2021 figure of 24.4 percent. The incidence of stunting in developing countries can be influenced by various risk factors. This study aims to analyze the risk factors for stunting in toddlers aged 12-59 months. The study was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The results obtained from the analysis of 8 journals show that there are several risk factors that have an important role in the prevalence of stunting in toddlers. Among them are breastfeeding history, maternal nutritional status, parental education, parental height, parental education, ANC visits, parental income, energy adequacy, fat and protein intake and the level of knowledge of mothers, especially about nutrition. However, there are several risk factors that do not have a significant relationship with the incidence of stunting in toddlers including dietary restrictions, consumption of Fe tablets in mothers, history of comorbidities, clean water sanitation, smoking environment, and economic conditions. Stunting is not only related to children's height below the standard.

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## INTRODUCTION

Stunting is a health problem because it has a risk of morbidity and mortality and suboptimal brain development, so motor development is delayed and mental growth is inhibited. This poses a serious threat to the existence of children as the next generation of a nation. Stunting is a widely accepted predictor of poor-quality human resources, which in turn reduces the productive ability of a nation in the future (Wikayah & Sulistyoningsih, 2023).

Stunting is a short-for-age body condition that exceeds a deficit of -2 SD (Standard Deviation) below the median standard of length or height for age. Short toddlers (stunting) illustrates the existence of long-term nutritional problems or chronic nutrition which can be influenced by the condition of the mother or prospective mother, fetal period and infancy or toddler period, including diseases suffered during toddlerhood (Alfarisi et al., 2019). Stunting has an impact on children's health. Stunted children under five tend to have difficulty achieving optimal growth and development potential. In addition, stunting can increase the risk of disease or infection, decrease intellectual ability, decrease economic productivity and reproductive ability, and increase the risk of chronic disease. The impact of stunting can be felt both in the short and long term (Stewart et al., 2013; Putri et al., 2024).

The incidence of short toddlers or commonly referred to as stunting is one of the nutritional problems experienced by toddlers in the world today. In 2017, 22.2% or around 150.8 million toddlers in the world experienced stunting (Susilowati, et al., 2021). Indonesia had a prevalence of stunting of 37.2% in 2013. This prevalence includes 18% of very short toddlers and 19.2% of short toddlers (Trihono et al., 2015).

The problem of stunting is one of the government's focuses in the health sector. Stunting is not only related to children's height below the standard. Stunting and other nutritional deficiencies in the first 1,000 days of life (HPK), in addition to the risk of inhibiting physical growth and causing children's vulnerability to disease, also inhibit cognitive development which will affect the level of intelligence and productivity of children in the future (Megawati & Wiramihardja, 2019).

Toddlers with stunting should get special attention because stunting is the cause of obstacles to toddlers' growth and mental health. The discussion that is widely discussed today is that children with stunting experience decreased learning achievement, which has an impact on low income in adulthood. Growing into unhealthy and poor individuals as adults is often experienced by children with stunting. Disease susceptibility is also caused by stunting factors, be it infectious diseases or non-communicable diseases (NCDs), besides that excessive weight gain is also caused by stunting factors which cause the risk of degenerative diseases. Therefore, stunting is a predictor of the low quality of a country's human resources (Kyu et al., 2013).

The incidence of stunting in developing countries can be influenced by various risk factors, namely family socioeconomic status, maternal education, macronutrient and micronutrient deficiencies, household sanitation and water treatment. Stunting in children is influenced by several factors both directly and indirectly. Factors that cause stunting in the WHO conceptual framework include household and family factors, inadequate complementary feeding, breastfeeding, and infection. These factors relate to economic policy, health and health services, education, socio-culture, agricultural and food systems, water, sanitation, and the environment (Stewart et al., 2013; Yusnitasari et al., 2024). An in-depth analysis of the risk factors that influence stunting is needed so that stunting prevention procedures are appropriate for mothers and toddlers at risk of stunting. Based on the explanation above, the authors are interested in compiling a scientific paper entitled Risk Factors for Stunting in Toddlers in Indonesia.

## METHOD

### Compilation Strategy

The study was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), which was carried out systematically by following the correct stages or research protocols. The procedure of this systematic review consists of several steps, namely 1) compiling the introduction and objectives; 2) Research questions; 3) Search for literature; 4) selection criteria; 5) Practical screen; 6) journal quality procedures and checklists; 6) Data extraction strategies. The researcher also scanned the reference list to match citations related to the research objectives. The database search was conducted from June 10-12, 2024. The keywords used were: 'Risk Factors,' 'Stunting,' 'Toddlers,' and 'Indonesia.'

### Assessment of Inclusion and Exclusion Criteria

The inclusion criteria in this study were articles in English and Indonesian, full text, cross-sectional or case-control studies, samples of toddlers aged 12-59 months, research conducted after 2018, conducted in Indonesia, only assessing risk factors in stunting toddlers including Breastfeeding History, Complementary Feeding History, Mother's Nutritional Status, Mother's

Education History, Father's Education, Family Income, Antenatal Care Visit, Mother's Height, Father's Height, LBW History, Number of Family Members, Mother's Nutrition Knowledge Level, Father's and Mother's Occupation, Fat Intake, Protein Intake, Food Restrictions, Fe Table Consumption, History of Comorbidities during Pregnancy, Clean Water Sanitation, Smoking Environment, Economic Condition, Energy Adequacy, Mother's Age at Pregnancy, Maternal Gestational Age, Birth Spacing, History of ARI, History of Basic Immunization. The two main electronic databases used to identify relevant sources were Google Scholar and Crossreff, which were published from 2020 to 2023.

**Data Extraction**

Each journal was extracted separately. Parameters were extracted from each research journal such as including research information (author, year of journal publication), place of research, number of respondents, research variables and research results.

**RESULT**

This research identified 1100 journals. Crossruff as many as 1000 journals and google scholar as many as 100 journals. Journal identification was carried out by screening based on eligibility according to the inclusion and exclusion criteria so that 9 articles were obtained for further review. The literature search strategy is shown in Figure 1.

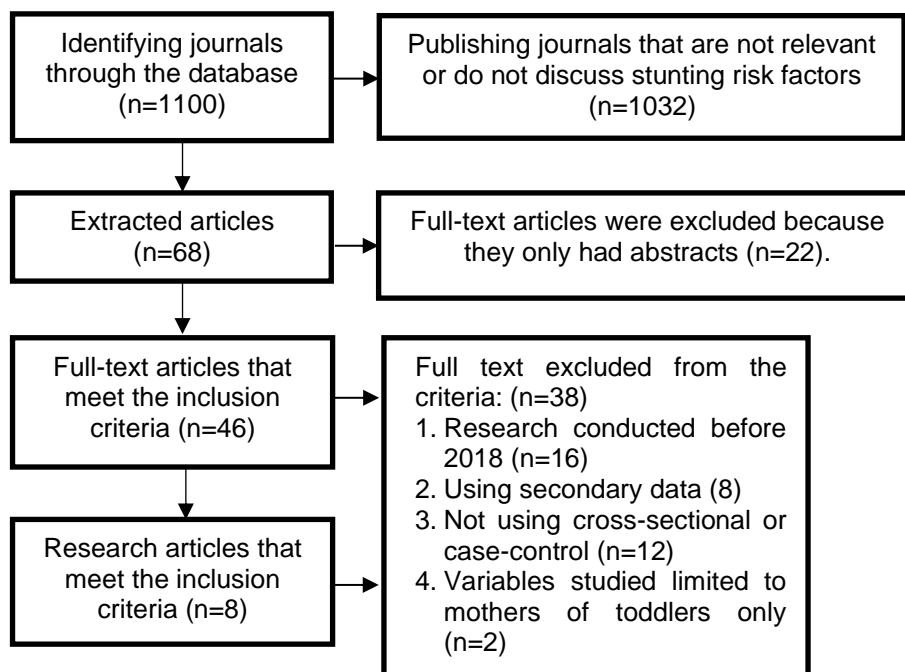


Figure 1. Flowchart of journal identification

The population in this study were articles published in international and national journals on the topic of risk factors for stunting in children under five in Indonesia. The samples in this study were articles published in international and national journals on the topic of stunting risk factors in toddlers in Indonesia. The sample inclusion criteria in this research article include the following: 1) Fulltext article; 2) English; 3) Published in 2020-2023; 4) The type of research design in the article is cross sectional or using case control; 5) The research topic is stunting in toddlers aged 12-59

months in Indonesia; 6) Research using primary data; 7) research conducted before 2018. The number of sources obtained from databases including Google scholar 100 and Crossreff 1000. Analysis of the identified articles showed that all journals used the Cross-sectional method or used case control. Data extraction is done by analyzing data based on the author's name, title, research method, year of publication and the results are grouping important data in the article. The results of data extraction are in table 2.

The journals obtained from the screening results were 8 journals with a total of 840 samples of stunted toddlers with an age range of 12-59 months. Research was conducted in several regions in Indonesia and carried out in 2018-2022. From the results of the study it was found that there are several risk factors associated with the incidence of stunting in toddlers such as gender, BMI, genetic, age, occupation, obesity, income, family history of hypertension, physical activity, cholesterol level, diet, smoking, history of hypertension, salt consumption.

Table 2. Article Data Extraction Result

No	Title	Author	Setting	Response	Variable	Research Design	Year	Results
1	Factors Causing the Incidence of Stunting in Toddlers	Komalasari, Esti Supriati, Riona Sanjaya, Hikmah Ifayanti	Lampung	56 Toddlers	Factors of stunting incidence	Case control	2020	Breastfeeding status (0.000), Maternal Nutrition Status (0.048), Education Level (0.046)
2	Factors associated with the incidence of stunting in toddlers	Zurhayati, Nurul Hidayah	Kepulauan Riaun	97 Toddlers	Factors associated with the incidence of under-five stunting	Cross-sectional	2022	The results showed education (0.15 < 0.1. income with the incidence of stunting where the P-value was 0.000 < 0.1, ANC visits with the incidence of stunting with a P-value of 0.004 < 0.1.
3	Factors associated with stunting in toddlers aged 24-59 months in Berasang Village, Kisam Tinggi Subdistrict, South Oku Regency 2020	Mauluddina, F	OKU Selatan	40 Toddlers	Factors of stunting incidence	Cross-Sectional	2021	there is a significant relationship between maternal height (p value = 0.026), exclusive breastfeeding history (p value = 0.001) and there is no significant relationship between the history of LBW (p value = 0.983) with stunting in toddlers aged 24-59 months in Berasang Village, Kisam Tinggi District, South Oku Regency.
4	Factors associated with the incidence of stunting in toddlers	Asweros Umbu Zogara, Maria Goreti Pantaleon	Kupang	176 Toddlers	Factors of stunting incidence	Cross-Sectional	2020	Parental factors associated with stunting were father's (P value=0.035) and mother's (P value=0.031)

No	Title	Author	Setting	Response	Variable	Research Design	Year	Results
								education, number of family members (P value=0.008), and mother's nutritional knowledge (P value=0.002). Meanwhile, father's occupation (Pvalue= 0.233) and mother's occupation (P value= 0.895) were not associated with the incidence of stunting. Nutrient intake associated with the incidence of stunting, namely protein intake (P value=0.002) and fat (P value=0.017).
5	Factors affecting stunting in children under five in Grobogan Regency	Yuwanti , Festy Mahanani Mulyaningrum, Meity Mulya Susanti	Kabupaten Grobogan	90 Toddlers	Factors of stunting incidence	Cross-Sectional	2021	Nutritional status, health problems in children, instant food eating habits, and maternal height were associated with stunting in toddlers with a p value <0.05. Abstinance from food, history of iron tablet consumption, history of antenatal care, history of comorbidities in pregnancy, history of exclusive breastfeeding, clean water sanitation, smoking environment and economic conditions are not associated with the incidence of stunting in toddlers with p value = > 0.05.
6	Factors influencing the occurrence of stunting in children aged 24-59 months	Lisa Tanzil, Hafriani	Aceh Timur	20 balita	Factors of stunting incidence  Cross-Sectional	Case control	2021	The results showed that energy adequacy, protein adequacy, maternal knowledge, maternal education, family income are risk factors for stunting. LBW, breastfeeding history, maternal employment are not risk factors for stunting.

No	Title	Author	Setting	Response	Variable	Research Design	Year	Results
7	Factors associated with the incidence of stunting in toddlers aged 24-59 months in the Ngasem Health Center working area Kediri district	Meyrinda Tobing, Eko Winarti	Kediri	251	Factors of stunting incidence  Cross-Sectional	Case control	2023	The results in this study are there is a relationship between the history of LBW (p=0.000), history of exclusive breastfeeding (p=0.000), history of complementary feeding (p=0.000), maternal age during pregnancy (p=0.001), maternal age of pregnancy (p=0.000), mother's height (p=0.000), father's height (p=0.000), mother's nutritional status during pregnancy (p=0.000), birth spacing (0.021), mother's educational status (p=0.001) and history of ARI (0.000) with the incidence of stunting in children under 24-59 months of age.
8	Factors associated with the incidence of stunting in children aged 24-59 months	Nursyamsiyah, Yulida Sobrie, Bani Sakti	Kabupaten Bandung Barat	110 balita	Factors of stunting incidence	Case control	2021	4 (four) independent variables associated with the incidence of stunting, namely maternal height (p=0.000) OR 7.7 (95% CI 3.0-19.6), maternal education (p=0.000) OR 5.1 (95%CI 2.1-12.6), family income (p=0.008) OR 3.2 (95%CI 0.2-2.0) and history of complete basic immunization (p=0.028) OR 3.5 (95%CI 1.1-11.6).

## DISCUSSION

The results obtained from the analysis of 8 journals show that there are several risk factors that have an important role in the prevalence of stunting in toddlers. Among them are breastfeeding history, maternal nutritional status, parental education, parental height, parental education, ANC visits, parental income, energy adequacy, fat and protein intake and the level of knowledge of mothers, especially about nutrition. However, there are several risk factors that do not have a significant relationship with the incidence of stunting in toddlers including dietary restrictions,

consumption of Fe tablets in mothers, history of comorbidities, clean water sanitation, smoking environment, and economic conditions.

### **Breastfeeding History**

Komalasari et al's research (2020) states that breastfeeding history is a risk factor for stunting in toddlers. In line with research conducted by Mauliddina (2021), it is stated that there is a relationship between breastfeeding history and the incidence of stunting in toddlers. The relationship between exclusive breastfeeding status and the incidence of stunting is in accordance with the theory which states that the nutritional status of toddlers is also influenced by exclusive breastfeeding. However, this is inversely proportional to the research conducted by Yuwanti et al (2021) which states that breastfeeding history is a risk factor for the occurrence of breast milk is the main source of food for newborn babies. They must get breast milk considering the nutrients contained in it are so great. Consuming breast milk during growth can also prevent babies from avoiding stunting in toddlers. Stunting is a disease that causes a short body or often called growth failure. Stunting will interfere with the physical growth and development of intelligence in a child. Therefore, one way to prevent stunting is to provide exclusive breastfeeding. The range of breastfeeding mothers starts from 0-2 years. Exclusive breastfeeding can reduce the risk of death from pneumonia by 15.1 times and the risk of death from diarrhea by 10.5 times. Breast milk also contains lactose, AADHA, iron, zinc, selenium, iodine which are the main raw materials for the formation of brain nerve cells. Breast milk also changes over time. At the time of delivery, breast milk contains colostrum which provides immunity and gastrointestinal protection for the baby. Then Continuing the phase of 4 to 6 weeks, antibody levels in breast milk can reduce the risk of infection. At 3 to 4 months, breast milk calories increase to meet the needs of the child's motor development. At 6 months, essential omega acids are abundant for brain cell development. In the last phase, 9 to 12 months, amino acids form the protein requirement for muscle growth and IQ optimization (Hizriyani and Aji, 2021).

### **History of Complementary Feeding**

Research conducted by Tobing and Winarti (2023) states that history of complementary feeding is a risk factor that can cause stunting in toddlers. The results of Septiani's research (2014), showed that undernutrition in children was around 31.1% with an average age of complementary feeding <6 months of 59.7%. The most dominant variable affecting the nutritional status of infants 0-11 months is the provision of early complementary foods, after being controlled by the variables of education, knowledge and occupation, infants who are given early complementary foods have a chance of having an unnatural nutritional status 16.694 times compared to the provision of complementary foods > 6 months this is seen from the results of multivariate analysis. Good feeding patterns can have an impact on the growth and development and intelligence of children from infancy. Feeding patterns refer to the recommendations (Kementrian Kesehatan RI, 2017), namely by providing foods that meet nutritional needs every day such as energy sources (rice, tubers) and so on, sources of building substances (fish, meat, eggs, milk, nuts) and regulating substances (vegetables and fruit) which contain vitamins and minerals that play a role in the process of infant growth and development, especially in order to avoid nutritional problems that have an impact on stunting. In the prevention and treatment of stunting, parents must pay more attention to the lack of attention to the frequency, texture, time of administration, and diversity of complementary foods. If not considered, it can lead to stunting in children under five. The content contained in MP-ASI can replace the function of breast milk which begins to decrease in accordance with the nutritional needs of children (Anggryni et al., 2021).

### **Maternal Nutritional Status**

In this study, it was found that maternal nutritional status is one of the factors that can cause stunting (Komalasari et al, 2020; Tobing and Winarti, 2023). Nutritional fulfillment before pregnancy is important during pregnancy, but nutritional fulfillment during pregnancy is also important during pregnancy. The conditions of pregnant women that need to be considered include nutritional status, blood hemoglobin (Hb) levels and the level of nutritional intake. The unhealthy condition of pregnant women is related to the health condition of the fetus they are carrying. The nutritional status of the mother during pregnancy will affect the growth of the fetus. The quality of the baby that will be born depends on the nutritional state of the mother before and during pregnancy. Nutrient deficiencies in the mother for a long time and sustainably will have a negative impact on the fetus. The nutritional history of pregnant women is described by the condition of mothers who experience chronic energy deficiency and iron nutritional anemia (AGB). Chronic energy deficiency is one of the causes of the birth of children with stunting conditions. Mothers with SEZ conditions during pregnancy will cause malnutrition in infants (Mirza, et al., 2023).

### **Mother's Education History and Father's Education**

This study found that out of 8 studies, there were 6 research journals which stated that maternal and paternal education was a risk factor and had a significant relationship with the occurrence of stunting in toddlers. The role of parents has a big contribution to the nutritional status of children. This is because parents are the first family a child has and become a place for them to grow and develop optimally with the fulfillment of good nutrition. There are several factors or the role of parents in preventing stunting, one of which is the level of education (Rahmawati, and Rasni, 2019). Parental education can affect nutritional status, one of which is the incidence of stunting. This is reinforced by research showing that low parental education increases the likelihood of children experiencing nutritional problems compared to parents with high levels of education. Education level can affect the incidence of stunting but does not occur significantly, this may be influenced by the ability of each parent to access information, because there are parents who have a good source of information from health services related to nutritional needs in children but, with a low level of education (Rahmawati and Rasni, 2019).

### **Family Income**

This study found that there are three research journals that state that family income is also an important factor in the causes of stunting in toddlers (Tanzil and Hafriani, 2021). Income affects a family's nutrition and formal education. Low education followed by low knowledge can lead to malnutrition. Based on research conducted by Nadhiroh and friends, there is a relationship between low-income families and stunting. Based on Roudhotun Nasikhah's research, it was found that continuous low income was a factor in stunting. Poverty for a long time results in the inability of families to fulfill good food (Lutfiana, 2018).

### **Antenatal Care Visit**

ANC visits have a relationship as a risk factor for stunting in toddlers. This is in line with research conducted by Darmawan, Reski and Andriani (2022) which states that ANC visits to health workers have a very important role in preventing stunting. The research is also in accordance with research conducted by Beal et al. (2018) in Indonesia which showed a strong relationship between the frequency of antenatal care visits and stunting in children aged 0-23 months. Garrido's (2009) study showed that the impact of ANC visits (in terms of timing and number) recommended by WHO for developing countries was seen in urban areas. In rural areas, the lack of impact on the number



of ANC visits is due to the low quality of ANC. The quality of ANC is more important in determining the subsequent nutritional status of children than the number of ANC visits, which is recommended to be at least four. ANC activities are important for pregnant women to know the healthy development of the baby in the womb. The condition of the baby in the womb until 2 years old is a critical period of baby development. If this period is not utilized properly, it will have an impact on the baby's growth and development. One of the things that can be done during this period is to do ANC so that the baby's growth can be known properly.

### **Parents' Height**

This research explains that out of 8 journals studied, 5 journals state that parents' height is one of the factors that can cause stunting in toddlers. Height is the result of the interaction between genetic factors, macronutrients, and micronutrients. Longitudinal growth occurs through the process of cell proliferation, the addition of new cells for bone growth, and hypertrophy. Additionally, growth hormone and insulin-like growth factor I (IGF-I) also play important roles in bone growth. IGF-I receptors are primarily found in proliferating bone chondrocytes and stimulate the synthesis of collagen and proteoglycans. The height of the parents affects the height of the child. Genetic factors can influence height by up to 15%. This means that if the parents are short, their children have a possibility of being short or stunted. According to Aman (2015), stunting is influenced by genetics; the short stature of parents is likely to be passed on to their children. Research conducted by Mediana (2016) shows that parental height is related to the occurrence of stunting in toddlers.

### **History of LBW**

Unlike the review of several other factors, the history of LBW is not related to the incidence of stunting in toddlers. This is demonstrated by research found in three journals that state there is no correlation indicating that a history of low birth weight (BBLR) is a risk factor for stunting. Based on the data presented by Tanzil and Hafriani (2021), it shows that between the normal and stunted baby groups, the majority were born with adequate birth weight, namely (90%) and (85%). The results of the statistical test prove that Low Birth Weight is not a risk factor for the occurrence of stunting ( $p=0.635$ ;  $OR=1.588$ ;  $CI=0.236-10.704$ ). The absence of a relationship between low birth weight (BBLR) and stunting can also be caused by the largest birth weight effect at the age of the first 6 months, which then decreases until the age of 2 years. If during the first 6 months, toddlers can catch up on growth, there is a chance that toddlers can grow to a normal height and avoid stunting later in life. (Nasikhah, R. 2012). This research is in line with the study by Elsa Nur Aini (2018) which states that based on the chi-square test results, Low Birth Weight (LBW) is not a risk factor for stunting occurrence ( $p=1000$ ;  $OR=1.288$ ;  $CI=0.318-5.219$ ).

### **Mother's Nutritional Knowledge Level**

Research conducted by Tanzil and Hafriani (2021) states that the mother's knowledge level plays an important role as a risk factor for the occurrence of stunting in toddlers. This is in line with the research conducted by Zogara and Pantaleon (2020) which shows that the mother's knowledge level plays an important role as a risk factor for the occurrence of stunting in toddlers. A study found that knowledge is closely related to maternal parenting patterns. Good maternal knowledge tends to be associated with good nutritional status in toddlers, whereas poor or even low maternal knowledge is associated with poor toddler nutritional status. Other research shows that toddlers with poor feeding-related parenting patterns have a 14.5 times greater chance of experiencing stunting compared to toddlers with good parenting history. Similar results were obtained in a study conducted

in Central Aceh District, which indicated that poor parenting patterns have an 8 times greater chance of experiencing stunting (Saputri, et al., 2021).

### **Fat Intake, Protein Intake, Energy Sufficiency**

Research results show that protein and fat intake are significantly related to the incidence of stunting in toddlers. Other research in South Sulawesi and East Java shows the same results. Protein intake provides the amino acids necessary for the body to build the bone matrix and influences bone growth because protein functions to modify the secretion and action of osteotropic hormones. Thus, protein intake can modulate the genetic potential for achieving peak bone mass. Low protein intake has been shown to impair the acquisition of bone mass minerals by disrupting the production and effects of IGF-I. IGF-I affects bone growth by stimulating the proliferation and differentiation of chondrocytes in the growth plate epiphysis and directly influencing osteoblasts (Zogara dan Pantaleon, 2022).

### **History of Respiratory Infections**

The causes of stunting are very complex. The causes of stunting, such as infections that commonly occur in children, are diarrhea and respiratory tract infections (RTIs). A history of infectious diseases is related to the incidence of stunting in toddlers. This happens because infectious diseases can reduce food intake, disrupt nutrient absorption, cause direct nutrient loss, and increase metabolic needs. There is a bidirectional interaction between nutritional status and infectious diseases. Malnutrition can increase the risk of infection, while infection can cause malnutrition, leading to a vicious cycle. If this condition persists for a long time and is not addressed promptly, it can reduce food intake and disrupt nutrient absorption, thereby increasing the risk of stunting in toddlers (Kusdalinah & Suryani, 2021).

## **CONCLUSION**

Stunting is not only related to a child's height being below the established standard. Stunting and other nutritional deficiencies during the First 1,000 Days of Life (HPK), in addition to being at risk of hindering physical growth and making children vulnerable to diseases, also impede cognitive development, which will affect the child's intelligence and productivity in the future. Therefore, a management approach tailored to the risk factors present in families, especially mothers and toddlers, is needed.

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## **CONFLICT OF INTEREST**

There is no conflict of interest in this research.

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