THE HOUSEHOLD FOOD SECURITY AND STUNTING OF UNDER-FIVE CHILDREN IN INDONESIA: A SYSTEMATIC REVIEW

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ABSTRACT

Inadequate access to food at home contributes to growth retardation in childhood. Under-five children who suffer from stunting have problems in their growth and development owing to a lack of nutrients over an extended period of time. This study aimed to analyzed the relationship between household food security and stunting prevalence. This study uses a systematic review using Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). Seven electronic databases are used: PubMed, ProQuest, MDPI, Science Direct, Scopus, Google Scholar, and Portal Garuda. This research was based on studies conducted in Indonesia and published between 2013 and 2023. For the final result, sixteen articles were included. Household food security has a positive correlation with the stunting of under-five children in Indonesia. Moreover, households with food insecurity had a greater risk of stunting. A household is said to be food-secure when access to food is fulfilled by all family members. From this systematic review, the government is expected to formulate policies and strategies to improve household food security and the nutritional status of children under the age of five. To accomplish these efforts, coordination between sectors is required to accelerate and strengthen the implementation of these policies and strategies.

Keywords: children, food insecurity, malnutrition, stunting

INTRODUCTION

A substantial problem faced by the world today is poverty. This occurred due to economic conditions affected by the COVID-19 pandemic, where Indonesia's status changed from a high-middle death country to a low-middle death country starting in July 2021 (World Bank 2022). The COVID-19 pandemic also increased the poverty rate, where the poverty percentage in Indonesia was 9.71% in September 2021, and there was a decrease in March 2023, namely 9.36% or the equivalent of 25.90 million people (Statistics Indonesia 2023). Poverty is the main factor causing food insecurity. Low-income families often do not have enough money to buy sufficient, nutritious, and affordable food. This may be a sign of an inability to attain food security. Food security is defined by Law No. 18 of 2012 as a location where all residents have constant and unfettered acces, throughout their life course, to sufficient, safe, diverse, nutritious, equitable, and affordable food, without prejudice to any person or group's faith, practice, or cultural background, in order to achieve and maintain an optimal level of physical and mental health and social and economic well-being (Ariani & Suradisastra, 2013). Food security is also one of the many objectives in the Sustainable Development Goals stated in the second point (zero hunger). Meeting one's nutritional needs is at the heart of the concept of food security, which encompasses not only food supply at the regional level but also food availability and intake at the regional, household, and individual levels.

Under-five stunting is significantly linked to food poverty at home. Stunting can be caused by inadequate nutritional intake, that can last for a relatively long time. Inadequate nutritional intake is a condition of household food insecurity, where its availability and access are less (lacking), so food or nutritional intake is not fulfilled. If a household experiences food insecurity for a certain period, this can result in a lack of nutritional intake and impact an individual's nutritional status (Arlius et al., 2017).

Nutritional problems in toddlers have become a major issue in Indonesia. Data from the Indonesian Nutritional Status Survey (2021) reported that the prevalence of toddlers being underweight was 17%, wasting was 7.1%, and stunting was 24.4%. The figure shows that toddlers' nutritional problems still become a significant health problem that can cause permanent damage

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to children's physical and mental health and affect their health and productivity as adults. Malnutrition in the first 1000 days of life can cause poor cognitive and physical health in toddlers because this period is essential for brain development and linear growth (De Onis et al., 2013).

The 1000 days of life is an early period of life, starting from the fetus being formed in the womb (270 days) to the first two years of life (730 days), popularly termed the Golden Age (Levinson et al., 2013). This is a crucial period because children's developmental conditions are progressing rapidly, which is also very vulnerable since this period will impact the quality of future generations. Within this period, nutritional intake must be considered starting from the time of a couple before their marriage, expectant mother, during pregnancy (fetus), until the children phase, because if the nutritional intake is low, this lack will cause disorders in the growth and development of the toddler. The 1000 Days of Life movement aims to improve the commitment of stakeholders to accelerate the accomplishment of the nutrition improvement target and strengthen the implementation of the nutrition program concept in direct and indirect ways by conducting two types of integrated interventions that cannot work alone and require collaboration between the government and the community; in the form of a specific nutrition intervention and a sensitive nutrition intervention (Levinson et al., 2013). Food security is an important factor that needs to be considered in efforts to reduce the prevalence of stunting. Effective food security interventions can be an important strategy to achieve the 2030 Sustainable Development Goals (SDGs), namely ending hunger, achieving food security and improving nutrition. From the description above, this systematic review was created to look at the relationship between food security and stunting in Indonesia. It can significantly contribute to efforts to reduce the prevalence of stunting in Indonesia.

METHODS

Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) were used as the framework for this systematic review (Moher et al., 2009). Articles were searched in seven databases: PubMed, ProQuest, MDPI, Science Direct, Scopus, Google Scholar, and Garuda Portal. The selected articles were published between 2013 to 2023 in both English and Bahasa. The search for articles was carried out from May to July 2023, with four keywords used in the search process by the boolean operators "AND" and "OR" as follows:

a. ("household food security" OR "food security") AND ("stunting" OR "stunt") AND ("Indonesia" OR "Indonesian")
b. ("household food insecurity" OR "food insecurity") AND ("stunting" OR "stunt") AND ("Indonesia" OR "Indonesian")
c. ("ketahanan pangan rumah tangga" OR "ketahanan pangan") AND ("stunting") AND ("Indonesia")
d. ("kerawanan pangan rumah tangga" OR "kerawanan pangan") AND ("stunting") AND ("Indonesia")

The inclusion criteria were as follows: (1) unique papers on the subject of this study; (2) the research studies chosen were carried out in Indonesia; (3) children under the age of five were the primary study participants; (4) observational research designs (cross-sectional, case-control, and cohort) were used for this investigation; (5) the research included a means of gauging food security at the household level; (6) the quality of the articles (indexed in SINTA and Scopus); and (7) articles that were fully accessible. The exclusion criteria were study design other than observational design (cross-sectional, case-control, and cohort) and unpublished opinions, books, and studies or abstracts.

All articles identified by the search engines were then exported to the Mendeley application to determine whether any similar articles were later deleted. Writers read the titles and abstracts of all articles. The researchers performed the last round of screening by reading all publications that met the inclusion and exclusion criteria. The authors conducted and evaluated all data extraction and research evaluation on their own. Articles were selected based on their relevance to the research question, and data were extracted into a table that included the author, publication year, sample size, sample age, study goals, method of assessing household food security, and the correlation between household food security and stunting in children under the age of five.

RESULTS AND DISCUSSIONS

From the search results of the seven electronic databases, 6.954 articles were initially obtained according to predetermined keywords. After deleting the same articles, 4.002 articles were obtained and reviewed to determine the suitability aspect of the title and abstract related to the aim of this study. Finally, 131 articles were selected for this study. The next stage of this study was to review the articles by reading their contents for further study according to the inclusion and exclusion criteria previously set in this study. This, resulted in 16 articles that could be analyzed in this study. The study stages of the search, selection process, and appropriate articles based on the inclusion and exclusion criteria are presented in Figure 1.

Table 1 displays the broad features of the studies considered in this systematic review. There were sixteen in Indonesia, seven of which were found in East Java and five in Central Java. The remaining studies (consisting of one study in each of the following regions) were from West Java, Central Sulawesi, Jambi, and North Sumatra. The subjects in this study were children under five years old (0-59 months), with sizes ranging from 96 to 736 households and 59 to 300 children. The majority of the study designs in these studies were cross-sectional, and four studies used case control methods. Measures of household food security can be conducted in a various ways. The Household Food Insecurity Access Scale (HFIAS) was used in seven investigations. The HFIAS method can be used to measure food security because it is an easy and practical method (Ashari et al., 2019). Meanwhile, five studies use the United States-Household Food Security Survey Module (US-HFSSM), as supported by a statement of US-HFSSM, which can be used to measure household food security (Ellison et al., 2021). Three studies used questionnaires prepared by their respective research teams, and one research study used the Household Dietary Diversity Score (HDDS). The HHDS score is the best proxy for assessing household food security (Hussein et al., 2018; Ngema et al., 2018).

According to the definition provided by Arlius et al. (2017), when everyone in a society is able to eat a healthy, balanced diet, we have achieved food security, is free from contamination, is culturally acceptable, is fairly distributed, is affordable, and promotes good health and well-being over the long term. Home food security is essential for adequate food intake, leading to excellent nutritional status (Yang et al., 2019). If a household cannot meet adequate food necessities, it will affect the nutritional intake of children under five years of

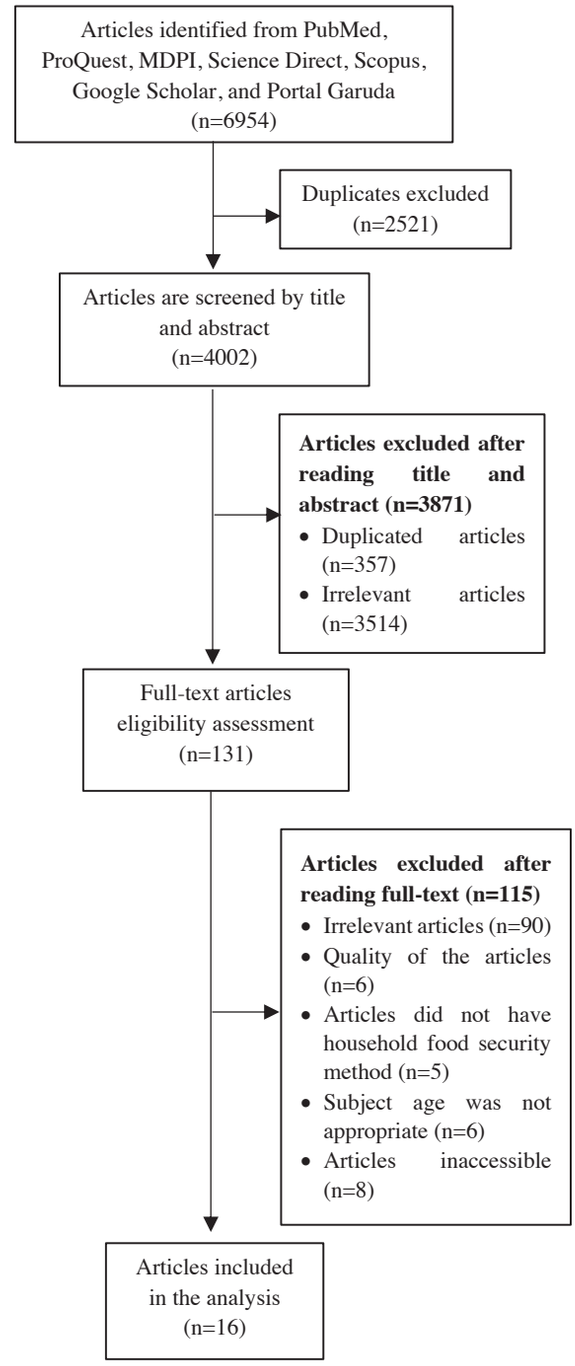

Figure 1. Flowchart of Articles Selection Process by PRISMA

age, eventually leading to stunting (Yanti et al., 2023). Stunting is a disease caused by chronic malnutrition (Sadiq et al., 2023). This growth disorder able to cause permanent damage (Adelia et al., 2018).

Children under the age of five who were not receiving enough to eat at home were not more likely to be stunted, according to two of the 16 articles analyzed. No correlation was found between household food security and stunting, according to a study conducted in Gunungkidul (Delima & Septriana, 2019) and other research in Sukoharjo showed that food availability is not related to toddler growth (Aryati et al., 2018). However, 14 studies suggest that a lack of family food security is linked to stunting in children younger than five.

Meanwhile, research conducted in Surabaya has reported that the HFIAS method can predict SCWOT in Indonesia (Mahmudiono et al., 2018). Several other studies have used the HFIAS methodology and have shown a correlation between low levels of food security at home and the prevalence of stunting. Toddlers in food insecure homes had a whopping 10.9 fold higher risk of stunting, according to studies conducted in Bogor (OR= 10.9 95 % Cl=1.8-67.3) (Utami & KP, 2015). This finding is also in line with research conducted in Gicumbi, Rwanda, which found that children living in food-insecure homes had a 2.47-fold higher risk than stunting as toddlers (AOR= 2.47; CI= 1.77, 3.46) (Kingsley et al., 2018).

In addition, studies conducted in several parts of East Java have revealed regional variations in food insecurity among households. Food insecurity and malnutrition are more common among households in coastal and limestone regions. The highest food insecurity condition was found in coastal areas (7.2%) and in the karst limestone area (5.3%), while the highest stunting prevalence was found in coastal areas (11.6%). Therefore, according to Sumarmi et al. (2018), geographic factors affect household food security and toddler nutrition. These findings corroborate those of a Brazilian study that found that the majority of people living in coastal regions are economically dependent on fishing and hence more susceptible to the effects of climate change. In addition, a similar study was found in Tapanuli with a significant relationship between food security and the nutritional status of children under five years old. This study also revealed that the bulk of the local workforce is comprised of fishermen, and that toddlers living in food-insecure homes are 6.3 times more likely to be underweight (p= 0.003; OR= 6.30) (Masthalina et al., 2021).

In agreement with this discussion, numerous additional studies (Raharja et al., 2019; Asparian et al., 2020; Islamiah et al., 2022) have shown that a high rate of stunting in children younger than five years is correlated with low levels of food security in the home. However, other variables had a substantial association with the prevalence of stunting aside from household food security, including mother's education, household food expenditure, birth length, history of exclusive breastfeeding, family economic position, and socio-demographics. According to research conducted in Jambi, household food security (OR= 4.722; 95% CI= 1.599-13.941) is the factor most associated with stunting in children under five, apart from the mother's education level which also related to the stunting incidence ($p<0.05$). After accounting for differences in household income and parenting styles, toddlers born to mothers with lower education levels had a 2.554 times higher risk of stunting than those born to mothers with higher education (Asparian et al., 2020). Moreover, parents' economic status (p=0.002; OR=3.182) and family food security (p=0.007; OR=3.164) were risk factors for stunting in toddlers (Raharja et al., 2019), as reported by researchers in Pasuruan and Semarang, who found that household food expenditure, birth length, history of exclusive breastfeeding, and socio-demographics are significantly related to stunting incidence (Sudargo & Armawi, 2019; Islamiah et al., 2022). These results also align with research conducted in Rwanda, which that reported the determinants of stunting, including gender, toddler age, mother's age, and mother's education (Nshimyiryo et al., 2019). Research conducted in Indonesia also revealed that the determinant factors that influence stunting incidence are the sex of the children, the duration of breastfeeding for more than 24 months, the children's age, the period of Early Breastfeeding Initiation (*Inisiasi Menyusui Dini*), growth monitoring, mother's age, mother's

Table 1. Summary of selected studies

No.	Study references	Study design	Charaistic of subject	Location	Methods of HFS	Study purpose	Result
1.	Sumarmi et al. 2018	Cross-sectional	• 96 households for each region with 768 households, yet only 736 were included in the inclusion criteria. • Children under five years old	East Java Province • Coastal area: Pasuruan and Lamongan • Karst/limestone area: Gresik and Pamekasan • Agriculture area: Ngawi and Banyuwangi • City area: Madiun and Blitar	US-HFSSM	To analyze the relationship between household food insecurity and malnutrition in under five children from different geographical areas (coastal, limestone, agricultural, and urban areas) in East Java Province.	• The prevalence of stunting is greatest (11.6%) in coastal areas, whereas the prevalence of wasting (6.2%) and underweight (8.9%) are highest in karst/limestone regions. • The highest prevalence of food insecurity is found in coastal areas (7.2%) and karst/limestone areas (5.3%). • Differences in household food insecurity and the nutritional health of children under age five are linked to locations. Children under the age of five were more likely to suffer from food insecurity and malnutrition in homes located near the seaside or in locations rich in limestone.
2.	Muslihah et al. 2022	Cross sectional	• 300 toddlers • 6-23 months	Madura, East Java	HFIAS	To investigate the connection between household food security and the improper feeding of complementary/weaning foods to 6-23-month-old anemic and stunting toddlers.	• Households experiencing food insecurity are found with a percentage of 65.3%. • The prevalence of stunted and anemic toddlers is higher in food insecurity households (36% and 48%) when compared to food secure households (31.7% and 43.3%).
3.	Mahmudiono et al. 2018	Cross-sectional	• 685 households • Children under five years old	Surabaya, East Java	HFIAS	Researching the association between SCOWT (Stunted Children and Overweight/Obese Mother) and food insecurity in Indonesian households.	The household food insecurity analyzed through the HFIAS method can be a SCWOT predictor in Indonesia.
4.	Delima & Septriana 2019	Cross-sectional	• 73 toddlers • 6-59 months	Gunungkidul, DI.Yogyakarta	HFIAS	The goal of this research is to better understand the connections between parents' food insecurity and their children's risk of stunting.	• Stunting rates are not linked to food insecurity in the home. • Household food insecurity found is in the category of light food insecurity.
5.	Adhyanti et al. 2022	Cross-sectional	• 96 households • 0-59 months	Palu, Central Sulawesi	HFIAS	Examining the four-year-later food security and nutritional condition of tsunami and earthquake survivors' households.	• Food security is significantly related to stunting status ($p<0.05$). • For a household with food secure status found with a percentage of 46.9%, a household with light food insecure status has a percentage of 28.1%, and households with moderate and heavy food insecure status have a percentage of 15.6% and 9.4% as taken from a population of survivors after four years of earthquake and tsunami's natural disaster.

Table 1. Summary of selected studies *(continue)*

No.	Study references	Study design	Characteristic of subject	Location	Methods of HFS	Study purpose	Result
6.	Aryati et al. 2018	Cross-sectional	• 130 toddlers • 12-24 months	Sukoharjo, Central Java	US-HFSSM	The purpose of this study is to examine the impact of food insecurity on the development of children between the ages of 12 and 24 months old by looking at their intake of protein and zinc throughout the course of the 1000 Days of Life.	• There is no relationship between poor household food security status and the growth and development period of toddlers/under two children ($p>0.05$). • Intake of protein (OR=1.068; 95% CI=1.035-1.103), and zinc (OR=1.31; 95% CI=1.314-2.025) correlate to toddlers' growth and development period.
7.	Asparian et al. 2020	Cross-sectional	• 98 toddlers • 24-59 months	Kerinci, Jambi	HDDS	The objective of this study is to examine the causes of stunting in children aged 24 to 59 living in agricultural families.	The most related factor to stunting incidence in toddlers is household food security status (OR= 4.722; 95% CI=1.599-13.941).
8.	Fadzila & Tertiyus 2019	Case-control	• 72 toddlers • 6-23 months	Nganjuk, East Java	US-HFSSM	To compare the household food security of children who are stunted (6-23 months) with that of children who are not stunted.	There is a significant negative relationship between stunting and household food security status.
9.	Islamiah et al. 2022	Cross sectional	• 87 households • 6-59 months	Pasuruan, East Java	HFIAS	The goal of this study is to examine the factors at play in the occurrence of stunting among toddlers, including family characteristics, child characteristics, and household food security.	There is a significant relationship between household expenditure, baby birth length, exclusive breastfeeding report, and household food security condition to stunting incidence in toddlers.
10.	Masrin et al. 2014	Case-control	• 126 toddlers • 6-23 months	Particular Region of Yogyakarta, Central Java	Questionnaire	To investigate the connection between household food security and stunting in young children (6–23 months).	There is a substantial correlation between household food security and stunting prevalence (OR=2.62, 95% CI=0.97-7.12).

Table 1. Summary of selected studies *(continue)*

No.	Study references	Study design	Characteristic of subject	Location	Methods of HFS	Study purpose	Result
11.	Masthalina et al. 2021	Cross-sectional	• 59 toddlers • Under-five children	Tapanuli, North Sumatra	HFIAS	In coastal regions, toddlers' nutritional status is a major concern, therefore we need to examine the connection between food insecurity at home, nutritional sufficiency, and household food insecurity.	In coastal regions, there is a substantial correlation (p=0.003; 0.003 OR=6.30) between household food security and toddler malnutrition.
12.	Riski et al. 2019	Cross-sectional	• 64 toddlers • 1-5 years	Surabaya, East Java	US-HFSSM	To analyze the household food security, illness, sanitation of the environment, toddlers' nutrition status	There is a significant relationship between household food security, illness, and sanitation of the environment and toddlers' nutritional status.
13.	Raharja et al. 2019	Case-control	• 141 toddlers • 24-59 months	Bejiharjo village, Central Java	Questionnaire	To what extent do parents' socioeconomic status and food insecurity correlate with the frequency of toddler stunting is the focus of this research.	Toddler stunting becomes a risk factor when parents' socioeconomic position (p=0.002; OR=3.82) and food security (p=0.007; OR=3.164) are poor.
14.	Safitri & Nindya 2017	Cross-sectional	• 68 toddlers • 13-48 months	Surabaya, East Java	US-HFSSM	To compare the prevalence of diarrhea and subsequent stunting in young children with the food security of their households.	• There are 30.9% of stunted children, 61.8% of children were in food insecurity conditions, and 19.1% experienced diarrhea. • Household food security and stunting incidence show a significant relationship.
15.	Sudargo & Armawi 2019	Case control	• 80 toddlers • 1-5 years	North Semarang, Central Java	Questionnaire	The goal of this study is to investigate the relationship between toddler stunting and the household's food security and other socioeconomic factors.	Household food security and socio-demographics have a significant relationship to stunting incidence.
16.	Utami and KP 2015	Cross-sectional	• 216 toddlers • 6-23 months	Bogor, West Java	HFIAS	To examine how household food security affects the prevalence of stunting in young children.	Children under the age of two who are at risk for stunting have lower rates of household food security (OR= 10.9 95% CI=1.8-67.3)

education, mother's occupation, the birth length, and history of diarrhea (Permanasari et al., 2021; Herbawani et al., 2022).

Furthermore, research conducted in Nganjuk, Surabaya, Yogyakarta, Bogor, Surabaya, and Palu reported that a correlation exists between household food security and the stunting of children under the age of five (Masrin et al., 2016; Safitri & Nindya, 2017; Fadzila & Tertiyus, 2019; Riski et al., 2019; Adhyanti et al., 2022). Children in Ethiopia who experienced food insecurity were shown to have a 6.7 times risk of stunting than those who lived in food-secure families (AOR= 6.7; CI= 3.71-12.1) (Betebo et al., 2017). Other studies conducted in Kenya have reported a relationship between household food insecurity and stunting incidence (Mutisya et al., 2016). Children under the age of five in food-insecure homes had a greater frequency of stunting and anemia than toddlers in households without food insecurity, according to a study performed in Madura. These results show a significant association between food insecurity at home and the incidence of stunting and anemia. Reduced supplemental feeding due to food poverty at home has been linked to stunted development and anemia (Muslihah et al., 2022).

Families that struggle to put food on the table are more likely to have stunted (Yanti et al., 2023). When toddlers' daily menu composition is lacking in both quality and quantity, and when vegetable side dishes predominate in terms of frequency, they are considered to have limited access to food (Adelia et al., 2018). Lack of access to fulfilling food necessities is caused by low family income. Children from high-income families can buy various foods to meet their nutritional requirements. However, children from low-income families have monotonous/not-varied food consumption. Income level limits at family's purchasing power, which can lead to household food insecurity (Amalia & Mahmudiono, 2017). Food insecurity is very dangerous to toddlers' health (Schmeer & Piperata, 2017) and creates risky habits and mental health problems during the transition period to adolescence and adulthood (Heflin et al., 2019).

CONCLUSION

According to a meta-analysis of 14 publications, this systematic review showed that higher levels of household food security are associated with lower rates of stunting among Indonesian toddlers. Stunting is more likely to affect toddlers from homes with food poverty than those from households without food security. When everyone in a household has enough food to eat, the household is regarded as food secure. According to two studies, there was no correlation between household food security and the prevalence of stunting. As a result, citizens look to the government to enact policies and tactics that will boost the food security of American households and the health of children under the age of five. For these efforts to succeed, coordination between sectors is needed to accelerate and strengthen the implementation of these policies and strategies.

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CONFLICT OF INTEREST

The authors declare there is no conflict of interest in this research.

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