e-ISSN : 2597-6052

MPPKI MEDIA PUBLIKASI PROMOSI KESEHATAN INDONESIA

Review Articles Open Access

The Relationship between Personal Hygiene, Maternal Health Status, and History of Diarrhea to Stunting Cases in Indonesia: Systematic Review

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ARTICLE INFO

Manuscript Received: 20 Oct, 2024
Revised: 28 Nov, 2024
Accepted: 01 Dec, 2024
Date of Publication: 9 Dec, 2024
Volume: 7
Issue: 12
DOI: 10.56338/mppki.v7i12.6424

KEYWORDS

Personal Hygiene;
Maternal Health Status;
History of Diarrhea;
Stunting

ABSTRACT

Background: The government established a goal of a prevalence rate of 14% by the end of 2024 because the number of stunting cases in Indonesia is still high, at 21.6%. This review aims to provide the factors such as personal hygiene, maternal health status, and diarrhea that cause stunting and recommendations for more effective health policies to prevent stunting in Indonesia. The purpose of this study is to examine the connection between personal hygiene, maternal health status, and a history of diarrhea with the occurrence of stunting in Indonesia..

Method: This study uses a systematic review method on observational studies with a case control and cross-sectional research design conducted in Indonesia published between 2019 and 2024. Databases such as PubMed, ScienceDirect, and Google Scholar are used to search for eligible articles. The quality of the publication was then assessed using The JBI (Joanna Briggs Institute) Critical Appraisal Tools.

Result: A total of 210 articles were taken from the database, and 17 research articles were included in this study. In the article studied, the factors that are most often associated with stunting are personal hygiene practices (behavior of washing hands with soap), maternal weight, maternal height, and infectious diseases such as diarrhea related to stunting.

Conclusion: A study of 17 articles showed that personal hygiene, maternal health status during pregnancy, and history of diarrhea contributed significantly to the incidence of stunting in Indonesia. Poor personal hygiene and diarrheal infections can worsen children's nutritional status, increase the risk of infection, and inhibit optimal growth and development. These factors are an important component in efforts to prevent stunting through improving hygiene, maternal health, and infection management.

Publisher: Fakultas Kesehatan Masyarakat Universitas Muhammadiyah Palu

INTRODUCTION

According to the WHO (World Health Organization), by 2022, approximately 148.1 million children under the age of five globally were affected by stunting, meaning they were shorter than the average height for their age. In addition, 45.0 million children suffered from wasting, which refers to being underweighted for their height, while 37.0 million children were classified as overweight. These alarming statistics highlight the ongoing global challenges related to child malnutrition, with millions of children experiencing varying degrees of undernutrition or excessive weight. The consequences of stunting and wasting extend beyond physical growth, impacting cognitive development, health, and long-term well-being. The WHO emphasizes the need for urgent interventions to address these issues through improved nutrition, healthcare, and sanitation, particularly in regions with high rates of malnutrition.

Indonesia ranks fifth globally for the highest prevalence of stunting among children under five years old. The causes of stunting can be attributed to 20 key factors, which are divided into categories based on household and living conditions, characteristics of the parents (mother and father), antenatal care services, and the child's own traits (1).

Data from the Ministry of Health of the Republic of Indonesia reveals that the prevalence of stunting among children under five years old decreased in 2022. The stunting rate dropped to 21.6% in 2022, compared to 24.4% in 2021, indicating a positive trend in addressing this critical issue. While the reduction is a step forward, stunting remains a significant concern, as it affects a substantial portion of the country's young population. The decline in stunting rates reflects the efforts made through various health and nutrition programs, but continued focus on improving maternal and child health, access to proper nutrition, and sanitation is essential to sustain this progress and reduce stunting further. Despite the improvement, the need for ongoing interventions to tackle the underlying causes of stunting, such as poverty, inadequate feeding practices, and insufficient healthcare, remains crucial to achieving long-term improvements in child development and well-being. This reduction reflects some progress in addressing the issue of stunting, but it remains a significant concern for child health and development in the country. While this decrease is noteworthy, stunting remains a significant public health issue in Indonesia, representing approximately 2.8% of the global prevalence. This decline indicates that there are better efforts in stunting prevention, although there are still many challenges to be faced, including stunting predictors involving household conditions, housing, maternal nutritional status, and access to adequate health services.

Stunting, as assessed through anthropometric measurements to evaluate children's nutritional status, is defined based on the PB/U (weight-for-age) or TB/U (height-for-age) index. It is characterized by a Z-Score value that falls below -3 standard deviations (SD), indicating severe stunting or very short stature, or a Z-Score between -2 SD and -3 SD, which indicates moderate stunting or short stature. When children's nutritional demands are not met by the food they are given, stunting, a chronic nutritional issue, results from long-term insufficient nutritional intake. This disorder may begin in the fetus and manifest by the time the child is two years old. In addition to reducing child growth, stunting can become a public health issue that raises the risk of illness, death, and developmental barriers in children's motor and cerebral skills if it is not counterbalanced by catch-up growth (2).

Personal hygiene is one of the factors that can affect an individual's nutritional status. Maintaining good personal hygiene will reduce the risk of microorganisms entering, ultimately helping to prevent infectious diseases. One of the significant elements that directly affects a person's nutritional state is this infectious disease (3). The mother's employment, the height of the mother and father, money, the number of family members, parenting, and exclusive breastfeeding are additional factors that contribute to stunting. Stunting can be influenced by a range of factors, many of which are interconnected. Key contributors include the mother's education level, which can affect her knowledge of proper nutrition and caregiving practices, and her awareness of the importance of early childhood nutrition. A mother's understanding of nutrition directly impacts her ability to make informed choices about her child’s diet. Additionally, whether a child is exclusively breastfed during the early months plays a critical role in preventing stunting, as breast milk provides essential nutrients and immune protection. The timing of introducing complementary foods (MP-ASI) also has an impact, as introducing solid foods too early or too late can interfere with optimal growth and development (4).

Multiple and interconnected variables may cause stunting, according to emerging studies. Personal higiene, maternal health, and diarrhea are recognized as major influences. Poor personal hygiene can expose infants to infections that limit food absorption, while maternal health—including nutrition and prenatal care—affects fetal growth and development. Due to nutritional depletion, diarrhea, a frequent symptom of poor sanitation, worsens malnutrition Despite these connections, the processes linking these factors to stunting are unclear, requiring further research.

METHOD

This study used systematic review by following the PRISMA guidelines. Observational studies such cross-sectional and case control conducted in Indonesia were included in this study, publish between 2019 And 2024. In this study, the review examined personal hygiene, maternal health status, and history of diarrhea on stunting cases in Indonesia. The articles were obtained through 3 databases, such as Science Direct, PubMed, and Google Scholar. Following keyword combination was used on Google Scholar: "(((((((((personal hygiene) OR (personal hygiene)) AND (maternal health status)) AND (history of diarrhea)) AND (stunting)) AND (stunted) ", keywords used on

Pubmed and ScienceDirect: "personal hygiene" OR "maternal health" OR "diarrhea" and stunting "Indonesia" (Figure 1).

Articles were collected, screening by inclusion and exclusion criteria followed by duplicate checking and selection by title and abstract. Once the relevant articles have been gathered, their quality will be evaluated using the guidelines provided by JBI (The Joanna Briggs Institute) Critical Appraisal Tool, which is designed for use in JBI systematic reviews. Then, the final results of articles were entered into data extraction tables, and data were synthesized using descriptive analysis techniques.

The inclusion criteria that have been set are (a) quantitative methods using case-control and cross-sectional design; (b) literature with the type of research article and journal article; literature with the scope of research in Indonesia; (c) can be accessed free full text; (d) published in 2019-2024; and (e) use both Indonesian and English. While the exclusion criteria that have been set are "literature with the type of non-research article (papers, books, review articles) and literature with duplication detected". Here is a flowchart of the article selection process regarding personal hygiene, maternal health status and diarrhea towards the incidence of stunting in Indonesia. This research was approved with letter number : 312/UN9. FKM/TU. KKE/2024 by the Ethics Committee of the Faculty of Public Health, Sriwijaya University.

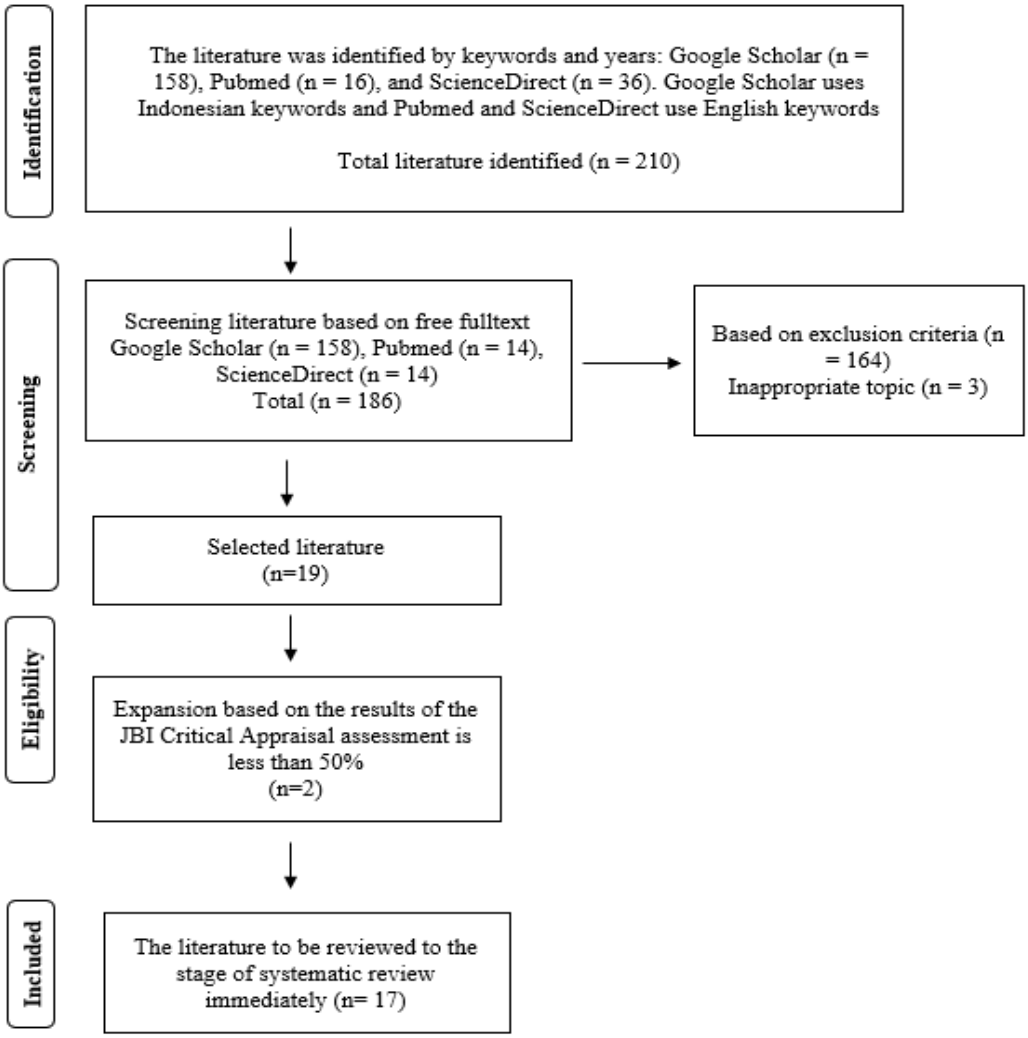

Figure 1. PRISMA Flow Diagram

RESULTS

The results of this study were obtained through a careful search of various academic databases and relevant scientific journals. From the search, 17 scientific publications were found that met the inclusion criteria for further analysis in the literature review. Each selected publication has an important contribution to understanding the topic being studied, both in terms of methodology, findings, and relevant discussions. The selection process of these articles is carefully carried out to ensure that only studies that have high quality and direct relevance to the topic under study are included in this review.

Table 1. Data Extraction of Scientific Articles

Name	Title	Method	Result
Indriyani et al., (2021) (5)	Relationship between Personal Hygiene, Sanitation, and History of Enteric Infectious Diseases (diarrhea) with the Incidence of Stunting in Toddlers Aged 24-60 Months	Observational study of cross-sectional design.	1. In the bivariate analysis between personal hygiene factors and stunting incidence, it was found that the most stunted toddlers (65.9%) had mothers with poor personal hygiene. On the other hand, toddlers who do not experience stunting the most (68.3%) have mothers with good personal hygiene. The study found an odds ratio (OR) of 4.177 (95% CI = 1.709-10.188) and a p-value of 0.003 (p-value <0.05). These results indicate a significant association between personal hygiene and the prevalence of stunting in toddlers aged 24 to 60 months. Specifically, the research conducted in the Way Urang Community Health Center area of South Lampung Regency revealed that children with poor hygiene practices had a 4.173 times higher likelihood of experiencing stunting compared to those with better hygiene. 2. In the bivariate analysis between the historical factors of diarrhea and the incidence of stunting, it was found that toddlers who experienced the most stunting (62.5%) had a history of diarrhea, on the other hand, toddlers who did not experience the most stunting (71.9%) did not have a history of diarrhea. The results showed a significant relationship between a history of diarrhea and the incidence of stunting in toddlers aged 24 to 60 months in the Way Urang Community Health Center's service area in South Lampung Regency. The study found a p-value of 0.004 (p-value < 0.05) and an odds ratio (OR) of 4.259 (95% CI = 1.661-10.921), indicating a strong association between previous diarrhea episodes and stunting in this population.
Khairani, Effendi, Suryani., (2022) (6)	The Relationship between Maternal Hygienic Behavior and	The type of research is an Analytical Survey	The incidence of stunting and maternal hygiene practices did not significantly correlate (OR = 1,310).

Name	Title	Method	Result
	the Incidence of Diarrhea with the Incidence of Stunting in Toddlers	and the design is Case Control.	Stunting and diarrhea incidence did not significantly correlate (OR = 0.814).
Tarigan et al., (2024) (7)	The Relationship between Maternal Personal Hygiene and Stunting Cases in Toddlers in Ogan Ilir Regency in 2023	Using observational analysis analytics with control case study design.	The findings of the bivariate analysis (p-value = 0.000, OR = 3.119 95%CI = 1.698-5.730) indicate a strong correlation between the frequency of stunting in toddlers and maternal personal hygiene. Stunting is 3.119 times more likely to occur in toddlers whose moms practice poor personal hygiene than in those whose mothers practice good personal hygiene.
Sambriong et al., (2024) (8)	Risk Factors for Stunting in Children Under Three Years Old	This study is a type of observational research utilizing a case-control design.	Maternal factors, such as the mother's level of education and her parenting style, play a significant role in stunting. Data indicates a strong correlation between these factors and stunting, with maternal education showing a p-value of 1.000 and parenting patterns a p-value of 0.223, accompanied by an odds ratio (OR) of 0.189 (95% CI: 0.041–0.871). However, the influence of infectious diseases, with a p-value of 1.000, is not statistically significant.
Novianti, Huriyati, and Padmawati., (2023) (5)	Safe Drinking Water, Sanitation and Mother's Hygiene Practice as Stunting Risk Factors: A Case Control Study in a Rural Area of Ciawi Sub-district, Tasikmalaya District, West Java, Indonesia	Using the case control method.	1. The history of diarrhea in children shows a significant correlation with the occurrence of stunting, as indicated by a p-value of 0.037. 2. With a p-value of 0.028, the incidence of stunting was significantly correlated with mother cleanliness practices.
Imamaturrodiyah and Sumarmi., (2023) (10)	Risk Factors for Stunting Seen from Exclusive Breastfeeding and Family Sanitation Hygiene in Children Aged 6-36 Months in the Working Area of the Sidoarjo Health Center	This research employs an observational analysis using a case-control design.	The findings of the investigation on the connection between the occurrence of this study and hygienic practices. It is visible. from the p=0.001 value, which indicated significant findings. This study's OR value of 22.48 indicates that the risk of stunting is 22.48 times higher for those who practice poor sanitation hygiene.
Solehah et al., (2024) (11)	The Relationship between Maternal Nutrition Knowledge Level, Parenting Style, and Sanitation Hygiene with the Incidence of Stunting in Toddlers in Padangdangan Village Pasongsongan District, Sumenep Regency	This study is a quantitative correlational research that utilizes a cross-sectional design.	The results indicate that Ha2, which posits a connection between parenting practices and stunting in toddlers in Padangdangan Village, Pasongsongan District, Sumenep Regency, was accepted (p=0.000 < 0.05). The odds ratio (OR) of 0.008 (95% CI 0.001 – 0.049) suggests that mothers who adopt appropriate feeding practices can significantly lower the risk of stunting in their children by 99.2% compared to mothers who have improper feeding patterns.

Name	Title	Method	Result
Ratnawati et al., (2024) (12)	Implementation of Water, Sanitation, And Hygiene (Wash) Stunting Clown Family in Jember Regency Agricultural Area	Cross-sectional studies in which measurements and observations are carried out simultaneously on one time or one time without any follow-up.	1. The occurrence of clown stunting in Jember Regency's agricultural districts is unrelated to the closest time clowns encounter diarrhea, according to the findings of a bivariate study using the chi-square test, which yielded a p-value of >0.05. 2. With 90.4% stunting and 98.1% nonstunting, the majority of responders cleansed their hands both before and after defecating. The analysis's findings indicated that there was no discernible relationship between the frequency of stunting and hand washing duration.
Jayanti et al., (2022) (13)	Determinants of Stunting Incidence in the Work Area of the North Lampung Regency Health Office	Survey analysis utilizing a cross-sectional approach.	The study revealed that out of 29 children under the age of five with infectious diseases, 21 (72.4%) were affected by stunting, while 8 (27.6%) were not. A p-value of 0.000 indicates a statistically significant link between infectious diseases and stunting. The odds ratio (OR) of 34.650 (95% CI: 10.225–117.424) suggests that children with infectious diseases are 34.650 times more likely to experience stunting than those without such diseases.
Asmirin et al., (2021) (14)	Determinant Analysis of Stunting Incidence in Toddlers (Age 24-59 Months)	This study uses a cross-sectional study design and is quantitative in nature.	A significant relationship was found between Hand Washing with Soap (CTPS) and the incidence of stunting in toddlers, with a p-value of 0.041 (< 0.05). The prevalence ratio (PR) of 2.808 indicates that respondents who do not practice CTPS are 2.808 times more likely to have stunted toddlers compared to those who do practice CTPS.
Tsasbita et al., (2023) (15)	Analysis of Complications of Infectious Diseases and History of Current Severity Born on the Incidence of Stunting of Toddlers in Indonesia	This study used a cross-sectional approach with observation as its methodology.	The results of the study's interaction/complications of ARI with diarrhea, and ARI with birth weight, showed that there was a relationship between ARI and stunting incidence in toddlers aged 24-59 months in Indonesia (p-value = 0.048), where toddlers who experienced ARI had a chance of stunting 2,234 times (OR = 2,234 ; 95% CI, 0.201-0.995) compared to toddlers who did not experience ARI after the test of the interaction of ARI with diarrhea, and the interaction of ARI with birth weight.
Nurhidayati and Riyadi, (2022) (16)	"Quality of Water Sources, Sanitation, and Hygiene in Families with Stunted Toddlers in Rural and Urban Areas in West Java"	Employing the cross-sectional approach	The study results indicated that proper hygiene practices are associated with the incidence of stunting. While many families with stunted toddlers maintain good handwashing habits, only 33.6% of households have separate handwashing facilities, and 50.0% provide soap for handwashing. This suggests that, despite awareness of hygiene's importance, there is still a lack of adequate facilities, particularly

Name	Title	Method	Result
			in urban areas, which may contribute to the high prevalence of stunting.
Sartika., (2021) (17)	"Prenatal and postnatal determinants of stunting at age 0–11 months: A cross-sectional study in Indonesia"	Using the cross sectional method	1. In this study, diarrhea had a significant relationship with the incidence of stunting in children. Children who experienced diarrhea in the last two weeks had a higher odds ratio for experiencing stunting, with an adjusted odds ratio (OR) of 3.28 and a 95% CI between 1.61 and 6.65. This indicates that children who suffer from diarrhea are more likely to experience stunting than those who do not have diarrhea. 2. In this study, maternal health status, including conditions like chronic energy deficiency and anemia, was significantly linked to the occurrence of stunting in children. While the summary does not provide specific p-values and confidence intervals (CI) for maternal health, the findings imply that inadequate maternal nutrition during pregnancy increases the risk of stunting in children. As a result, maternal health status is considered a crucial factor in the development of stunting.
Soviyati., (2023) (18)	"Effect of applying the health promotion model in stunting prevention and behavior control in Indonesia"	Quantitative analytical studies of cross sectional design	Behaviors focused on preventing and managing stunting are strongly influenced by social support, self-efficacy, and sanitation ($P < 0.05$). Parenting practices concerning food and nutrition are vital in reducing stunting rates ($P < 0.05$), while socioeconomic and sanitation factors, mediated by self-efficacy, have a significant positive indirect effect. Factors like perceived vulnerability, perceived severity, perceived barriers, self-efficacy, social support, community organization, and facilitators all directly and significantly contribute to enhancing behaviors that prevent stunting ($P < 0.05$).
Arini., et al., (2020) (19)	"The incidence of stunting, the frequency/duration of diarrhea and Acute Respiratory Infection in toddlers"	Quantitative analytical studies of cross sectional design.	The findings revealed a strong relationship between the incidence of stunting in children under five and both the frequency and duration of diarrhea. The Spearman Rho test yielded $P = 0.005$ and $P = 0.003$, indicating that a child's risk of stunting rises with both the frequency and length of their episodes of diarrhea.
Nadhiroh, Ayuningtyas, Salsabil., (2024) (20)	"Linear growth determinants of under two years old children in Surabaya, Indonesia"	Observational study of cross sectional design.	In four Health Center areas of Surabaya City, the average LAZ of children under two years old is within the normal range (-0.76 ± 1.70). A significant correlation was found between linear growth and both maternal height (p-value : 0.001)

Name	Title	Method	Result
			and newborn length (p-value : 0.001). This suggests that the mother's height and overall health may influence the risk of stunting.
Noor et al,. (2022) (21)	"Analysis of Socioeconomic, Utilization of Maternal Health Services, and Toddler's Characteristics as Stunting Risk Factors"	Observational study of cross sectional design	The connection between maternal health status and stunting reveals significant factors, including the mother's level of education. Higher maternal education is associated with a reduced risk of stunting in children. In the analysis, the p-value for maternal education was $p < 0.001$, with a 95% CI = 0.410–0.784..

DISCUSSION

The stunting problem in Indonesia is influenced by various factors that are the main causes, including maternal personal hygiene, overall maternal health status, and a history of infectious diseases, especially diarrhea. Suboptimal maternal personal hygiene can increase the risk of exposure to disease-causing microorganisms in children, which ultimately has an impact on children's nutrition and growth. Maternal health status is also crucial, as poor health during pregnancy can impact the fetus's nutritional intake, increasing the risk of stunting. A history of infectious diseases, such as diarrhea, is another significant factor, as these illnesses disrupt the absorption of essential nutrients in children, hindering growth and elevating the risk of stunting (22).

The Relationship between Personal Hygiene and Stunting Incidence

Personal hygiene is a very important thing to maintain overall body health, both in physical and mental aspects. Overall, there are eight manuscripts which said that personal hygiene with significant relationship with stunting. This activity includes various actions taken to maintain body hygiene and comfort, such as bathing, washing hands, maintaining dental and oral hygiene, and caring for hair and skin. In addition to serving to prevent the spread of diseases and infections, maintaining personal hygiene also plays a role in increasing confidence and psychological well-being. By taking care of personal hygiene, a person can feel more comfortable, refreshed, and ready to carry out daily activities more optimally. Therefore, personal hygiene is not only important for physical health but also has a positive impact on a person's mental and emotional state (23).

According to a study by Indriyani et al. (2021), there is a significant association between stunting and a history of diarrhea in children. The research, conducted in the Way Urang Community Health Center area of South Lampung Regency, specifically focused on toddlers aged 24 to 60 months. The findings showed a p-value of 0.004 (p-value < 0.05), indicating that the relationship between diarrhea and stunting is statistically significant. Additionally, the study reported an odds ratio (OR) of 4.259 (95% CI = 1.661-10.921), suggesting that children with a history of diarrhea are more than four times as likely to experience stunting compared to those without such a history (5). In a study by Tarigan et al. (2023), the bivariate analysis revealed a significant relationship between maternal personal hygiene and stunting in toddlers, with a p-value of 0.000 and an odds ratio (OR) of 3.119. The findings indicated that toddlers whose mothers have poor personal hygiene are 3.119 times more likely to experience stunting compared to those whose mothers practice good personal hygiene (7). In Jayanti et al's research (2022), the results of 29 children under five with infectious diseases and experiencing stunting were 21 people (72.4%), while those who were not stunted were 8 people (27.6%) and the p-value = 0.000 which means that there is a relationship between infectious diseases and the incidence of stunting. OR value = 34,650 (10,225-117,424) which means that toddlers with infectious diseases are 34,650 times more likely to experience stunting than toddlers who do not have infectious diseases (9). In the research of imamaturrodiyah and sumarmi (2023), the results of the analysis of the relationship between sanitation hygiene and the incidence of this study can be seen from the value of p=0.001 which concludes significant results (10). In the research of Solehah et al (2024), there is a relationship between parenting and the incidence of stunting in toddlers with a value (p=0.000 < 0.05) (11). In the study of Asmirin et al (2021), there was a significant relationship between Hand Washing with Soap (CTPS) and the incidence of stunting in toddlers p = 0.041 (< 0.05) [14]. In the

study by Nurhidayati and Riyadi (2022), the findings indicate that proper hygiene practices are linked to the occurrence of stunting. While most families with stunted toddlers maintain good handwashing habits, only 33.6% of households have dedicated handwashing facilities, and 50.0% provide soap for handwashing (16). From several related articles, there are 2 studies that state that there is no relationship between personal hygiene and stunting incidence. The results of this study are not in line with the results of previous studies can be caused due to the limitations in this study. To determine the incidence of diarrhea for the past month, the data obtained was only based on the results of interviews with mothers toddlers, not based on data from Puskesmas or doctor's diagnosis.

The Relationship between Maternal Health Status and Stunting Incidence

Maternal health during pregnancy encompasses the physical, mental, and emotional well-being of the pregnant woman, along with the impact of various factors on her health and the development of the fetus. Pregnancy is a critical time, as the physical and hormonal changes in the mother's body can influence her overall health. Key factors affecting maternal health include regular prenatal check-ups, adequate nutrition, physical changes and symptoms during pregnancy, access to healthcare services, and other related factors (24).

According to previous research by Sartika et al. (2021), the study's results reveal a significant link between stunting in children aged 0–11 months and the mother's health status. Anemia affects 62% of pregnant women, while 27% experience chronic energy deficiency, both of which can negatively impact the child's growth and development. Maternal malnutrition during pregnancy increases the likelihood of stunting in children (17). The study by Sovianti et al (2023) showed that maternal health status, including education level and height, has a significant relationship with the risk of stunting in children (18). In the research of Nadhirroh, Ayuningtyas and Salsabil (2024), maternal height is the main determining factor with a beta value of 0.231. The study also noted that maternal hemoglobin levels during pregnancy were related to the health of the child, although it was not described in detail in the results. Overall, this study emphasizes the importance of maternal health factors and child feeding practices in preventing stunting and supporting optimal growth (20).

The Relationship between Diarrheal Disease History and Stunting Incidence

The illness known as diarrhea is characterized by irregular feces frequency and consistency. The World Health Organization defines diarrhea as having soft or loose bowel motions three or more times a day. Diarrheal infections are frequently brought on by infectious agents including bacteria, viruses, or parasites. This infection can be contracted by eating tainted food or by not practicing good hygiene. Generally speaking, diarrhea is a sign of digestive system diseases that can be brought on by a number of things (25).

A study by Indriyani et al. (2021) found a significant association between a history of diarrhea and the occurrence of stunting in children. The research reported a p-value of 0.004 (p-value < 0.05), indicating statistical significance, and an odds ratio (OR) of 4.259 (95% CI = 1.661-10.921). This indicates a strong link between previous diarrhea episodes and stunting in children aged 24 to 60 months. Conducted in the Way Urang Community Health Center area of South Lampung Regency, the study emphasizes the importance of addressing diarrhea as a key factor contributing to stunting in this region. The results highlight the need for targeted interventions to prevent diarrhea, particularly among young children, to mitigate the risk of stunting (5). In a study conducted by Novianti, Huriyati, and Padmawati (2023), the results indicated a significant association between a history of diarrhea and the occurrence of stunting in children. The research found a p-value of 0.037, which is below the threshold of 0.05, confirming the statistical significance of the relationship. This suggests that children who have experienced diarrhea in the past are at a higher risk of developing stunting. The study emphasizes the importance of addressing diarrhea as a critical factor in the prevention of stunting, highlighting the need for focused interventions that reduce the prevalence of diarrhea, improve child health outcomes, and ultimately contribute to better growth and development (9). In the study conducted by Jayanti et al. (2022), the researchers investigated the relationship between infectious diseases and stunting in children under the age of five. The findings revealed that out of 29 children with infectious diseases, 21 (72.4%) experienced stunting, while 8 (27.6%) did not. The p-value of 0.000 indicates a statistically significant association between the presence of infectious diseases and the incidence of stunting. Additionally, the study reported an odds ratio (OR) of 34.650 (95% CI = 10.225-117.424), suggesting that toddlers with infectious diseases are 34,650 times more likely to experience stunting than those without such diseases (26). In the study by Tsasbita et al. (2023), the interaction between ARI and diarrhea, as well as ARI and birth weight, revealed a significant relationship between

ARI and the incidence of stunting in toddlers aged 24-59 months in Indonesia (p-value = 0.048). Additionally, Sartika et al. (2021) found that diarrhea is notably prevalent among children aged 0-11 months, with over 10% of infants experiencing acute diarrhea within the past two weeks (17). The research of Soviyati et al (2023) showed that diarrhea has a significant influence on stunting, with a P value indicating a relevant relationship (18). The research by Arini et al. (2020) identified a significant relationship between both the frequency and duration of diarrhea and the occurrence of stunting in children under five years old. Using the Spearman Rho test, the study produced p-values of 0.005 and 0.003, demonstrating statistical significance. The results suggest that children who suffer from diarrhea more often and for extended periods are at a higher risk of experiencing stunting (19). However, in a previous study by Khairani (2022) that there was no significant relationship between the incidence of diarrhea and the incidence of stunting (OR=0.814). In the research conducted by Yusi Ratnawati et al. (2024), the bivariate analysis utilizing the chi-square test yielded a p-value exceeding 0.05. This suggests that there is no statistically significant association between the recent occurrence of diarrhea and the prevalence of stunting in the population under study. Based on this finding, the researchers concluded that the timing of a child's most recent episode of diarrhea does not have a direct association with the likelihood of stunting. This suggests that other factors may play a more significant role in influencing stunting, and further investigation is needed to explore the various contributing elements beyond diarrhea (12). Overall, there are two manuscripts which said that diarrheal disease with significant relationship with stunting. Recurring diarrhea can disrupt linear growth due to impaired nutrient absorption in the body. Several studies stated that diarrheal disease is a major contributor to suboptimal child growth, making children more susceptible to nutritional problems, including stunting (27–30).

Implications for Public Health

The results of this study highlight the huge impact on public health, especially in efforts to reduce stunting rates in Indonesia. Research shows that personal hygiene habits, maternal health conditions during pregnancy, and history of diarrhea in mothers and children are directly related to the incidence of stunting. Poor hygiene habits and repeated infections can worsen a child's nutritional status, make them more susceptible to disease, and hinder overall growth and development. Therefore, hygiene behavior and attention to maternal health during pregnancy are important keys to supporting healthy child growth. To reduce the prevalence of stunting, strategic steps are needed in public health. Health programs must include education about maternal hygiene and health, campaigns to increase public awareness, and improved access to quality health services. In addition, the government must focus on reducing socio-economic disparities and developing adequate sanitation infrastructure. By adopting a multisectoral approach that includes education, health, and social policy, this effort is expected to have a significant positive impact in creating a healthier, smarter, and more productive generation of Indonesian children.

Limitations and Cautions

This systematic review has several limitations, including methodological variations in the studies analyzed. Differences in variable definitions, data collection techniques, and inclusion and exclusion criteria can affect the consistency of the results obtained. In addition, this review only includes articles in Indonesian and English, so it can potentially exclude relevant research written in languages or originating from other regions. This review also does not involve meta-analysis, so it cannot see associations in the variables analyzed.

Recommendations for Future Research

Based on the study's findings, which show a link between stunting and maternal health status, history of diarrhea, and personal hygiene, it is recommended to improve access to quality healthcare services and raise awareness about the importance of maternal health and hygiene. Additionally, effective management of diarrhea and improvements in nutrition, particularly for families with low socio-economic status, should be prioritized in efforts to prevent stunting. A comprehensive approach addressing various factors, including health, economic, and environmental aspects, is crucial to reducing the prevalence of stunting in Indonesia.

CONCLUSION

A study analysing 17 articles explored the relationship between personal hygiene, maternal health status, and a history of diarrhea with stunting in Indonesia. The findings revealed that maternal hygiene behavior, health during pregnancy, and recurrent diarrhea in mothers or children significantly influence the prevalence of stunting—a condition marked by chronic malnutrition and impaired growth in children. Poor hygiene practices and infections worsen children's nutritional status and increase their vulnerability to diseases, emphasizing the critical role of maternal health and hygiene in supporting optimal child development.

While most studies identified a clear link between these factors and stunting, two articles reported no significant relationship between maternal hygiene practices or diarrhea incidence and stunting prevalence. These findings suggest that other factors—such as socio-economic status, dietary habits, healthcare access, and environmental or genetic influences—also contribute to stunting. This complexity highlights the need to consider the broader interplay of determinants affecting stunting in children.

To address stunting effectively, targeted interventions should be prioritized at policy and community levels. Policymakers should focus on improving maternal hygiene and health through education, awareness campaigns, and integrating hygiene promotion into maternal healthcare. Additionally, efforts must enhance healthcare access, reduce socio-economic disparities, and improve sanitation infrastructure. A holistic, multi-sectoral approach addressing both immediate and underlying factors is essential to reduce stunting prevalence and ensure healthier futures for children in Indonesia.

AUTHOR'S CONTRIBUTION STATEMENT

The tasks in preparing a systematic review have been designed with a clear division of roles among the authors. RR and AB, are responsible for helping with the substance of the writing. Meanwhile, ES and RE, assist in the adjustment of the writing systematics and conduct a final review of the manuscript to ensure the quality and consistency of the content before completion. This division of tasks is carried out so that preparing a systematic review becomes more efficient and produces comprehensive work.

CONFLICTS OF INTEREST

The authors declare that they have conflict of interest related to this publication.

SOURCE OF FUNDING STATEMENTS

The authors received no specific grant from any agency (public, commercial, or not-for-profit) for this research.

ACKNOWLEDGMENTS

Conveyed to all parties involved in writing this article, especially for Sriwijaya University which has facilitated literature searching, ethical studies, and others.

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