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Submission date: 07-Jul-2023 01:30PM (UTC+0700)

Submission ID: 2127600591

File name: document_17.pdf (398.18K)

Word count: 5090

Character count: 28396

Analysis of environmental factors with the incidence of stunting in toddlers (literature review)

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Accepted: 23 November 2022; revision: 01 June 2023; published: 30 June 2023

Abstract

Background: The potential for a pandemic to trigger an increase in the malnutrition crisis in 2020 is that 132 million people suffer from hunger and 370 million school-age children do not receive adequate food, as well as 6.7 million. The potential for triggering a pandemic triggering a malnutrition crisis in 2020 is that 132 million people suffer and 370 million school-age children do not get enough food, and 6.7 million neglected children in addition to 2019 before the pandemic 47 million children are deprived and 14 million children stunting. The problem of malnutrition is caused by environmental factors (insufficient sanitation and drinking water source, inadequate health services, low knowledge of maternal nutrition, and poor feeding practices). The purpose of the study was to analyze environmental factors with the incidence of stunting in children under five based on the results of internationally published health research.

Method: The research design is a literature review, by conducting a literature search through international journal articles from 2018-2022 regarding stunting in toddlers. Correlation research articles used cross-sectional, case-control and cohort studies. The research population is all research articles in published journals regarding the analysis of environmental factors with the incidence of stunting in toddlers through the ScienceDirect, Biomed Central, PubMed, SAGE journals, ProQuest and Google Scholar databases, while the sample is the relevant articles.

Results: The incidence of stunting is still high in Indonesia with a prevalence rate of 19%-61.8%, mostly caused by environmental factors including sources of drinking water, sanitation facilities and latrines as well as hygiene practices.

Conclusion: Environmental factors are factors related to the incidence of stunting in toddlers.

Keywords: Stunting, Environmental Factors, literature review

Abstrak

Latar Belakang: Potensi pandemi memicu meningkatnya krisis malnutrisi tahun 2020 yaitu 132 juta orang menderita kelaparan dan 370 juta anak usia sekolah tidak mendapat makanan yang memadai, serta 6,7 juta anak terlanjar sebagai tambahan dari tahun 2019 sebelum pandemi sebanyak 47 juta anak wasting, 144 juta anak stunting. Masalah kurang gizi disebabkan oleh faktor lingkungan (sanitasi dan sumber air minum yang tidak memadai), pelayanan kesehatan yang tidak memadai, rendahnya pengetahuan gizi ibu, dan praktek pemberian makanan yang buruk. Tujuan penelitian untuk menganalisis faktor lingkungan dengan kejadian stunting pada balita berdasarkan hasil penelitian kesehatan terpublikasi secara internasional.

Metode: Desain penelitian adalah literatur review, dengan melakukan penelusuran kepustakaan melalui artikel jurnal internasional dari tahun 2018-2022 tentang stunting pada balita. Artikel penelitian korelasi menggunakan studi cross sectional, case control dan cohort. Populasi adalah seluruh artikel penelitian pada jurnal terpublikasi internasional melalui database ScienceDirect, Biomed Central, PubMed, SAGE journals, ProQuest dan Google Scholar, sedangkan sampel adalah artikel yang relevan.

Hasil: Kejadian *stunting* masih tinggi di Indonesia dengan angka prevalensi dari 19%-61,8%, sebagian besar disebabkan oleh faktor lingkungan diantaranya sumber air minum, fasilitas sanitasi dan fasilitas jamban serta praktik higiene.

Kesimpulan: Faktor lingkungan merupakan faktor yang berhubungan dengan kejadian *stunting* pada balita.

Kata Kunci: *Stunting*, faktor lingkungan, kajian literatur

INTRODUCTION

Nutrition is a major factor in child mortality, disease and disability. Factors related to nutrition contribute around 45% of under-five deaths, including low birth weight, malnutrition, children who are not given breast milk (non-breastfeeding) and an unhealthy environment (1).

Malnourished children have weak immune systems and may have a greater risk of death from Covid 19. This condition has increased due to the deteriorating quantity and quality of food and various other shocks. Mitigation efforts undertaken disrupt the food system, health and nutrition services, undermine livelihoods and threaten food security. The potential for a pandemic to trigger an increase in the malnutrition crisis in 2020, namely 132 million people suffer from hunger and 370 million school-age children do not receive adequate food, as well as 6.7 million abandoned children in addition to 2019 before the pandemic of 47 million wasted children and 144 million stunted children (2).

Stunting in children is a form of malnutrition. Based on the 2016 World Bank global database on Child Malnutrition Estimates, in 2013 there were ten countries with a stunting prevalence of >30.0%. Afghanistan is the largest stunting contributing country for South Asia Regions, namely 40.9%, followed by Bangladesh 38.7%. Indonesia ranks first in the prevalence of stunting from the South-East Asia Regions, namely 36.4% and the Philippines 30.3%. Compared to 2007, South-East Asia Regions (Timor Leste 53.9%) occupy number 1 with the largest prevalence of stunting in the world, followed by South Asia Regions occupying number 4, namely Bangladesh 43.2%. This illustrates that most stunting occurs in Asia, especially in South Asia and Southeast Asia, but not as high as Africa.

Stunting is a public health problem in almost all developing countries and is a global problem faced by many countries in the world (3).

The problem of malnutrition is caused by environmental factors (inadequate sanitation and drinking water sources), inadequate health services, low knowledge of maternal nutrition, poor feeding practices and low household food security (4). UNICEF states that in developing countries, unsafe water and poor sanitation and hygiene impact a child's nutrition, growth and development through repeated bouts of diarrhea, parasitic or worm infections (2). The impact of shortness on children can reduce intelligence, increase morbidity and mortality, reduce productivity and can be inherited (intergenerational) in adults, pregnant women, and at every stage of the life cycle (5).

Poor sanitation factors have a significant influence on the incidence of stunting in children under five and have a risk of experiencing stunting of up to 5.0 times. The factor of poor sanitation is the dominant factor in the risk of children experiencing stunting (6). Environmental sanitation and disease infection are one of the determining factors for stunting in children under five. To overcome the problem of stunting, children under five need appropriate interventions regarding health hygiene practices and healthy behavior so as to enable the creation of good environmental sanitation conditions and avoid the threat of infectious diseases originating from the environment (7). In making prospects for tackling stunting and achieving the WHA (World Health Assembly) target in 2025 to reduce the prevalence of stunting by 40% in all countries, it is very important to apply the evidence-based principle as an important step in breaking the

vicious cycle of intergenerational malnutrition, chronic disease and poverty (8).

The purpose of this research using a literature review approach is to analyze environmental factors with the incidence of stunting in toddlers based on the results of health research published internationally.

METHOD

The research design is a literature review, by conducting a literature search through articles in international journals from 2018-2022 according to the research topic, resulting in writing on a particular topic or issue. The selected articles are correlation research articles using cross-sectional and case-control studies. The respondents were toddlers aged 0-59 months.

The population of this study was all research articles in published journals on the analysis of environmental factors with stunting in toddlers through the ScienceDirect, Biomed Central, PubMed, SAGE journals, ProQuest and Google Scholar databases, while the sample was the relevant articles. In this study, contact with research in related fields or manual tracing was not carried out.

The inclusion criteria are research articles that examine the analysis of environmental factors with the incidence of stunting in toddlers and use primary data and Demographic and Health Survey data. Data

collection was carried out by determining the required variables with a literature study.

RESULTS

Based on the study search and title review, irrelevant articles were excluded, and then the abstract was reviewed. Furthermore, the article is reviewed in full-text form. Literature reviews were conducted on 25 international published studies (16 cross-sectional, 8 case controls and 1 cohort). Utilization of literature, most studies use 9-65 pieces of literature, either in the form of books, magazines, bulletins, or journals about stunting and environmental factors.

This research was conducted from 2018-2022 and published through the ScienceDirect database, Biomed Central, PubMed, SAGE journals, ProQuest and Google Scholar from 2018-2022. Most of these studies used primary data (19 studies) and 6 studies used data from the Indonesia Family Life Survey (IFLS), the MYCNSIA end-line survey data and The 2013 Indonesia Basic Health Survey.

Table 1 also shows an overview of the research. The sample studied numbered 54234 children and was quite diverse ranging from 51-24657 children with an average of 2170 children. The average sample is 0-59 months old. This research was conducted in various regions in Indonesia.

Table 1. Overview of Research

Researcher (Name, Year, Journal Source)	Total and Sample Age	Data Source	Research Design	Research Sites
1. Wiyono S, <i>et al.</i> , 2018 (9) <i>Academia</i>	348 (6-35 months)	Primary data	<i>Cross sectional study</i>	Banyumas, Jawa Tengah
2. Hasanah U, <i>et al.</i> , 2020 (10) <i>Macedonia Journal</i>	150 (7-24 months)	Primary data	<i>A case-control study design</i>	Ambon
3. Shofifah A, <i>et al.</i> , 2022 (11) <i>Journal of Environmental Health</i>	51 0-59 months	Primary data	<i>A case-control research design</i>	Bojonegoro
4. Yunitasari, <i>et al.</i> , 2022 (12) <i>Children</i>	154 0-23 months	Primary data	<i>Cross sectional study</i>	Jawa Barat
5. Wicaksono <i>et al.</i> , 2021 (13) <i>Paediatrica Indonesiana</i>	194 1-60 bulan	Primary data	<i>A case-control study design</i>	Lawe Alas, Aceh Tenggara

Researcher (Name, Year, Journal Source)	Total and Sample Age	Data Source	Research Design	Research Sites
6. Hasanuddin <i>et al.</i> , 2021 (34) <i>IOP Conference Series: Earth and Environmental Science</i>	98 0-59 bulan	Primary data	<i>A case-control study design</i>	Donggala, Sulawesi Tengah
7. Inti <i>et al.</i> , 2019 (15) <i>IOP Conference Series: Earth and Environmental Science</i>	2571 0-59 bulan	11 the Indonesia Family Life Survey (IFLS)	Cross sectional study	Indonesia
8. Mulyaningsih <i>et al.</i> , 2021 (16) PLOS ONE	8045 0-59 bulan	the Indonesia Family Life Survey (IFLS)	26 Cross sectional study	Indonesia
9. Rah, Jee H, <i>et al.</i> , 2020 (17) <i>Maternal and Child Nutrition</i>	1450 6-35 bulan	the MYCNSIA end line survey data	Cross sectional study	Papua, Jawa Tengah, NTT
10. Suciyanti <i>et al.</i> , 2021 (18) <i>Preprints</i>	196 24-59 bulan	Primary data	Cross sectional study	NTT
11. Kamila P, Salami I, (36) (22) <i>IOP Conference Series: Earth and Environmental Science</i>	75 0-59 bulan	Primary data	Cross sectional study	Bandung
12. Titaley <i>et al.</i> , 2019 (20) <i>Nutrients</i>	24657 0-24 bulan	The 2013 Indonesia Basic Health Survey	Cross sectional study	Indonesia
13. Nur T, Lukman E, <i>et al.</i> , 2021 (21) <i>J. Gizi Pangan</i>	90 12-59 bulan	Data primer	Cross sectional study	Gowa, Sulawesi selatan
14. Hanifah, L, <i>et al.</i> , 2018 (22) <i>Mal J Nutr</i>	1609 0-23 bulan	Indonesia Family Life Surveys (IFLS)	Cross sectional study	Indonesia
15. Choirunnisa <i>et al.</i> , 2020 (23) <i>STRADA Jurnal Ilmiah Kesehatan</i>	74 25-59 bulan	Data primer	Cross sectional study	Tasikmalaya
16. Banudi <i>et al.</i> , 2020 (24) <i>Medico-legal Update</i>	245 6-24 bulan	Primary data	Cross sectional study	Kendari dan Semarang
17. Putri, S.I and Hedo, (24) (21) (25) <i>Journal of Xi'an Shiyou University, Natural Science Edition</i>	10213 0-59 bulan	Primary data	retrospective cohort study design	Kendari
18. Belutowe <i>et al.</i> , 2022 (26)	89 0-59 bulan	Primary data	Cross sectional study	Lembata, NTT

Researcher (Name, Year, Journal Source)	Total and Sample Age	Data Source	Research Design	Research Sites
19. Novianti S & Nurjaman A, 2022 (27) <i>Timorese Journal of Public Health</i>	102 0-24 bulan	Primary data	A case-control research design	Tasikmalaya
20. Kusumawardani et al., 2019 (28) <i>International Journal of Health Science & Medical Research</i>	220 12-36 bulan	Primary data	A case-control research design	Jember, Indonesia
21. Sugiyanto J, et al., 2019 (29) <i>Journal of Epidemiology and Public Health</i>	225 6-59 tahun	Primary data	A case-control research design	Bontang, Kalimantan Timur, Indonesia
22. Otsuka et al., 2019 (30) <i>American Journal of Tropical Medicine and Hygiene</i>	228	Primary data	Cross sectional study	Bandung, Jawa Barat, Indonesia
23. Ramaningrum et al., 2022 (31) <i>South East Asia Nursing Research</i>	90 24-59 bulan	Primary data	A case-control research design	Rembang
24. Hasanah I and Susanti, Hera, 2018 (32) <i>Open Access Macedonian Journal of Medical Sciences</i>	2835 0-59 bulan	Indonesia Family Life Surveys (IFLS)	Cross sectional study	Indonesia
25. Diana et al., 2021 (33) PLOS ONE	622 6-12 bulan	Indonesia Family Life Surveys (IFLS)	Cross sectional study	Indonesia
Total	54234			
Mean	2170			
Min	51			
Max	24657			

Source: Stunting Research Article, processed

Table 2. Study Characteristics

Researcher	Stunting incidence	Relationship Analysis
1. Wiyono S, et al., 2018 (9)	Z-Score mean HAZ - 0.5722±1.646	There is a relationship between toilet cleanliness and stunting ($p < 0.05$).
2. Hasanah U, et al., 2020 (10)	Case 75 control 75	WASH conditions and low birth weight status are risk factors for stunting in children aged 7–24 months in Ambon.
3. Shofifah A, et al., 2022 (11)	33,3%	The sanitary environment at home with a history of infectious diseases has a significant relationship with the incidence of stunting in toddlers. Toddlers who live in families with poor sanitation at home have a 5.9 times higher risk of stunting compared to those with adequate environmental sanitation (OR = 5.921)

Researcher	Stunting incidence	Relationship Analysis
4. Yunitasari, <i>et al.</i> , 2022 (12)	29,5%	Inadequate sanitation and untreated water sources are risk factors for stunting in toddlers.
5. Wicaksono <i>et al.</i> , 2021 (13)	Case 97 Control 97	Inadequate sanitation and water sources are risk factors for stunting in toddlers.
6. Hasanuddin <i>et al.</i> , 2021 (14)	Case 49 Control 49	Factors from the availability of clean water, ownership of a latrine and the habit of washing hands with soap have a significant relationship with the incidence of stunting ($p < 0.05$).
7. Irianti <i>et al.</i> , 2019 (15)	21,58%	Inadequate sources of drinking water and inappropriate waste collection are related to the incidence of child stunting. Inadequate sanitation facilities were not found to significantly affect the likelihood of stunting.
8. Mulyaningsih <i>et al.</i> , 2021 (16)	26,29%	The risk of stunting is higher for children living in communities without access to water, sanitation and hygiene. Lack of access to WASH is associated with stunting among children in Indonesia. Children are more susceptible to diarrhea, intestinal worm infections and environmental enteropathy if the household has poor WASH facilities.
9. Rah, Jee H, <i>et al.</i> , 2020 (17)	26%	Children with better sanitation facilities had a 29% reduced likelihood of being stunted compared to those in households with no sanitation facilities. Source of drinking water was not associated with stunting or anemia among children. There is no synergistic effect of household sanitation and water supply on stunting and anemia.
10. Suciyanti <i>et al.</i> , 2021 (18)	29,9%	Multivariate analysis showed that households with unsafe drinking water (AOR 1.702; 95% CI 0.825 – 3.512) had significant independent risk factors for stunting after adjusting for child sex, father's occupation, educational caregiver, monthly expenditure, sanitation facilities, and food security status.
11. Kamila P, Salami I, 2022 (19)	36%	There is a relationship between access to sanitation and the incidence of stunting in toddlers.
12. Titaley <i>et al.</i> , 2019 (20)	33,7%	A higher wealth index reflects an increase in a household's ability to purchase and access good quality food and adequate health care services, as well as improved sanitation and safe drinking water facilities.
13. Nur T, Lukman E, <i>et al.</i> , 2021 (21)	52,2%	There is no relationship between environmental sanitation and hygiene with the incidence of stunting in toddlers.
14. Hanifah, L, <i>et al.</i> , 2018 (22)	32,6%	There is a significant relationship between environmental sanitation status and the incidence of stunting.
15. Choirunnisa <i>et al.</i> , 2020 (23)	22,3%	There is a relationship between environmental sanitation and stunting.
16. Banudi <i>et al.</i> , 2020 (24)	57,1%	Unprotected drinking water sources and inadequate latrines are risk factors for stunting.
17. Putri, S.I and Hedo, 2021 (25)	Not stated in the article	There is a relationship between sanitation facilities and incidence of stunting in toddlers.
18. Belutowe <i>et al.</i> , 2022 (26)	61,8%	There is no relationship between hygiene and sanitation practices with the incidence of stunting in toddlers.

Researcher	Stunting incidence	Relationship Analysis
19. Novianti S & Nurjaman A, 2022 (27)	Case 51 Control 51	The results of the study found a relationship between access to sanitation (p-value = 0.034, OR = 4.02) and access to drinking water (p-value = 0.006, OR = 4.453) and the incidence of stunting.
20. Kusumawardani et al., 2019 (28)	Case 110 Control 110	Sources of clear water, drinking water and sanitation affect the incidence of stunting in children.
21. Sugiyanto J, et al., 2019 (29)	32%	The risk of stunting increases with poor environmental sanitation.
22. Otsuka et al., 2019 (30)	36,4%	There is a relationship between the source of drinking water and the incidence of stunting.
23. Ramaningrum et al., 2022 (31)	Case 45 Control 45	There is a relationship between environmental sanitation and the incidence of stunting in toddlers.
24. Hasanah I and Susanti, Hera, 2018 (32)	Not stated in the article	Children living in households with poor sanitation have a 45 times higher probability of being stunted than children living in households with proper sanitation. When children living in unprotected water are more likely to experience stunting 0.874 times but it is statistically significant.
25. Diana et al., 2021 (33)	19%	There is a relationship between the source of drinking water and the incidence of stunting. However, there is no relationship between sanitation facilities and the incidence of stunting.

Source: Stunting Research Article, processed

Table 2 shows that the incidence of stunting is still high in Indonesia with a prevalence rate of 19% -61.8%. Most stunting incidents are caused by environmental factors including sources of drinking water, sanitation facilities and latrines as well as hygiene practices. In table 3 it can be concluded that the factors that have been studied the most are environmental sanitation and the most influencing the incidence of stunting in toddlers are environmental sanitation and sources of drinking water.

Table 3. Research distribution based on the variables studied and analysis of the relationship with stunting

Environmental Factor	Researched Variables		Relationship	
	n	%	+	-
Source of drinking water	13	34	12	1
Environment sanitation	18	47	14	4
Hygiene	3	8	1	2
Latrine use	3	8	3	0
Rubbish	1	3	1	0
Total	38	100	31	7

DISCUSSION

Stunting in children is a form malnutrition. Stunting is failure to be tall or short, is the impact of failure to thrive in the previous period, assessed by height (TB) body length (PB) for age (U) less than -2 standard deviations (SD) from the median child growth standard (34).

Another factor that is closely related to the incidence of stunting is the factor of water and environmental sanitation. Poor sanitation will cause disease and infection in the digestive tract or what is called environmental enteric dysfunction. One of the diseases caused by poor sanitation is diarrhea. Diarrhea has a role in the incidence of stunting. Children who are stunted have a high frequency of diarrhea. These conditions will cause disruption of the child's linear growth. Water sanitation and hygiene (WASH) which consists of sources of drinking water, clean quality of drinking water, ownership of latrines and hygiene. WASH can have a negative impact on toddlers and contribute greatly to the incidence of diarrhea

in children, which in turn has impaired growth and even increases death (35).

WHO more comprehensively describes the direct and indirect impacts and causes of stunting. The direct causes of stunting are related to infectious diseases, breastfeeding practices, food availability, and the household and family environment (mother and home environment factors). Maternal factors include malnutrition during preconception, pregnancy and breastfeeding, short mothers, infections, pregnancy as a teenager, mental health, Intra Uterine Growth Retardation (IUGR) and premature birth, short gestation intervals and hypertension. Environmental factors in the form of low household food security, lack of stimulation of toddler development, poor toddler care, inadequate sanitation and clean water facilities and low knowledge of maternal nutrition (4).

Environmental characteristics, including the quality of water and sanitation, have a strong relationship with stunting. The poor quality of water and sanitation causes the development of various diseases, causing the growth and development of children to be not optimal (32).

Elimination of stunting in toddlers must pay attention to environmental factors such as water, hygiene and sanitation and accelerate the fulfillment of access to clean water, especially in Indonesia and monitoring the quality of drinking water at the household level, such as conducting periodic surveys by the health center or local health office (36).

CONCLUSIONS

Based on the results of the literature review above, environmental factors in the form of sources of drinking water and environmental sanitation are factors related to the incidence of stunting in toddlers. Nutrition from an early age is an important indicator in the framework of human resource development by providing interventions in order to improve nutritional status, through the provision of environmental quality, especially improving the quality of water sources and environmental sanitation. Poor quality water and sanitation is one of the reasons for the development of various forms

of diseases such as diarrhea and other infectious diseases. The government's role in improving the quality of water and sanitation will have a major impact on health, especially for toddlers who are vulnerable to disease and stunting.

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