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# The Relationship Between Water Quality and Stunting in Indonesia: Literature Review

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**Abstract:** A toddler who is stunting likely has a long-term nutritional problem since they are shorter than other children their age. Stunting is a problem that is brought on by environmental sanitation issues, such as water quality does not meet requirements. The purpose of this study is to summarize the existing research on the topic of the association between stunting and water quality in Indonesia. The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) meta-analysis strategy is used in the study process together with the literature review methodology. If drinking water satisfies physical, microbiological, chemical, and radiological standards, it is safe for human consumption. Good water is defined as being no cloudy, tasteless, odorless, and colorless based on the physical criteria. Toddlers who drink clean water that is turbid or colored often get diarrhea. From some research results, there is a relationship between water quality and stunting in Indonesia. Toddlers will contract infectious infections that result in stunting if the drinking water quality does not match the standards.

**Keywords**: Sanitation; Stunting; Water quality

## Introduction

Stunting, a long-term nutritional issue in toddlers, is indicated by a shorter height than other kids their age (Ernawati et al., 2014). When adults are at risk for having degenerative diseases, children who are stunted will be more sensitive to two diseases (Djauhari, 2017). Childhood stunting is an issue that affects pain, death, stunted physical growth, stunted mental development, stunted cognitive development, and stunted motor development. The development that follows disorders usually has an impact and is usually irreversible (de Onis & Branca, 2016).

The availability of water and sanitation facilities, as well as environmental factors including contaminated water and poor hygiene habits, all contribute to stunting. Stunting in Indonesia is also linked to subpar maintenance techniques, insufficient sanitation and water supply, and lack of access to food and water (Beal et al., 2018). 60% of all diarrhea-related deaths occur in low- and middle-income countries, where around 827,000 people per year pass away from poor access to water, sanitation, and hygiene. 432,000 deaths each year are primarily caused by poor sanitation. The deaths of 297,000 children under the age of five each year could be prevented with better access to water, sanitation, and hygiene (WHO, 2019).

Infectious disorders like diarrhea, *Environmental Enteric Dysfunction* (EED), and intestinal worms are on the rise in part due to factors of poor environmental sanitation, such as limited access to clean water, improper latrine use, and poor handwashing hygiene behavior. The syndrome can result in problems of linear growth and raise infant mortality rates (Headey & Palloni, 2019). Based on data from WHO in 2018, one of the nations with a high prevalence of stunting is Indonesia. In Indonesia, the average rate of stunting in children under five between 2005 and 2017 was 36.4%. Stunting can result from a variety of reasons, not just inadequate nutrition encountered by pregnant women and young children (Putri et al., 2015). Poor parenting techniques, a lack of ANC (Ante Natal Care) services, quality post-partum care, and quality early learning, a family's inability to get nourishing food, clean water, and sanitary facilities are a few of these problems (Tim

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Nasional Percepatan Penanggulangan Kemiskinan, 2017).

Stunting will be correlated with the socioeconomic and hygienic conditions of the home since the availability of health care for infants, pregnant mothers, and toddlers is directly correlated with economic conditions. Meanwhile, food safety and sanitation could raise the danger of infectious diseases. According to SDGs 6.1 and 6.2, access to water, sanitation, and hygiene is still a problem for global public health. Although access to water, sanitation, and hygiene (WASH) services has increased significantly over the past 30 years, an estimated two billion people still do not have access to managed drinking water, 3.6 billion do not have access to safe sanitation, and 2.3 billion do not have access to basic hygiene services (World Health Organization, 2021). Poor water, sanitation, and hygiene conditions lead to increased exposure to fecal infections from both human and animal sources (Rah et al., 2020).

According to a study on the quality of household drinking water undertaken by the Ministry of Health, 7 out of 10 families in Indonesia use drinking water facilities (SAM) that contain *Escherichia coli*. The ready-to-drink water likewise included these E. coli and total coliform values. Drinking water treatment still falls short of health standards, and a number of other issues must be taken into consideration. These include the cleanliness of areas where ready-to-drink water is kept, how long it is kept there, the cleanliness of the facilities where the water is kept, and the cleanliness of hands that can contaminate the water. Another study found that children under the age of two have better access to sanitation where they live and are about 5 points less stunted, whereas kids who live in open-defecation-free neighborhoods during their most critical developmental years are about 10 points less stunted than kids who do the same in other household communities (Cameron, 2021).

Water quality has a big impact on the occurrence of stunting in early kids and toddlers. The purpose of the article review study is to offer data on the association between Indonesian stunting and water quality so that it may be utilized as a reference point by other researchers and the general public.

Therefore, this literature review is conducted to thoroughly investigate and analyze the relationship between water quality and the prevalence of stunting in Indonesia. This research is crucial because water quality is a key factor in maintaining public health. By delving into the correlation between water quality and stunting, this study will provide a better understanding of the influence of water quality on children's health and its implications on the high prevalence of stunting in Indonesia. The insights gained from this research will serve as a foundation for formulating more effective prevention and intervention strategies to address stunting through improvements in water quality. Moreover, this research is also significant to fulfill the need for focused data and literature specific to the Indonesian context, aiming to bridge knowledge gaps and guide the development of more precise policies and interventions.

## Method

*Research Methods*

The literature review method is the one used in this study. Figure 1 illustrates the steps in the selection of the identified articles using the literature review research method.

Identifies and evaluates theories and methodologies from research findings that are pertinent to a specific topic. Using the *Preferred Reporting Items for Systematic Review and Meta-Analysis* (PRISMA) methodology, this step of the research collects, identifies, assesses, and interprets data.

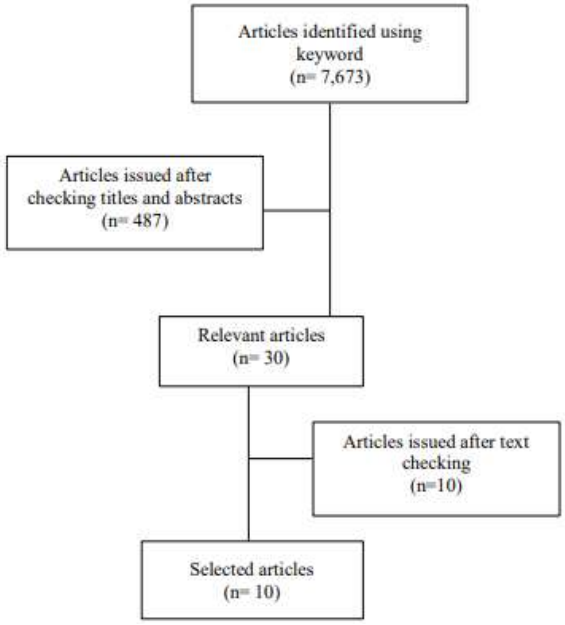


**Figure 1.** Article selection flow

*Inclusion Criteria*

The relationship between water quality and stunting in Indonesia, articles citing national journals written in Indonesian, original research articles or not literature reviews in the last 10 years are the inclusion criteria for this study, which are then taken for analysis.

*Search Keywords*

Keywords and Boolean operators (AND, OR) were employed in the papers in this study. In June 2023, a search was done. Google Scholar, PubMed, and the

Google search engine were employed in the database source's searches. The information sought comprises papers that were published between 2014 and 2023 and that had the keywords sanitation, water quality, and stunting.

## Results and Discussion

7,673 articles were found based on the findings of the literature review that was done to determine the connection between Indonesian stunting and water quality. Additionally, 30 papers that were relevant to determining which articles matched the criterion for inclusion were obtained along with 487 articles that were issued. 10 articles were ultimately chosen because they were feasible.

Based on the findings of a literature evaluation of articles over the past ten years of study that can be used for systematic reviews. According to the findings of the literature research, Indonesian stunting and water quality are related. Table 1 provides a summary of the study's findings.

**Table 1**. Summary of Data Descriptions

| Heading | Author | Method | Result |
|---|---|---|---|
| Beyond personal factors: Multilevel determinants of childhood stunting in Indonesia. | (Mulyaningsih et al., 2021) | Cross-sectional | The risk of stunting is higher in children living in communities without access to water, sanitation, and Hygiene. |
| Drinking Water, Sanitation, and Hygiene as Stunting Risk Factors in a Rural Area | (Hasan et al., 2022) | Case control | Access to drinking water in this study in Categorize into 4 categories based on definition of SDGs, namely Safe Drinking Water, Water drink worth yourself, drinking water worth together, drinking water is not worth it. Analysis results multivariate in individuals with water access drinking is not worth the risk of 4.62 times experiencing stunting OR=4.62 with (95%CI:1.924-11.077), individuals who have access to adequate drinking water together at 5.80 times risk of stunting OR=5.80with (95%CI:2.469-13.609), individual who have access to their own decent drinking water 4.59 times risk of stunting OR=4.59 with (95%CI:1,931-10,920) compared with access to safe drinking water |
| Water, sanitation, and hygiene as a priority intervention for stunting in under-five children in northwest Ethiopia: a community-based cross-sectional study. | (Ademas et al., 2021) | Cross-sectional | Inadequate sources of drinking water, poor sanitation, practices poor hygiene, diarrhea in 2 Weeks related to stunting. |
| Water, Sanitation, and Hygiene: Linkages with Stunting in Rural Ethiopia | (Kwami et al., 2019) | wider controlled | The results of this study have similarities with the findings of research in Indonesia, Research in Ethiopia revealed that Drinking water sources associated with events Stunting in children under five |
| Stop stunting: improving child feeding, women's nutrition and household sanitation in South Asia | (Aguayo & Menon, 2016) | Case control | Non-compliant drinking water the terms come from unqualified sources, The distance of the water source is too close to the latrine, water Those that are not processed before consumption can causes infectious diseases in children who resulting in inhibition of nutrient absorption and will cause children to experience stunting. |
| Identification of Environmental Sanitation Factors in Families with stunting toddlers in mobile villages Fort Ulu, Banjar Regency | (Ulfah et al., 2021) | Quantitative descriptive | It was found that 40.38% of families with stunted toddlers use river water as a source drinking water, 11.63% manage drinking water by depositing, 9.30% have drinking water quality the murky |
| The relationship between water and sanitation with the incidence of stunting in the work area of UPT Puskesmas | (Mayasari et al., 2022) | Quantitative analytics | 31 respondents of the case group (Stunting) who were stunted as much as 83.9% with water quality that did not meet the requirements. The results of the statistical test obtained p-value = 0.005 which means p>α = 0.05 (Ha accepted and Ho rejected), it can be concluded that there is |

| Heading | Author | Method | Result |
|---|---|---|---|
| Candipuro, South Lampung Regency Year 2021 | | | a relationship between water quality and stunting in the working area of the UPT Puskesmas Candipuro South Lampung in 2021. An OR value of 4,875 means that unqualified water quality has a 4,875 times greater risk of stunting than respondents with qualified water quality. |
| The role of drinking water source, sanitation, and solid waste management in reducing childhood stunting in Indonesia | (Irianti et al., 2019) | Regression analysis | The results of research in Indonesia show that the water factor includes drinking water sources Un-improved, drinking water treatment can increase the incidence of stunting in toddlers. Most stunted toddlers live in Rural areas experiencing difficulties in accessing safe drinking water sources. |
| Risk Factors for Undernutrition and Diarrhea Prevalence in an Urban Slum in Indonesia: Focus on Water, Sanitation, and Hygiene | (Otsuka et al., 2019) | Cross-sectional | Research results declare consuming households Drinking water sourced from piped drinking water can increase the incidence of stunting in children compared to households that using tank and well water. It can occur when the quality of piped drinking water is used by households, does not meet Requirements based on Permenkes RI No. 492/2010. Quality of drinking water that is not meet requirements that may lead to the child suffers from an infectious disease that leads to on stunting. |
| Determinants of stunting among children aged 6-59 months at Kindo Didaye woreda, Wolaita Zone, Southern Ethiopia: Unmatched case control study | (Batiro et al., 2017) | Case control | Water consumption from unfit sources, increase the risk of stunting seven times in children |

Based on literature review studies, data obtained from several studies that have been proven the relationship between water quality and stunting include:

*The Relationship between Water Quality and Stunting*

The World Health Organization (WHO) states that stunting has both direct and indirect causes. Things like water, sanitation, and environmental factors are examples of indirect causes. By diverting energy from the body's potential to grow to its capacity to fight illness, infectious diseases can become more common due to a lack of access to clean water and inadequate sanitation facilities. This can limit growth. Stunting is more common in households without access to clean water (59.3%) and in those that do not treat or heat their drinking water (93.2%). According to the history of toddler diarrhea, stunting is more common in toddlers who have experienced diarrhea frequently (66.1%) (Ahmad & Nurdin, 2019). Infectious disorders like diarrhea, *Environmental Enteric Dysfunction* (EED), and intestinal worms are on the rise in part due to factors of poor environmental sanitation, such as limited access to clean water, improper latrine use, and poor handwashing hygiene behavior. The syndrome can result in problems of linear growth and raise infant mortality rates (Olo et al., 2021). Diarrhea and EED are intestinal infection illnesses that can damage a child's nutritional status because they impair nutrient absorption, decrease appetite, and induce malnutrition and growth abnormalities that result in stunting. (Owino et al., 2016).

Stunting is linked to inadequate drinking water sources, unsanitary conditions, poor hygiene habits, and diarrhea that lasts longer than two weeks (Ademas et al., 2021). The results of this study have similarities with the findings of research in Indonesia, research in Ethiopia revealed that drinking water sources associated with events stunting in children under five (Kwami et al., 2019). According to the findings, toddlers who used unclean drinking water sources had a stunting rate of up to 62.2%, whereas toddlers who used clean drinking water sources had a stunting rate of up to 15.8%. There is a correlation between the use of drinking water sources and the incidence of stunting in toddlers in Palangkau Village, UPT Palangkau Health Center Working Area in 2021, according to the results of the Pearson Chi-Square test, which had a P-value= 0,003 < α= 0,05. The Barito River, which has turbid water from the numerous activities of large ships like coal barges, tributary channels from trans, and palm oil companies, is still used by the majority of mothers of toddlers. This has an effect on the health of toddlers, especially stunted toddlers (Ariyanto et al., 2021).

According to the findings, river water is used as a source of drinking water by 40.38 percent of homes with

stunted toddlers, 11.63% manage drinking water by depositing, and 9.30% have turbid drinking water quality (Ulfah et al., 2021). Consuming water from insufficient sources raises a child's chance of stunting seven times (Batiro et al., 2017). When water is not treated before being used, it can lead to viral disorders in kids, which prevent them from absorbing nutrients and result in stunting (Aguayo & Menon, 2016). Due to the fetus's lack of nutrient intake while it was growing inside the mother, stunted fetal growth can put children at risk for stunting in the future. If the child does not receive good nourishment after birth to help the growing process, the problem will only become worse (Mardihani & Husain, 2021).

Based on research Mayasari et al. (2022) 31 responders from the case group (Stunting) had water quality problems, causing them to be stunted by as much as 83.9%. The results of the statistical test showed that the association between water quality and stunting in the UPT Puskesmas Candipuro South Lampung operating region in 2021 was p-value = 0.005, which is p> = 0.05 (Ha accepted and Ho refused). The risk of stunting is 4,875 times higher in subjects with unqualified water quality than in those with qualified water quality, according to an OR value of 4,875. According to Republic of Indonesian Minister of Health Regulation No. 492/MENKES/PER/IV/2010 on Drinking Water Quality Requirements, drinking water is considered safe for human consumption if it satisfies physical, microbiological, chemical, and radioactive standards. Good water is defined as beingno cloudy, tasteless, odorless, and colorless based on the physical criteria. Compared to households who use clean water that is not cloudy and colorless, turbid and colored clean water conditions can cause toddlers to have bloody diarrhea (Candra et al., 2014). Stunting and child mortality are primarily brought on by diarrhea.

Unimproved water sources and insufficient water treatment, according to an Indonesian study, might increase the prevalence of stunting in young children. Most stunted children under five live in rural areas with little access to good water sources (Irianti et al., 2019). Based on research households who utilize tank and well water for drinking have lower rates of stunting in children than those that use piped drinking water. This may occur if the household's piped drinking water does not fulfill the standards established by Permenkes RI No. 492/2010. Toddlers who consume water that doesn't match the standards may contract infectious infections that result in stunting (Otsuka et al., 2019). Children that consume water that does not meet the standards may contract infectious infections that result in stunting. When mothers provide toddlers with water that does not match the criteria, their growth and development will be impeded, which may result in stunting. Toddlers are particularly susceptible to infectious infections (Andriani et al., 2022).

## Conclusion

The quality of drinking water that does not meet the requirements will cause toddlers to suffer from infectious diseases that lead to stunting. There is a relationship between water quality and stunting in Indonesia.

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**Author Contributions**
Research articles with many authors must include a brief paragraph outlining each author's unique contributions. The phrases listed below ought to be utilized "Conceptualization, methodology, and data analysis, Hasmy Raharini and Elsa Yuniarti.; writing—original draft preparation, Hasmy Raharini.; resources, writing—review and editing, funding acquisition, Elsa Yuniarti. All authors have read and agreed to the published version of the manuscript."

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**Conflicts of Interest**
The authors say they have no conflict of interest.

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