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The Influence of Environmental Hygiene Factors and Water Consumption on Diarrhea: A Literature Review

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ABSTRACT

Diarrhea is a major cause of morbidity and mortality in all age groups and regions in the world. Environmental factors and drinking water are risk factors for diarrhea. it is important to examine the influence of environmental hygiene factors and drinking water on the incidence of diarrhea. Therefore, this study presents information regarding the influence of environmental cleanliness and drinking water on diarrhea by reviewing empirical studies in previous and current research. In order to identify the influence of environmental cleanliness and drinking water factors on the incidence of diarrhea, a review of literature collected from the PubMed, Scopus, Google Scholar databases in English and Indonesian was carried out. Literature taken from the last 10 years, namely from 2014 to 2024 and in the form of full text publications. Environmental sanitation factors and good drinking water play an important role in determining how susceptible a person is to gastroenteritis or diarrhea. The availability of clean drinking water is the most important factor in preventing diarrhea. Lack of clean water has emerged as one of the main factors causing diarrhea. Access to proper and clean drinking water is obtained from protected drinking water sources, including tap water (taps), public hydrants, public taps, water terminals, rainwater reservoirs or protected springs and wells, drilled wells/pumps that are at least a distance away 10 meters from waste disposal facilities can prevent diarrhea.

Keywords: Diarrhea, Drinking water, Environmental risk, Hygiene, Sanitation

ABSTRAK

Diare merupakan penyebab utama kesakitan dan kematian pada semua kelompok umur di dunia. Faktor lingkungan dan air minum kotor merupakan faktor risiko terjadinya diare. Penting untuk mengetahui pengaruh faktor kebersihan lingkungan dan air minum terhadap kejadian diare. Tinjauan literatur ini menyajikan informasi mengenai pengaruh kebersihan lingkungan dan air minum terhadap diare dengan meninjau studi empiris pada penelitian terdahulu dan penelitian saat ini. Untuk mengetahui pengaruh kebersihan lingkungan dan faktor air minum terhadap kejadian diare, dilakukan kajian literatur yang dikumpulkan dari database PubMed, Scopus, Google Scholar dalam bahasa Inggris dan bahasa Indonesia. Pustaka diambil dalam kurun waktu 10 tahun terakhir yaitu tahun 2014 sampai dengan tahun 2024 dan berbentuk terbitan *full paper*. Faktor sanitasi lingkungan dan air minum yang baik berperan penting dalam menentukan seberapa rentan seseorang terkena gastroenteritis atau diare. Ketersediaan air minum bersih merupakan faktor terpenting dalam pencegahan diare. Kurangnya air bersih menjadi salah satu faktor utama penyebab diare. Akses terhadap air minum yang layak dan bersih diperoleh dari sumber air minum yang dilindungi, antara lain air PAM, tempat penampungan air hujan atau mata air, sumur terlindung, sumur bor/pompa yang jaraknya minimal 10 meter dari tempat pembuangan sampah dapat mencegah diare.

Kata kunci: Air Minum, Diare, Higienis, Risiko lingkungan, Sanitasi

INTRODUCTION

Diarrhea is a major cause of morbidity and mortality in all age groups and regions in the world. Among children aged 0–59 months, diarrhea is responsible for 1.236 million deaths annually and is the second leading cause of death in this age group (Cohen et al., 2022; Zhu et al., 2022). Although the mortality rate in older children, adolescents and adults is lower than the mortality rate in children under five years of age, diarrhea still poses a large burden, namely approximately 2.8 billion cases of diarrhea in children older people, teenagers, and adults (Fedor et al., 2019). Diarrhea is characterized by defecation more than three times a day with a change in the shape and consistency of the stool from soft to liquid which may be accompanied by vomiting or bloody stool. Diarrhea can be caused by various bacteria, viruses and parasitic organisms (Khurana et al., 2021; Kotloff, 2022).

In 2020, the incidence of diarrhea among toddlers in Indonesia was 12.3% and in 2021 the incidence of diarrhea was 23.8%. The percentage of open defecation free (ODF) villages/sub-districts achieved nationally in 2022 will only reach 57.01% of all regions that have implemented community-based total sanitation. According to the Ministry of Health, an area can be assessed as an area that has has ODF status if all residents of the area have access to defecation in healthy latrines (Kemenkes, 2023).

Environmental factors and drinking water are risk factors for diarrhea. The incidence of diarrhea is also closely related to human knowledge, attitudes and behavior, clean water facilities, waste water disposal facilities and environmental health (Oktavianisya et al., 2023). The dominant risk factors for diarrhea are clean water and places to dispose of feces and cannot be separated from human behavior. Apart from that, poor sanitation will have a negative impact on reducing the quality of the community's living environment, polluting drinking water sources, increasing the incidence of diarrhea (Pradhana et al., 2019). The existence of a relationship related to the incidence of diarrhea can be influenced by sanitation and drinking water factors. In addition, drinking water of good quality and sufficient quantity is an important element in people's lives, apart from being a factor related to improving public health and reducing the incidence of various diseases (Fitriani et al., 2021).

Given the importance of diarrhea as one of the main causes of global morbidity and mortality, it is important to examine the influence of environmental hygiene factors and drinking water on the incidence of diarrhea. Therefore, this study presents information regarding the influence of environmental cleanliness and drinking water on diarrhea by reviewing empirical studies in previous and current research. This literature review reveals important information that can help understand diarrhea, the influence of environmental hygiene and drinking water.

METHODOLOGY

In order to identify the influence of environmental cleanliness and drinking water factors on the incidence of diarrhea, a review of literature collected from the PubMed, Scopus, Google Scholar databases in English and Indonesian was carried out. Literature taken from the last 10 years, namely from 2014 to 2024 and in the form of full text publications. The exclusion criteria for sampling research manuscripts are all manuscripts whose titles indicate research in the field of veterinary medicine. These manuscripts will not be selected in the process of writing this literature review. Inclusion criteria are research manuscripts that contain information about diarrhea and influencing environmental factors. In addition, manuscript searches in the database are carried out by searching for a combination of terms in the title. Through this process, ten articles were identified and selected for this writing.

RESULTS AND DISCUSSION

As a result of the literature search, we obtained ten libraries discussed in this article (Table 1). Environmental sanitation factors and good drinking water play an important role in determining how susceptible a person is to gastroenteritis or diarrhea. For example, on the one hand, limited access to drinking water is one of the main causes of the prevalence of gastroenteritis and diarrhea in the pediatric population (Chang et al., 2021). On the other hand, the incidence of diarrhea is higher in areas with poor sanitation conditions and inadequate environments. Water as a medium for disease transmission can cause problems for public health. Pollution in clean water can decrease in chemical, physical and biological quality. Chemically, physically and biologically, polluted water can be seen in terms of salinity, TDS and coliform bacteria (Khairunnisa et al., 2023).

The availability of clean drinking water is the most important factor in preventing diarrhea. Lack of clean water has emerged as one of the main factors causing diarrhea [Pradhana et al., 2019)]. Demographic factors also influence the transmission of acute gastroenteritis and diarrhea. Previous research shows that children aged 0-5 years are the group most vulnerable to water-borne diseases or diarrhea when compared with other age groups (Chowdhury et al., 2015). Diarrhea is one of the main causes of infant morbidity and mortality in children under 5 years of age, mostly occurring in developing countries. In addition, diarrhea often attacks elderly people and those who suffer from serious or comorbid illnesses. Worldwide, an estimated 1.5-2.5 million children die each year from diarrhea and gastroenteritis. Climate-related factors influence levels of waterborne diseases via rainfall. Diarrhea trends tend to be higher in months with a high rainfall index. So people consume untreated water, which is currently unsafe, because surface water close to the surface is susceptible to contamination by human waste and animal carcasses that flow and flow with rainwater (Sidhi et al., 2016). In other hand, there are still many wastewater drainage systems that do not meet health requirements, so these channels are associated with diarrhea incidents (Aolina et al., 2020).

Apart from that, the requirements for drinking water consumption are in accordance with Minister of Health Regulation no. 2 of 2023 must be free from organic and inorganic ingredients. In other hand, the quality of drinking water must be free of bacteria (microbiology), chemicals, poisons and hazardous waste and physical parameters (Abidin et al., 2022). Access to proper and clean drinking water is obtained from protected drinking water sources, including tap water (taps), public hydrants, public taps, water terminals, rainwater reservoirs or protected springs and wells, drilled wells/pumps that are at least a distance away 10 meters from waste disposal facilities can prevent diarrhea (Wolf et al., 2022).

Rosmadewi et al. (2020) stated that aspects of the quality of latrine sanitation, washing hands with soap and the habit of washing hands with soap at five critical times are determining factors for the incidence of diarrhea in Banjarangkan District, Klungkung Regency. In addition, the habit of washing hands and environmental sanitation are also risk factors for the occurrence of diarrhea in Kalideres working area, West Jakarta. The optimal time for washing hands with soap is before eating and after eating. The use of goose neck latrines without septic tanks which directly dispose of feces and urine into open areas and floors that are not watertight contributes to the spread of diarrhea (Deng and Setiarini, 2022).

Contamination of diarrhea-causing infections in drinking water is influenced by several factors, namely the position of the drinking water source which is close to the source of pollution, and non-sterile water distribution media which can affect the quality of the water distributed to people's homes (Harsa, 2019). Bacteria whose presence is known are tested by performing gram staining to determine the type of gram positive or negative bacteria. From 11 drinking water

samples on Barrang Lompo Island, 2 samples contained bacteria that cause diarrhea, namely *Enterobacter hafniae* and *Staphylococcus aereus* (Birawida et al., 2020). For more details, you can see Table 1.

Table 1. Literature obtained

Authors	Method	Result
Khairunnisa et al., 2023	Systematic review	The content of salinity, TDS, and E. coli in clean water is related to the incidence of diarrhea and E. coli is able to survive in salt water without losing its pathogenic properties in causing diarrhea, and the presence of sea water intrusion can increase the salinity content in ground water.
Aolina et al., 2020	Analytical case control study	Variables are related to the incidence of diarrhea are SPAL treatment
Chowdhury et al., 2015	Analytical and interview	Males, young children, renting homes, having fewer family members living there, using unsanitary restrooms, only visiting the area occasionally, residing in a community with lower levels of education, living near a hospital, and living in an area with less access to safe drinking water have all been linked to an increased risk of diarrhea.
Sidhi et al., 2016	Simple random sampling with infant sample	Latrine conditions have a relationship with the incidence of diarrhea in toddlers based on the results of statistical tests using the Chi-square test, obtaining a value of p=0.002 ($p < \alpha$). In other hand, the bacteriological quality of clean water has a relationship with the incidence of diarrhea in toddlers based on the results of statistical tests using the Chi-square test, obtaining a value of p=0.010 ($p < \alpha$).
Putra et al., 2017	Observasional case control	The results of statistical tests using Chi Square show a ρ value of 0.025. Because ρvalue < 0.05, it can be concluded that H0 is rejected and Ha is accepted, meaning that there is a relationship between the condition of the latrine building and the incidence of diarrhea in toddlers in the working area of the Tasikmadu Community Health Center
Abidin et al., 2022	Observasional cross sectional study	The results showed that there was a significant relationship between household water conditions (p=0.027), drinking water management (p=0.000), waste management (p=0.000), latrine ownership (p=0.002), and maternal hygiene practices (p= 0.000) with the incidence of diarrhea in toddlers in the last 3 months
Wolf et al., 2022	Systematic review and meta-analysis	Protected drinking water sources include taps, public hydrants, public taps, water terminals, rainfall reservoirs, protected springs, wells, and drilled wells/pumps that are at least a distance away. These sources provide access to safe and clean drinking water. It can stop diarrhea to be 10 meters away from waste disposal facilities.
Dwipayanti, 2020	Cross sectional study	Aspects of the quality of latrine sanitation, washing hands with soap and the habit of washing hands with soap at five critical times are determining factors for the incidence of diarrhea in Banjarangkan District, Klungkung Regency
Deng et al., 2022	Qualitative study	Most of the water sources used by residents for their daily needs come from PAM water. From environmental factors, most septic tanks are located in the house. The informant urinated and defecated in the bathroom in the house. Handling household wastewater that has been used flows into the gutter. The informant threw the rubbish into the trash can inside the house. The trash cans used are closed and open trash cans. Therefore, hand washing habits and environmental factors are risk factors for diarrhea
Harsa, 2019	Cross sectional study	As many as 53.3% of respondents experienced diarrhea and 46.7% of respondents did not experience diarrhea (P = 0.087, r = 0.463). The results of the research show that there is a moderate level of relationship between water sources and the incidence of diarrhea in the residents of Kampung Baru Ngagelrejo Wonokromo Surabaya

CONCLUSION

Diarrhea is more common in areas with inadequate environmental conditions and poor sanitation. The use of water as an instrument for the transmission of disease can have negative effects on public health. Clean water can have less pollution in terms of its chemical, physical, and biological qualities. The presence of diarrhea-causing pathogens in drinking water can be caused by a number of factors, including the closeness of the drinking water source to the pollution source and the use of non-sterile water distribution media, which can degrade the quality of the water that is delivered to homes.

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