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Systematic Literature Review: Environmental Sanitation Conditions and Health Risks in Kendari Coastal Areas, Indonesia

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Abstract

Globally, coastal populations face increasing sanitation challenges, with over 40% of the world's population living within 100 kilometers of coastlines experiencing limited sanitation infrastructure. In Indonesia, where 60% of citizens reside in coastal areas, these problems are particularly evident in rapidly growing cities such as Kendari. Although several studies on coastal sanitation exist, there is still a lack of systematic reviews that comprehensively analyze sanitation conditions and health outcomes in Indonesian coastal settings. This study aims to describe environmental sanitation conditions in Kendari's coastal areas. A Systematic Literature Review (SLR) was conducted following PRISMA guidelines by analyzing 10 eligible studies (2017–2025) from international and national databases. Articles were assessed for methodological rigor, sample representativeness, and data validity. Findings showed low household latrine ownership, unsafe water, poor waste management, and inadequate sanitation practices. Health impacts identified include diarrhea, dengue hemorrhagic fever, and childhood stunting. Contributing factors were economic limitations, low environmental literacy, and persistent socio-cultural practices. Policy implications highlight the need for integrated infrastructure development, culturally sensitive community education, and monitoring systems to achieve sustainable coastal health outcomes and support SDG targets.

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Introduction

Coastal areas are strategic areas that serve as centers of economic, social, and residential activity. Kendari City, as one of Indonesia's coastal cities, faces complex challenges, particularly related to environmental sanitation. Kendari's coastal areas are populated by high-density communities, diverse economic activities, and limited land for sanitation infrastructure development. These conditions give rise to various interrelated public health issues.

Sanitation is very important for public health. But most homes in the coastal areas of Kendari don't have good sanitation. Many families use shared places for washing, bathing, and using the toilet that are not well kept. They also throw their trash into the sea and use open drains. This problem gets worse because the areas are crowded and people don't have enough money, making it hard for them to fix their sanitation on their own (Riski et al., 2024).

Inadequate sanitation conditions result in a high risk of environmentally-related disease transmission. Diarrhea, gastrointestinal infections, and skin diseases remain prevalent, particularly among children and vulnerable groups. This is consistent with research by (Nurseni et al., 2020), which showed a relatively high incidence of diarrhea in coastal areas of Kendari.

Poor sanitation affects more than just health; it also harms the environment. When household waste is dumped directly into the sea, it pollutes coastal areas, making the water dirty and harming the environment. This affects the ability of fishermen to earn a living. A polluted environment worsens the quality of life for the community and brings new problems related to money and jobs. In Kendari's coastal areas, money is a big reason why sanitation isn't good. Most people don't have enough income to get

proper sanitation systems. Although the government and other groups offer help, it doesn't reach every part of the coast. Because of this, many people use temporary toilets that don't protect their health.

In addition to economic factors, social and cultural factors also influence sanitation conditions in coastal areas of Kendari. Open defecation and dumping of waste into the water are still common. Low public awareness of the importance of healthy sanitation is a major obstacle to sanitation improvements. Education and outreach programs need to be improved to ensure the public understands the close relationship between environmental sanitation and health (Ocktafia et al., 2025).

Several studies have been conducted on sanitation in coastal areas of Indonesia. One comprehensive study describes the environmental sanitation conditions in coastal area (Rahman & Isnaeni, 2025). Furthermore, there is a study that systematically examines the relationship between community sanitation behavior and the incidence of diarrheal disease in coastal areas (Izmi & Susilawati, 2022). However, these studies generally focused only on physical conditions or community perceptions of sanitation issues, without comprehensively integrating health, environmental, socioeconomic, and cultural aspects. Furthermore, studies specifically addressing sanitation conditions in Kendari City are still limited.

Based on this gap, this study uses a systematic literature review approach to map environmental sanitation conditions and health risks in the coastal areas of Kendari City. This approach is expected to provide a comprehensive picture by integrating physical, health, social, economic, and cultural aspects. Thus, the novelty of this study lies in presenting a broader and more holistic perspective than previous research.

Sanitation issues in coastal areas of Kendari are also relevant to the global development agenda. Adequate sanitation is part of the Sustainable Development Goals (SDGs), particularly Goal 6 on clean water and sanitation. This systematic literature review aims to gain a deeper understanding of environmental sanitation conditions and health risks in the coastal areas of Kendari. The research findings are expected to serve as a reference for developing more targeted policies, intervention strategies, and community empowerment programs, thereby sustainably improving the quality of life for coastal communities (UNDP, 2023).

Methods

This study employed a Systematic Literature Review (SLR) guided by the PRISMA 2020 framework to ensure clarity and reproducibility. The literature search was conducted in international databases (Scopus, PubMed, ScienceDirect) and national sources (Garuda, Neliti), as well as official reports from the Indonesian Ministry of Health and the WHO, using keywords such as “sanitation,” “environment,” and “coastal.” From this process, a total of 352 records were identified (Scopus = 110, PubMed = 82, ScienceDirect = 74, Garuda = 40, Neliti = 28, official reports = 18). After removing 72 duplicates, 280 publications remained for screening. Based on title and abstract review, 205 studies were excluded for irrelevance to sanitation and coastal health risks. The remaining 75 full-text articles were assessed for eligibility, of which 65 did not meet the inclusion criteria. Ultimately, 10 studies fulfilled all requirements and were included in the final synthesis. The inclusion criteria required publications to be peer-reviewed articles or organizational reports published between 2017–2025, written in Indonesian or English, and directly addressing sanitation and coastal health risks. Exclusion criteria applied to manuscripts not fully accessible, opinion pieces, or those outside the research scope. Extracted data included author, year, study location, methodology, and main findings. The selected studies were then analyzed through narrative synthesis to describe the results and thematic analysis to identify patterns, research gaps, and practical implications.

Results

Table 1. Systematic Literature Review

No	Author/Year	Research Title	Research Design	Result
1	(Riski et al., 2024)	The Relationship between Environmental Sanitation and the Incidence of Diarrhea in Toddlers in the Working Area of Puuwatu Health Center, Kendari City	Analytical survey with cross sectional design	The conclusion of this study is that there is a relationship between the condition of family latrines, the quality of household waste disposal facilities and wastewater drains with the incidence of diarrhea in toddlers in the working area of the Puuwatu Health Center, Kendari City
2	(Nurseni et al., 2020)	The Relationship of Environmental Sanitation Conditions and Family Behavior to the Incidence of Dengue Hemorrhagic Fever	Quantitative Analytical Observational *cross sectional*	From the results of the research, it is hoped that health agencies will further intensify counseling and education programs to increase public awareness of the effectiveness of

No	Author/Year	Research Title	Research Design	Result
		in the Community in the Working Area of the Puuwatu Health Center, Kendari City		dengue prevention efforts
3	(Ocktafia et al., 2025)	The Relationship between Personal Hygiene and Sanitation Li Ngkungan and the Incidence of Diarrhea in Toddlers at Puwatu Health Center, Kendari City	Analytical survey with cross sectional design	The conclusion of this study shows a correlation between personal hygiene, healthy toilet facilities, and wastewater drainage facilities with the incidence of diarrhea in toddlers.
4	(Fithria et al., 2022)	The Relationship of Sanitation Hygiene and the Presence of E.Coli in Processed Beverages in Kendari Beach	Observational analytics	The results of this study showed that of the 32 samples of processed beverages in Kendari Beach, Kendari City, there were 26 (81.2%) samples found to have Escherichia coli bacteria and 6 (18.8%) samples of processed beverages were not found to be Escherichia col. Exist The relationship between the hygiene of processed beverage handlers and the presence of Escherichia coli bacteria in processed beverages at Kendari Beach, Kendari City in 2022 with a p-value of 0.023. There was no relationship between the sanitation of processed beverage places and the presence of Escherichia coli bacteria in processed drinks at Kendari Beach, Kendari City in 2022 with a p-value of 0.083. There was no relationship between the sanitation of processed beverage places and the presence of Escherichia coli bacteria in processed drinks at Kendari Beach, Kendari City in 2022 with a p-value of 0.072
5	(Sumarti et al., 2024)	The Relationship of Macronutrient Intake to the Nutritional Status of Stunting Toddlers in the Coastal Areas of Kendari City	Cross Sectional Study	Data analysis used the chi-square test. The chi-square test results at a 95% confidence level yielded a p-value of 0.000 for carbohydrate, protein, and fat intake. The study concluded that there is a relationship between macronutrient intake (carbohydrate, protein, and fat) and stunting among toddlers in the coastal areas of Kendari City.
6	(Nurseni et al., 2021)	The Relationship between Food Sanitation and Individual Hygiene and the Incidence of Diarrhoea in Toddlers in Puuwatu District, Kendari City	Observational with a quantitative approach.	The results of this study showed that there was a relationship between food sanitation and the incidence of diarrhea (p-value = 0.001), there was a relationship between individual hygiene and the incidence of diarrhea (p-value = 0.003), and there was no relationship between environmental sanitation and the incidence of diarrhea (p – value = (0.154). The

No	Author/Year	Research Title	Research Design	Result
				conclusion in this study is that poor food sanitation and personal hygiene can result in the incidence of diarrhea because they do not meet the requirements in the application of sanitation hygiene
7	(Maywati et al., 2023)	Environmental Sanitation as a Determinant of the Incidence of Diarrheal Disease in Toddlers at the Bantar Health Center, Tasikmalaya City	Observational descriptive research	The results of the study showed a significant correlation between the incidence of diarrhea in toddlers and the availability of clean water facilities (P=0.000), toilet facilities (P=0.000), waste processing facilities (P=0.000), SPAL facilities (P=0.000). It was concluded that environmental sanitation that does not meet health requirements is a risk factor for the incidence of diarrhea in toddlers with a risk more than 5 times compared to sanitation conditions that meet health requirements.
8	(Saltan, 2017)	The relationship between literacy and attitude and community environmental sanitation in the coastal area of Kendari Bay, West Kendari District, Kendari City	Quantitative with cross sectional study design	Based on the results of the analysis and discussion, it was concluded that there is a relationship between environmental literacy and environmental sanitation and there is a relationship between environmental attitudes and environmental sanitation, as well as a relationship between environmental literacy and environmental attitudes and environmental sanitation
9	(Suama et al., 2024)	The Relationship of Community Knowledge, Attitudes, and Actions with Environmental Sanitation of Fish Auction Areas on the Coast of Kendari Bay (Study of Environmental Change Material Class X High School)	Descriptive observation	The results of statistical tests show that knowledge is significantly related to environmental sanitation ($p<0.05$), community attitudes are significantly related to environmental sanitation ($p<0.05$), but community actions are not significantly related to environmental sanitation ($p>0.05$).
10	(Sekarningrum et al., 2023)	Environmental Sanitation in Urban Residential Areas (Case in the Community in Kebon Jeruk Village Area, Bandung City)	Quantitative with crosssectional study design	The results of the study show that the condition of urban settlements in the "Gang K" area shows the condition of slums, characterized by limited basic infrastructure, so that the environmental sanitation conditions in the area are not good and cause various sources of disease. This finding strengthens Blum's theory that although there are four factors that affect the degree of public health, namely behavior, environment, health services, and heredity (heredity), environmental factors, especially environmental sanitation, are decisive factors in improving the health of the community

Discussion

(1) Synthesis of Environmental Sanitation Conditions in Coastal Areas of Kendari

This study synthesized evidence from 10 eligible publications identified through a Systematic Literature Review (SLR) following the PRISMA 2020 guidelines, covering the period 2017–2025. The findings show consistent discrepancies in sanitation conditions across coastal areas of Kendari City. Limited sanitation infrastructure—particularly low household toilet ownership, inadequate wastewater management systems, and improper waste disposal practices—was the most frequently reported issue. Eight of the ten studies employed a cross-sectional design (Riski et al., 2024; Nurseni et al., 2020; Ocktafia et al., 2025; Fithria et al., 2022; Nurseni et al., 2021; Maywati et al., 2023; Saltan, 2017; Amiruddin et al., 2024), producing reliable prevalence estimates but with inherent limitations in establishing causality. Even though the results from different studies are similar, it shows that the problems found are likely real and important. This also shows that there is a need for long-term research to see how improving sanitation affects health over time. Another big issue is that not many homes have their own toilets. Many people still use shared toilets or even do their business outside. This matches what national reports say, which is that areas near the coast in cities have less access to proper sanitation than areas in the countryside (Kementerian Kesehatan Republik Indonesia, 2024). The fact that this gap persists despite government programs demonstrates serious implementation challenges.

(2) Health Risk Patterns: Multi-Study Synthesis

The review consistently identified diarrheal disease as the most prominent health risk associated with poorsanitation, reported in four studies (Riski et al., 2024; Ocktafia et al., 2025; Nurseni et al., 2021; Maywati et al., 2023). Reported odds ratios ranged from 2.1 to 5.8, indicating substantial risks, particularly among children. However, prevalence rates varied, reflecting differences in diagnostic criteria, seasonal factors, and micro-geographic conditions. This variability underscores the need for standardized surveillance systems in future research. The synthesis also identified multiple transmission pathways including waterborne, vector-borne, and foodborne diseases highlighting the complex interplay between sanitation and health risks.Another important finding is the presence of multiple disease transmission pathways, including waterborne (diarrhea), vector-borne (dengue fever), and foodborne (E. coli contamination). This multipathway risk profile illustrates the complexity of the interaction between environment and health, requiring an integrated intervention approach. This characteristic also distinguishes the sanitation challenges in coastal Kendari from non-coastal urban areas. When compared with coastal cities in other countries, Kendari faces similar challenges. In Bangladesh, particularly in the coastal area of Assasuni—Satkhira—research indicates that limited access to adequate sanitation and clean water sources poses a high risk of infectious diseases (Khanam et al., 2024). Meanwhile, in the Philippines, a study on seawater quality and waste management practices in the coastal community of Batad, Iloilo, showed that unmanaged waste disposal practices negatively impacted water quality and the health of the local community (Hapinat, 2023).

(3) Socioeconomic and Behavioral Determinants

The findings from the study show that economic, social, and behavior-related factors are major reasons why sanitation problems get worse. The biggest challenge found was financial difficulties within communities, which is a problem that appears in many urban sanitation studies around the world (Wolf et al., 2018). However, this review also identified gaps in knowledge and practice.

Economic constraints, limited behavioral change, and low literacy emerged as consistent determinants exacerbating poor sanitation. While knowledge of sanitation was reported as relatively good (Amiruddin et al., 2024; Saltan, 2017), People aren't adopting clean living habits very much, which shows that traditional education methods aren't working well. This means we need new approaches that focus on changing behaviors, especially ones that take into account how communities are ready to change and how people think and learn socially (Dreibelbis et al., 2013). Furthermore, environmental literacy has been shown to play a significant role. Saltan (2017) there is a strong connection between how literate people are and how well they practice sanitation. This suggests that combining efforts to improve adult literacy with efforts to improve sanitation can make interventions more effective.

(4) Policy and Practice Implications

This evidence synthesis emphasizes the need for multi-layered interventions that combine infrastructure development, behavior change, and health system strengthening. Compared to fragmented approaches, integrated interventions offer greater promise for sustainable results. Recommended policy directions include prioritizing infrastructure investment in densely populated coastal settlements and implementing community-based sanitation programs with ongoing maintenance support. Furthermore, socio-economic factors such as poverty alleviation, diversifying fishing livelihoods, and improving access to basic education should also be part of sanitation programs. These findings align with global evidence regarding the multi-sectoral nature of successful sanitation programs (Garn et al., 2017).

The evidence suggests that fragmented programs are less effective than integrated approaches. Policy priorities should therefore include improving sanitation infrastructure in densely populated coastal settlements, supporting community-based programs with ongoing maintenance, and addressing socioeconomic barriers such as poverty reduction, livelihood diversification, and access to education.

(5) Global Context and Health Implications

By looking at studies from 2017 to 2025, this review helps us better understand the sanitation problems in coastal cities and how they affect Sustainable Development Goal (SDG) 6. The research shows that places like Kendari need special approaches because their sanitation challenges are different from those in rural or inland cities. The studies used good methods, like standard tools and enough participants, but there are still some issues. For example, most studies are cross-sectional, which limits how much we can learn. Also, there are differences in how sanitation is defined and not enough consideration of factors like income level and access to healthcare. These issues show the limits of current research and suggest that more long-term and action-based studies are needed to better understand the causes and create better policies (WHO & UNICEF, 2021).

Conclusion

This review of ten studies from 2017 to 2025 shows that sanitation in the coastal areas of Kendari is still not good enough. Many homes don't have toilets, wastewater is not handled properly, and waste is disposed of in unsafe ways. These poor conditions are connected to higher health risks, especially diseases like diarrhea. The ways these diseases spread include through water, insects, and food. Other problems include money issues, people not following good habits even when they know what's right, and not enough understanding of environmental issues. Most of the studies had good quality, but they mostly used cross-sectional designs, had different ways of defining problems, and didn't control for other factors well, which makes it hard to prove causes and effects clearly. Overall, the results show that we need to combine building better facilities, changing behaviors, and helping people economically. Future research should use long-term and action-based studies to give stronger support for making policies and programs that work.

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