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THE RELATIONSHIP BETWEEN ENVIRONMENTAL SANITATION AND THE INCIDENCE OF *DENGUE* HEMORRHAGIC FEVER (DBD) IN THE WORK AREA OF HOSPITAL X GRESIK SUB-DISTRICT

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Abstract

Dengue fever (DHF) is an infectious disease that is still a public health problem in Indonesia, including in Gresik District. Environmental factors, especially sanitation, have an important role in the spread of this disease. This study aims to determine the relationship between housing conditions, water reservoir conditions, and waste disposal systems with the incidence of DHF in the work area of Hospital X, Gresik District in 2025. This study used a quantitative analytic approach with a cross sectional design. The number of respondents was 106 people selected using random sampling technique. Data collection was done through questionnaires and observation, then analyzed using the chi-square test. The results showed that there was a significant relationship between house condition (p = 0.014), water reservoir condition (p = 0.031), and waste disposal system (p = 0.021) with DHF incidence. The conclusion of this study is that environmental sanitation has a significant relationship with the incidence of DHF, so it is necessary to improve sanitation as a preventive measure in the community.

Keywords: Dengue Fever (DHF), Environmental Sanitation

Introduction

Dengue fever (DHF) is a severe febrile illness caused by infection with one of four dengue virus serotypes (DENV-1, -2, -3, -4) belonging to the Flavivirus group. DENV is transmitted through the bite of infected Aedes species mosquito vectors (CDC, 2025). Dengue fever (DHF) is a viral disease transmitted by the bite of the Aedes Aegypti mosquito (Kementerian Kesehatan Republik Indonesia, 2024), and is a public health concern (WHO, 2023) in many countries.

The disease is endemic in more than 100 countries in Africa, the Americas, the Eastern Mediterranean, Southeast Asia, and the Western Pacific (News, 2024). In the Americas, PAHO/WHO reported a 70% decrease in suspected dengue cases in the 14th week of this year compared to the same period in the previous year (*Pan American Health Organization*, 2024). In recent decades, the global incidence of dengue has soared, making it the fastest spreading insect vector-borne disease (VBD) (Li *et al.*, 2022). According to an ECDC report, by March 2025, more than 1.4 million dengue cases had been recorded in 53 WHO countries, with trends varying between regions (ECDC, 2025).

The WHO sets standards for assessing the severity of dengue including abdominal pain, repeated vomiting, excess fluid, bleeding, and an enlarged liver. Severe dengue occurs when there is leakage large fluid that causes shock, respiratory distress, severe bleeding, or organ damage (CDC, 2024). Symptoms of dengue fever include sudden high fever up to 39-40°C (Sahara, 2023), bleeding such as nosebleeds, bleeding gums, and red spots on the skin due to leaking blood vessels (Erdi Komara, 2024). If left untreated, DHF can cause death, especially for children and people with weak immune

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systems (Sherli Shobur, 2024). Based on the 2021 Global Burden of Disease data, the number of dengue fever cases globally has increased from 26.45 million in 1990 to 58.96 million in 2021, with a peak of 63.88 million in 2015. The age-standardized incidence also rose from 481.90 to 752.00 per 100,000 population (Zhang *et al.*, 2025). Regions with frequent transmission of dengue infection in 2024 are Southeast Asia (50.4%), South East Asia (14.9%), the Caribbean (10.9%), and the United States (9.2%) (Duvignaud *et al.*, 2024). Based on data from WHO, more than 1.8 million cases of dengue and 1,037 deaths from dengue will occur in 2025 (WHO, 2025).

Table 1. *World Health Organization* (WHO) Data Related to Dengue Fever (DHF) 2025

WHO Region	Number of Cases	Severe Cases	Contaminated Cases	Died
African region	13.508	0	1.248	126
Mediterranean region east	5.104	0	8	0
European region	10	0	0	0
Americas Region	1.766.831	2.046	689.661	708
Region Asia Southeast	59.175	2.410	58.434	201
Region west pacific	19.527	0	0	2
Total	**1.864.155**	**4.456**	**749.351**	**1.037**

Source : (*World Health Organization* (WHO), 2025)

In Indonesia, with its tropical geography, rising temperatures and changes in the rainy and dry seasons affect the life cycle of mosquitoes and the spread of the virus (Bone, Kaunang and Langi, 2021), so one of the highest rates of DHF cases in the Southeast Asia Region (KemenKes, 2024). DHF cases in Indonesia in early 2024 experienced a significant increase compared to the previous year, with total cases continuing to rise to more than 119,000 cases in the 22nd week of 2024 (Kementerian Kesehatan Republik Indonesia, 2024). The spread of DHF also extended to 482 districts/cities in 34 provinces, indicating an expansion of transmission areas (Kementerian Kesehatan Republik Indonesia, 2024).

Table 2. Based on data from the Ministry of Health of the Republic of Indonesia

	Number of Dengue Fever Cases	Number of Deaths Due to Dengue Fever
2020	108.303	747
2021	73.518	705
2022	143.184	1.236
2023	114.720	894
2024	244.409	1.430

Source : (Kementerian Kesehatan Republik Indonesia, 2024)

Based on data (Badan Pusat Statistik Provinsi Jawa Timur, 2025), the number of Dengue Fever (DHF) cases in East Java Province recorded a dengue morbidity rate per 100,000 population of 76 and the number of DHF cases in Gresik according to data was 36 cases in 2024. This figure increased sharply when compared to the period January to March 2024, which only recorded 116 cases. The highest increase in cases was recorded in January 2025. In the first week of April 2025, the Gresik District Health Office (DHO) recorded 174 dengue cases in various areas.

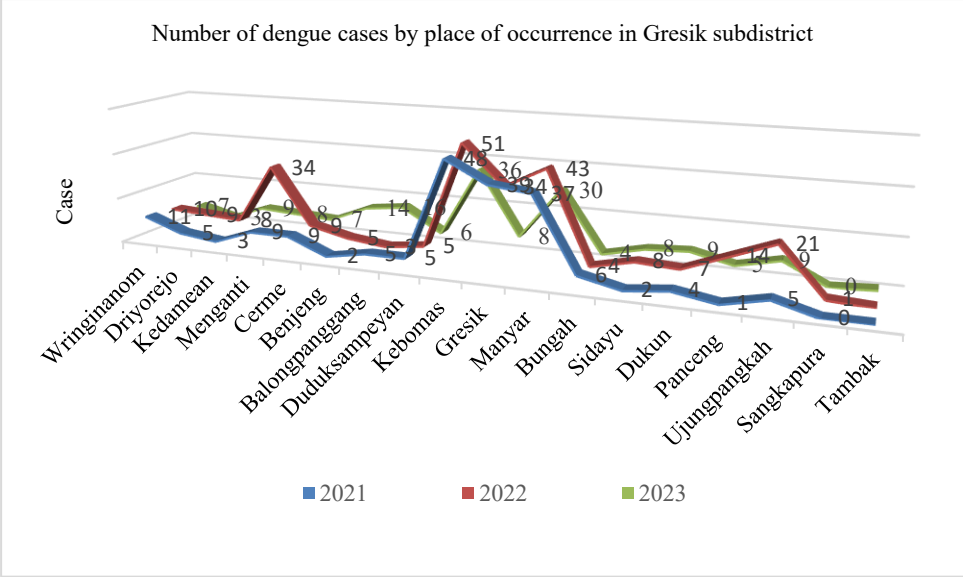

Figure 1. Number of DHF cases in Gresik sub-districts
Source: (Badan Pusat Statistik Kabupaten Gresik, 2024)

Some areas in East Java that reported a high number of DHF cases in 2024 include Malang District, Probolinggo District, Malang City, and Surabaya. Meanwhile, from January to the third week of April 2025, there were 181 dengue cases in Gresik District. The age groups recorded were 1-4 years old with 22 patients, 5-14 years old with 74 patients, and 15-44 years old with 78 patients. According to DHO data, the number of DHF cases in East Java in 2022 was 13,236 with an incidence rate of 33 per 100,000 population and a death rate of 154 people (CFR 1.2%). In 2023, the number of cases dropped to 7,235, an incidence rate of 17.96 per 100,000 population, and 65 deaths (CFR 0.9%) (Dinas Kesehatan Provinsi Jawa Timur, 2023). While in 2024, for the first semester of 2024, 21,959 cases were reported, and the second semester was 7,537 cases. According to research by Wahyuni, S. (2025), recorded the number of outpatient visitors of dengue hemorrhagic fever cases in January as many as 15,438 patients, and in March there were 17,144 patients. this shows an increase in the number of patients seeking treatment at the hospital from month to month.

The importance of environmental sanitation is crucial in the prevention of various diseases, especially environment-based diseases caused by pathogenic agents or vectors (Paendong, Maddusa and Warouw, 2021). Poor environmental sanitation conditions, such as stagnant water and uncovered water reservoirs, can create ideal conditions for the breeding of Aedes aegypti, thus increasing the risk of dengue transmission (Lilis Suryanti, Ardiansyah, 2023). One important aspect of environmental sanitation is the domestic wastewater disposal system (SPAL). Inadequate SPAL systems, such as clogged drains or leaking septic tanks, increase the risk of household wastewater inundation in settlements by 68% (Rochmawati, Asih and Syafiuddin, 2021). Stagnant water from poor sewage systems has been shown to increase larval densities by 12-15 times compared to locations with closed SPALs (Dheandri *et al.*, 2021). Household waste management also affects dengue vector dynamics. Non-organic waste such as used cans and plastic bottles increased the availability of mosquito breeding sites by 7.8% in residential areas (Lestari, Azizah and Fatah, 2024).

A study in East Java showed that 34.5% of DHF cases were concentrated in areas with littering practices (Pratama, Wulandari and Santoso, 2021). In addition to water and waste disposal system management, community education has proven to be an important element in increasing awareness of environmental hygiene and prevention of environment-based diseases. Providing health education on the importance of environmental hygiene and sanitation to mothers of children under five increases their knowledge, potentially reducing the risk of diseases such as stunting associated with poor

sanitation (Udin Rosidin, Hendrawati Hendrawati, Iceu Amira, 2024). Disease risk has also been shown to increase in areas that are not have a good waste management system. Research in Sumbawa showed that areas with a high sanitation risk index had a significant association with an increased incidence of stunting in children under five, with environmental sanitation contributing up to 60% of recorded cases (Maliga *et al.*, 2022). Meanwhile, another literature study highlighted that the main cause of diarrhea in children under five is the quality of home sanitation that does not meet standards, such as poor SPAL conditions and lack of proper waste disposal facilities (Farkhati, 2021). As a preventive measure, actions such as river normalization to improve drainage and reduce inundation also have a significant impact in creating a healthier and safer environment from disease vectors (Solon, Sela and Warouw, 2023). These interventions need to be accompanied by increased collaboration between government, communities and the health sector to ensure the sustainability of sanitation and environmental management programs.

Gresik Regency still experiences fluctuations in dengue fever cases every year. This shows that efforts to prevent and control DHF need to be strengthened, especially by looking at environmental factors that affect the spread of the disease. Environmental sanitation, such as wastewater and waste management, is thought to play an important role in the increase of DHF cases. Therefore, this study aims to determine the relationship between environmental sanitation conditions and the incidence of DHF in the work area of Gresik District hospital.

Methods

Analytic quantitative research using a cross sectional approach. This research was conducted in May 2025 in the work area of Hospital X, Gresik District. The population in this study was 325 with a total of 106 respondents obtained by calculating the sample using the *Lemeshow* Formula:

$$n = \frac{Z^2 \cdot p \cdot (1 - p)}{d^2}$$

Description :

Z = 1,96 (95% confidence level)

p = 0,5 (due to unknown proportion)

d = 0,1 (*margin of error* 10%)

The independent variables in this study included: house condition, water reservoir condition, and waste disposal system, while the dependent variable was the incidence of DHF. Data were collected using a questionnaire that had been tested for validity and reliability and supplemented with observations and interviews. The data obtained were then processed using SPSS software. The data were analyzed univariately to describe the characteristics of the data, while the bivariate analysis used the chi-square test to determine the relationship between variables with a significance level of $\alpha = 0.05$. The results of this analysis are presented in the form of distribution tables, frequencies, and narrative descriptions.

Results

Table 3. Characteristics of Respondents (n = 106)

Respondent Characteristics	Frequency (n)	Percentage (%)
Age		
17-25 Years	30	28,3
26-35 Years	35	33,0
36-45 Years	25	23,6
46-55 Years	16	15,1
Gender		
Male	42	39,6
Female	64	60,4
Last Education		
SD SLTP SLTA	10	9,4
D3 S1	20	18,9
	35	33,0
	18	17,0
	23	21,7
Jobs	40	33,7
Housewife Trader	25	23,6
Self-employed Private Employee Civil	28	26,4
Servant	13	12,3

Based on table 3, it shows that respondents in this study were dominated by the largest age group range, namely 26-35 years with 35 respondents (33.0%), while respondents with the least age were 46-55 years, 16 respondents (15.1%). Of the total respondents, m o s t had female gender as many as 64 respondents (60.4%), while those who were male amounted to 42 respondents (39.6%). Based on the level of education, the majority of respondents are high school as many as 35 respondents (33.0%) and the least is elementary school 10 (9.4%), and the most occupation is housewife as many as 40 respondent (33,7%), and the least respondent's job is civil servant 13 (12,3%).

Table 4. Distribution of Respondents Based on House Condition, Water Storage Condition, Waste Disposal System, and DHF Incidence

Univarat Analysis	n	%
House Condition		
Bad	64	60,4
Good	42	39,6
Water Storage Condition		
Bad	58	54,7
Good	48	45,3
Waste Disposal System		
Bad	61	57,5
Good	45	42.5
Incidence of DHF		
Yes	47	44.3
No	59	55,7

Based on table 4, the results of this univariate analysis show that of 106 respondents (100%), these respondents who have poor housing conditions are 64 respondents (60.4%) while respondents

who have good housing conditions are 42 respondents (39.6%). Respondents who had poor water storage conditions were 58 respondents (54.7%) while respondents who had good water storage conditions were 48 respondents (45.3%). Respondents who had a poor waste disposal system were 61 respondents (57.5%) while respondents who had a good waste disposal system were 45 respondents (42.5%). Respondents who had been or were being diagnosed with DHF were 47 respondents (44.3%) while 59 respondents (55.7) had never been diagnosed with DHF.

Table 5. Bivariate Analysis

Variables	Incidence of DHF				Total		*P-Value*
	DHF		No DHF				
	n	%	N	%	n	%	
House Condition							
Bad	34	(53,1)	30	(46,9)	64	100	0,014
Good	13	(31,0)	29	(69,0)	42	100	
Water Storage Condition							
Bad	31	(53,4)	27	(46,6)	58	100	0,031
Good	16	(33,3)	32	(66,7)	48	100	
Waste Disposal System							
Bad	33	(54,1)	28	(45,9)	61	100	0,021
Good	14	(31,1)	31	(68.9)	45	100	

Based on the results of bivariate analysis using the chi-square test, it was found that there was a relationship between house conditions and the incidence of DHF. Respondents with poor housing conditions experienced more DHF incidence (53.1%) compared to those with good housing conditions (31.0%), with a *p-value* = 0.014 ($p < 0.05$), which means significant.

In the variable of water storage conditions, these respondents who had poor water storage conditions also had a higher proportion of DHF incidence (53.4%) than those who had good conditions (33.3%). =The results of the chi-square test showed a p value of 0.031, which means that there is a significant relationship between the condition of water reservoirs and the incidence of DHF.

Meanwhile, the waste disposal system also showed a significant association with the incidence of DHF. Respondents with a poor waste disposal system had more DHF cases (54.1%) compared to those with a good one (31.1%), with a *p-value* = 0.021.

Discussion

Relationship between House Condition and Dengue Fever Incidence (DHF)

Based on the results of this study, 64 respondents who had poor housing conditions, 53.1% of them experienced DHF incidence. The results of bivariate analysis showed a *p-value* = 0.014, indicating a significant relationship between house conditions and DHF incidence. Houses categorized as in poor condition in this study include inadequate ventilation, low natural lighting, and unmaintained room cleanliness. These situations create a damp and dark home atmosphere, which supports the development of Aedes aegypti mosquitoes. This is in line with vector ecology theory, which explains that the physical condition of the dwelling greatly influences the life cycle of disease vectors. Dark, damp and unkempt home environments are ideal places for mosquitoes to breed and take refuge (WHO, 2022).

Previous research by (Lestari, Azizah and Fatah, 2024), that houses with a poor environment are more at risk of DHF because they are easy places for mosquitoes to breed. Another study by (Aprianto, Tosepu, Azim, *et al.*, 2025) showed that houses without proper ventilation and standing water have the potential to cause DHF. Similarly, (Rochmawati, Asih and Syafiuddin, 2021) noted

that 65% of DHF cases occurred in homes with a poor environment. However, in densely populated areas, dengue cases remain high even though housing conditions are good, because other factors such as the behavior of residents and the surrounding environment also play a role (Zahro, Maulana and Lu'lu Fitriyani, 2023).

Relationship between the Condition of Water Shelters and the Incidence of Dengue Fever (DHF)

Based on the results of the analysis, 53.4% of 58 respondents with poor water storage conditions experienced DHF, while only 33.3% of respondents with good water storage conditions experienced DHF. The chi-square test gave a value of $p = 0.031$ ($p < 0.05$), so it can be concluded that there is a significant relationship between the condition of water reservoirs and the incidence of DHF. Poor water storage conditions often contain Aedes aegypti mosquito larvae, which is the main vector of dengue virus spread, thus increasing the risk of transmission of this disease. People's habit of not routinely draining or tightly closing water reservoirs is also an important factor, because the 3M (drain, cover, bury) behavior that is not well implemented causes water reservoirs to become a source of mosquito breeding (Aprianto, Tosepu, Ode, *et al.*, 2025). Other studies have also confirmed that the frequency of draining water reservoirs is closely associated with DHF incidence, where respondents who did not drain water reservoirs at least once a week had a higher risk of DHF (Philips Homer, Khairul Rasyid, 2025).

An environment with poor sanitation, such as stagnant water, clogged drains, and accumulation of garbage around the house, creates a place that supports the breeding of Aedes aegypti mosquitoes, thus increasing the risk of DHF incidence (Lilis Suryanti, Ardiansyah, 2023). Research by (Febrianti *et al.*, 2023) at Mojopurno Health Center also identified a significant association between the condition of water reservoirs and the incidence of DHF ($p= 0.010$), confirming that optimal water reservoir management is an important factor in the prevention of this disease. Thus, interventions that focus on improving the condition of water reservoirs, such as keeping them tightly closed and draining regularly, as well as increasing public awareness on the importance of 3M behavior and clean environmental sanitation, are needed to effectively reduce the incidence of DHF in endemic areas.

Relationship between Waste Disposal System and Dengue Fever (DHF) Incidence

The results of this study showed that there was a significant association between the waste disposal system and the incidence of DHF ($p = 0.021$), where 54.1% of respondents with poor waste disposal system experienced DHF. This finding reinforces the basic hypothesis that environmental sanitation affects the spread of vector-based diseases. Various strategies have been implemented to suppress the spread of Dengue Fever (DHF), ranging from increasing public awareness to mosquito nest control programs (PSN). One important environmental factor is poor waste management. Inorganic waste such as bottles, cans and plastics often hold stagnant water and can become breeding sites for Aedes aegypti mosquitoes, thus strengthening the life cycle of the dengue vector.

Rochmawati et al. (2021) in Surabaya found a significant correlation between household waste management and DHF incidence. Poorly managed waste increases the risk of dengue transmission because it provides an ideal place for mosquitoes to develop. Community service activities in Sleman by Prasetyawati et al. (2021) showed that plastic waste that is difficult to decompose becomes a mosquito breeding ground. Education on waste management has proven effective in reducing DHF cases. Purba et al. (2023) emphasized the importance of environmental education from an early age, finding a significant relationship between the habit of littering among elementary school students and dengue cases ($p= 0.045$). Research by Hamid et al. (2022) in Sumbawa showed that poor

environmental sanitation and hygiene were closely associated with an increase in DHF cases, emphasizing the importance of environmental improvement approaches in controlling this disease.

Conclusion

Based on the results of the analysis in the work area of Hospital X, Gresik District in 2025, it was found that there was a significant relationship between the condition of the house, the condition of the water reservoir, and the waste disposal system with the incidence of Dengue Hemorrhagic Fever (DHF). The three factors proved to play an important role in increasing DHF cases, so it can be concluded that poor environmental sanitation is a major determinant in the spread of DHF.

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