DOI: 10.36566/ijhsrd/Vol8.Iss1/378
https://ijhsrd.com/index.php/ijhsrd

Indonesian Journal Of Health Sciences Research and Development

e- ISSN: 2715-4718

Literature Review

THE RELATIONSHIP BETWEEN COMMUNITY BEHAVIOR IN WASTE MANAGEMENT AND THE INCIDENCE OF DENGUE HEMORRHAGIC FEVER IN INDONESIA: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Trash containers can potentially serve as breeding sites for mosquitoes that transmit dengue hemorrhagic fever. This study aims to examine the relationship between community waste management practices and the incidence of dengue hemorrhagic fever in Indonesia.
Methods: A systematic review was conducted using the PRISMA approach on articles published between 2020 and 2025. Literature searches were performed using the PubMed, ScienceDirect, and Google Scholar databases, yielding five articles that met the inclusion criteria.
Results: The findings indicate a significant association between community behavior in waste management and the incidence of dengue hemorrhagic fever. Communities that do not implement proper waste management practices are at a higher risk of developing dengue fever compared to those that do.
Conclusion: Therefore, the application of the 3R principles (Reduce, Reuse, and Recycle) is strongly recommended to minimize potential breeding sites for Aedes aegypti mosquitoes.

Keywords: Community Participation; Waste Management; Dengue Hemorrhagic Fever

INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by the dengue virus and transmitted by Aedes aegypti mosquitoes. Dengue hemorrhagic fever remains prevalent and continues to be one of the leading causes of mortality in Indonesia. Although DHF is treatable, it can become fatal if it progresses to severe complications such as shock or Dengue Shock Syndrome (DSS). The first reported case of DHF in Indonesia occurred in 1968 in Surabaya, with an incidence rate of 0.05 and a mortality rate of 41.3%. Since then, the number of cases has continued to increase annually, and the disease has shown a tendency to cause outbreaks.(1)

According to the Ministry of Health, in 2023 the case fatality rate (CFR) of dengue hemorrhagic fever reached 0.78%, exceeding the national threshold of 0.7%. The number of affected districts and cities in Indonesia also increased from 440 in 2018 to 484 in 2022, with more than 90% of districts and cities reporting dengue cases between 2019 and 2022. Furthermore, the CFR for dengue cases from 2020 to 2022 showed an upward trend, rising from 0.69% to 0.89%.(1) Data from the Ministry of Health indicate that by the end of March 2024 there were 53,131 reported cases with 404 deaths, increasing to 60,296 cases with 455 deaths in April 2024. By the end of May 2025, the cumulative number of cases had exceeded 56,000, with 250 deaths reported.(3)

Dengue hemorrhagic fever is closely associated with environmental factors. This is supported by research conducted by Juliska, which found that environmental sanitation plays a significant role as a risk factor for dengue hemorrhagic fever.(4) Although control measures such as mosquito breeding site elimination have been implemented, their execution remains suboptimal. This is consistent with findings by Widyantoro, which indicate that dengue control efforts have not yet been fully effective and require stronger community involvement.(5)

Efforts to prevent and control dengue hemorrhagic fever are essential to reduce mortality and prevent outbreaks. One effective strategy is to eliminate potential breeding sites for Aedes aegypti, such as unmanaged waste. Poor waste management, particularly during the rainy season, allows containers to collect water, creating ideal conditions for mosquito breeding. Items such as used bottles, drums, coconut shells, and other debris can serve as breeding sites. Therefore, environmental factors—including physical, biological, and social aspects—play a crucial role in dengue prevention, especially community behavior related to waste management.(4)

There limited literature specifically discusses the association between community behavior in waste management and the incidence of dengue hemorrhagic fever. Therefore, this study aims to review existing literature to identify the relationship between community waste management behavior and the incidence of dengue hemorrhagic fever in Indonesia.

MATERIAL AND METHODS

This study employed systematic review with the PRISMA method (Preferred Reporting Items for Systematic Reviews an Meta-analysis). The literature review was conducted using the PubMed, ScienceDirect, and Google Scholar databases. Article were searched for using keywords relevants to the research topic, such as Community Participation, Health Behavior, Waste

Management, Garbage Management, Rubbish Management, Sanitation, Dengue, Dengue Fever, Dengue Hemorrhagic Fever, and Community Behavior in Waste Management. This study used the Systematic Review procedure from University of Maryland Library, which is:

Identify Research Questions

The research questions is: "Is the public's waste management behavior associated with the increasing incidence of Dengue Hemorrhagic Fever in Indonesia?"

Determine Inclusion Criteria

The inclusion criteria for this study were established using the PICO approach (Populatiom, Intervention, Comparison, Outcome):

P = The general public in Indonesia.

I = Community behavior regarding proper waste management (3R and disposing of waste in designated areas).

C = Community behavior that is inadequate or does not involve waste management.

O = Incidence or Incidence rate of Dengue Hemorrhagic Fever.

The inclusion criteria used were as follow:

a. Articles published in English and Indonesian.
b. Research articles published between 2020 and 2025.
c. Research articles that are open acces and freely available
d. The types of articles included were peer-reviewed journal articles with observational study designs (cross-sectional, case-control, and cohort).
e. The research results relate to the relationship between community waste management behaviors and the incidence of dengue hemorrhagic fever in Indonesia

Article Search

a. The keywords used in the PubMed database were (Community Participation) OR (Health Behavior)) AND (Waste Management) OR (Garbage Management)) OR (Rubbish Management) OR (Sanitation) AND (Dengue) OR (Dengue Fever) OR (Dengue Hemorrhagic Fever) AND (Indonesia).
b. The keyword uses in the ScienceDirect database were Community Participation OR Health Behaviour AND Waste Management OR Rubbish Management OR Garbage Management AND Dengue Fever OR Dengue OR Dengue Hemorrhagic Fever AND Indonesia.
c. The keywords used in Google Scholar database were "Community Waste Management Practices" and "Dengue Hemorrhagic Fever" in Indonesian.

Article Selection

The PRISMA flowchart was used to screen te articles for selection. The selection process began by screening the titles and abstracts for relevant topics. Inclusion and exclusion criteria were then applied to identify more specific articles.

Critical Review of Articles

Critical appraisal of articles was conducted using a questionnaire from the Joanna Briggs Institute in accordance with the study design used in the research.

Article Extraction

Article extraction was performed by providing a brief review using a table. The table includes the authors, year of publication, article title, study location, design study, sample size, variables of study,

methods of analysis, study results, the relationship between waste management and dengue hemorrhagic fever incidence, and article quality.

Article Synthesis

The selected articles were analyzed using the Synthesis without Meta-analysis (SWiM) guidelines.

RESULTS

This literature search found 623.809 articles matching the keyword search across the three databases used- PubMed, ScienceDirect and Google Scholar- with 800 articles from PubMed, 620.679 articles from ScienceDirect, and 2.330 article Google Scholar. A total of 623,609 articles were identified out of 623,809, as some were duplicates. This was followed by a screening process based on inclusion and exclusion criteria, resulting in 14,622 articles that met the criteria and 608,987 that did not. Based on the screening results, the titles and abstracts of the 14,622 articles that met the criteria were reviewed to assess their relevance, resulting in the identification of 7 relevant articles. Following this, an eligibility assessment was conducted according to the PICO criteria, resulting in 5 articles selected for analysis in this study. The five selected articles will undergo a quality assessment using the Critical Appraisal Checklist Tools from the Joanna Briggs Institute, and data extraction will be performed on these 5 articles to examine the characteristics and outcomes of the selected articles.

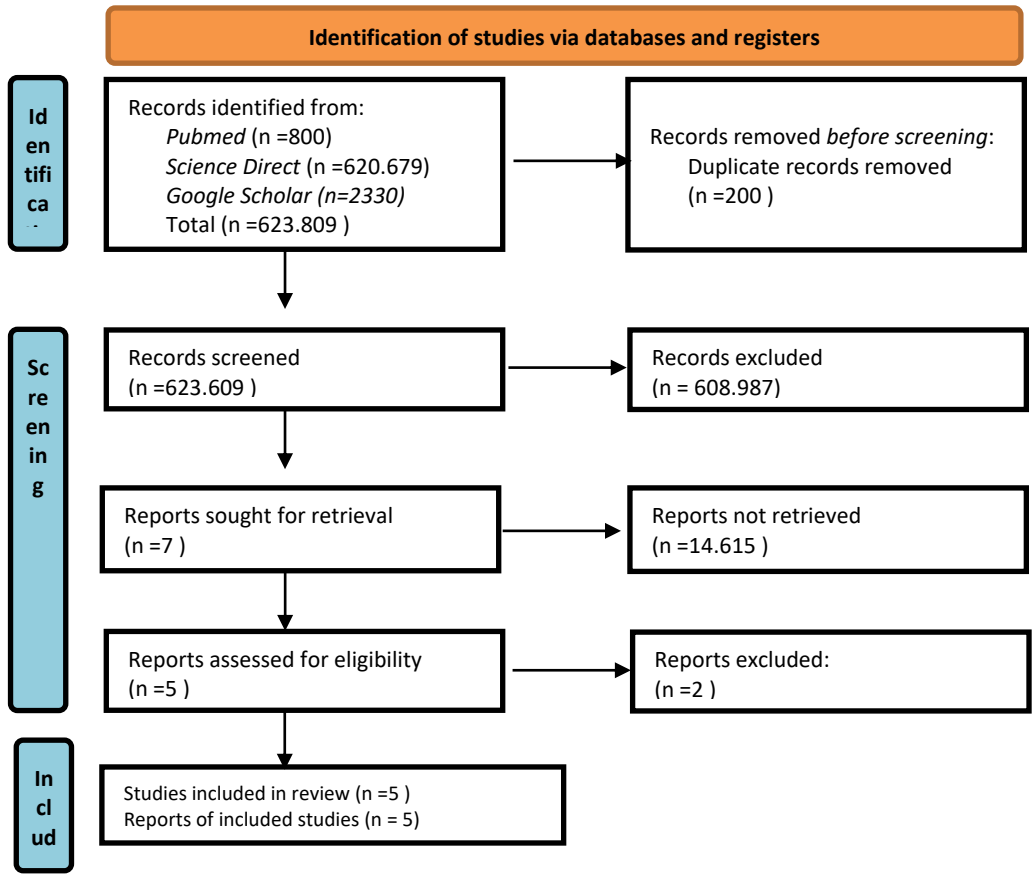

Figure 1. PRISMA Flowchart

Table 1. Article Data Extraction Results

Authors (Year)	Research Title	Location	Research Design	Sample Size	Research Variables	Methods of Analysis	Study Results	The Relationship Between Waste Management And Dengue Hemorrhagic Fever Incidence	Article Quality
Balqis, Naziratul, dkk (2023)	The Relationship Between Community Behavior in Waste Management and the Incidence of Dengue Fever in the Service Area of the Jeulingke Community Health Center	Banda Aceh	Cross-sectional	60 respondents	Community Waste Management, Confirmation of Dengue Fever Cases	Chi-square	The proportion of residents practicing proper waste management was 83.33% (n = 50). Meanwhile, confirmed dengue fever cases in the surrounding environment were reported by 16.67% of respondents (n = 10). A significant association was observed between community behavior in waste management and the incidence of dengue fever (p-value = 0.000; p < 0.05).	Relationship	Strong
Renita, Seren, dkk (2025)	The Relationship Between Mosquito Larval Control Practices and the Incidence of Dengue Fever Among the Community in the Service Area of the Wua-	Kendari	Cross-sectional	358 respondents	Solid Waste Management System, Habit of Draining Water Storage Tanks, Habit of Covering Water Storage Tanks, Habit of Hanging Clothes	Chi-square	A significant relationship was identified between dengue incidence and several factors, including solid waste management systems (p-value = 0.000), the practice of draining water storage	Relationship	Strong

Authors (Year)	Research Title	Location	Research Design	Sample Size	Research Variables	Methods of Analysis	Study Results	The Relationship Between Waste Management And Dengue Hemorrhagic Fever Incidence	Article Quality
	Wua Community Health Center, Kendari City						containers (p-value = 0.001), covering water storage containers (p-value = 0.003), and the habit of hanging clothes (p-value = 0.000) in the working area of the Wua-Wua Community Health Center, Kendari City.		
Lestari, Desta Dewi, dkk (2024)	Waste Management and Dengue Fever Outbreaks	Banyuwangi	Cross-sectional	64 respondents	Dengue fever cases, individual (host) factors: age, gender, education, knowledge; Causative factors (agent): Aedes aegypti mosquitoes; Environmental factors: waste management	Chi-square	Among 64 respondents aged ≥17 years, the majority were aged 30–50 years (59.3%), female (85.9%), and had a low level of education (70.3%). Of the total respondents, 15 individuals (23.4%) had experienced dengue fever. The incidence of dengue fever was higher among individuals with poor waste management practices (43.5%) compared to those with	Relationship	Strong

Authors (Year)	Research Title	Location	Research Design	Sample Size	Research Variables	Methods of Analysis	Study Results	The Relationship Between Waste Management And Dengue Hemorrhagic Fever Incidence	Article Quality
							good practices (12.2%). Statistical analysis showed a significant association between waste management and dengue incidence (p-value = 0.005).		
Noraisyah, Dila, dkk (2024)	The Relationship Between Community Behavior Toward Environmental Sanitation and the Incidence of Dengue Hemorrhagic Fever (DHF) in the Sungai Lulut Area of Banjarmasin	Banjarmasin	Cross-sectional	75 respondents	Age, Gender, Education, Occupation, Implementation of 4M Plus, Waste Management, Dengue Fever Cases	Chi-square	Age and gender were not significantly associated with dengue incidence (p-values = 1.000 and 0.404, respectively). Similarly, occupation and education were not associated with dengue incidence (p-values = 0.209 for both variables). In contrast, environmental sanitation practices, including the implementation of the 4M Plus program and waste management, were significantly associated with dengue incidence (p-values = 0.000 and	Relationship	Strong

Authors (Year)	Research Title	Location	Research Design	Sample Size	Research Variables	Methods of Analysis	Study Results	The Relationship Between Waste Management And Dengue Hemorrhagic Fever Incidence	Article Quality
							0.003, respectively; $p < 0.05$).		
Mawaddah, Fatin, dkk (2022)	Analysis of the Relationship Between Environmental Sanitation Conditions and Family Behavior and the Incidence of Dengue Fever in the City of Pontianak	Pontianak	Case-Control	54 respondents	Age, Gender, Education,Occupation, Water Storage, Waste Management System, Lighting, Presence of Mosquito Larvae, Habits Regarding Hanging Clothes, Use of Insect Repellents	Chi-square	Statistical analysis in Pontianak City demonstrated significant associations between dengue incidence and the presence of water storage containers ($p = 0.002$), waste disposal systems ($p = 0.029$), the habit of hanging clothes ($p = 0.029$), the presence of mosquito larvae ($p = 0.049$), and the use of mosquito repellents ($p = 0.040$). However, no significant association was found between lighting conditions and dengue incidence ($p = 1.000$).	Relationship	Strong

Based on Table 1, all five reviewed articles indicate a consistent association between community behavior in waste management and the incidence of dengue hemorrhagic fever. The first study, which examined community waste management in relation to confirmed dengue cases, reported a significant association (p-value = 0.000; $p < 0.05$).(6) Similarly, the second study analyzed variables related to solid waste management systems alongside behavioral factors such as draining and covering water

storage containers and the habit of hanging laundry, and found a significant relationship between solid waste management systems and dengue incidence (p-value = 0.000).(7)

The third study, which explored host, agent, and environmental factors—including waste management—also demonstrated a significant association between solid waste management systems and dengue incidence (p-value = 0.000).(8) In line with these findings, the fourth study reported a statistically significant relationship between waste management and dengue hemorrhagic fever incidence (p-value = 0.003; $p < 0.05$).(9)

Furthermore, the fifth study, employing a case–control design, identified a significant association between waste disposal systems and dengue incidence (p = 0.029), with an odds ratio (OR) of 4.03. This finding suggests that individuals with poor waste disposal practices are 4.03 times more likely to develop dengue hemorrhagic fever compared to those with proper waste management practices. (10)

DISCUSSION

Based on the analysis of the five reviewed studies, it can be concluded that there is a significant association between community behavior in waste management and the incidence of dengue hemorrhagic fever. Waste management consists of two main components, namely waste reduction and waste handling. Waste reduction focuses on minimizing waste generation at its source, such as households and markets, while waste handling includes sorting, collection, transportation, processing, and final disposal. These processes also involve treating waste or residues to ensure their safe return to the environment.(11)

Waste generation is an inevitable outcome of human activity and may become a serious problem if not properly managed. According to Syamsul, waste constitutes a public health issue due to its association with poor environmental sanitation, particularly at the household level. One of the diseases linked to inadequate waste management is dengue fever, as poorly managed waste creates favorable conditions for the proliferation of mosquito vectors.(12)

Evidence from the reviewed studies supports this relationship. The fifth article reported that individuals with poor waste disposal practices had a 4.03-fold higher risk of developing dengue fever compared to those with proper waste management.(10) This finding is consistent with the study by Rosmawati et al, which identified a significant association between exposure to solid waste and dengue incidence (p = 0.019) in the area surrounding the Bakung Landfill, Bandar Lampung. Individuals exposed to solid waste—including household, non-hazardous industrial, and construction waste—were found to have a threefold higher risk of dengue infection (OR = 3.01; p = 0.013). (13)

Improper waste disposal and accumulation, particularly when waste is left unmanaged for more than three days, can create breeding grounds for disease vectors and pathogenic microorganisms. Items such as used tires, plastic containers, and buckets that can hold stagnant water are especially conducive to mosquito breeding. In addition, improper disposal of waste—such as discarded plastic cups—can create ideal habitats for *Aedes aegypti*, thereby increasing the mosquito population in residential areas.(10) Field findings from one of the reviewed studies revealed that household yards often contain scattered waste, including empty cans, coconut shells,

plastic bottles, and used beverage containers that can collect rainwater. During periods of heavy rainfall, these items frequently become filled with water and serve as breeding sites for mosquito larvae.(7)

The life cycle of Aedes aegypti further explains this phenomenon. This mosquito undergoes four developmental stages: egg, larva, pupa, and adult, with the first three stages occurring in water. Eggs are typically laid on the inner walls of water-filled containers near human dwellings, with each female capable of laying 10–100 eggs every 4–7 days. Under optimal temperatures of 25–30°C, the development from egg to adult mosquito can occur within 5–7 days.(14) Therefore, improperly managed waste that holds water can significantly contribute to the proliferation of dengue vectors.

Effective waste management is guided by standards such as Indonesian National Standard 3242-2008, which outlines five key aspects: regulatory frameworks, institutional arrangements, technical operations, financing mechanisms, and community participation.(15) At the community level, technical measures include waste segregation, the application of the 3R principles (Reduce, Reuse, Recycle), and proper handling of residual waste by municipal services.(16)

The 3R approach can be readily implemented at the household level. “Reduce” involves minimizing waste generation, for example by using reusable shopping bags or refillable water bottles. “Reuse” refers to repurposing items such as containers and plastic bottles for other uses, thereby reducing waste accumulation. “Recycle” involves processing waste materials into reusable products, including composting organic waste or recycling plastics. The consistent application of these practices can reduce the volume of waste and limit potential mosquito breeding sites.

Finally, community engagement plays a crucial role in dengue prevention. Improvements in knowledge, attitudes, behavior, and community empowerment have been shown to enhance the effectiveness of vector control efforts.(5) As demonstrated in this review, better waste management practices are associated with a reduced risk of dengue fever. Conversely, inadequate waste management—often influenced by limited time or awareness—can increase the availability of mosquito breeding sites and contribute to higher dengue incidence. (17)

CONCLUSION

There is a significant association between community behavior in waste management and the incidence of dengue fever. Communities that do not implement proper waste management practices are at a higher risk of developing dengue fever compared to those that do. Therefore, the application of the 3R principles (Reduce, Reuse, and Recycle) is essential to minimize potential breeding sites for Aedes aegypti mosquitoes. Furthermore, additional research is needed to examine the relationship between waste management practices, waste generation, and dengue incidence, particularly in relation to climatic factors.

ACKNOWLEDGMENT

Recognize those We would like to express our gratitude to the Dekan of the Faculty of Public Health, Andalas University, and our supervisors for their guidance and advice. We would also like to thank all lecturers and academic staff at the Faculty of Public Health, Andalas University, for their support during the

completion of this research.

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