



THE ANALYSIS OF *PREDISPOSING FACTORS* AND INCIDENTS OF ENVIRONMENTAL SANITATION RELATED TO DENGUE HEMORRHAGIC FEVER (DHF) ON TODDLERS AND CHILDREN IN THE WORKING AREA OF TANJUNG PURI PRIMARY HEALTH CENTER OF SINTANG REGENCY

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ABSTRACT

Dengue Hemorrhagic Fever (DHF) is a disease with a high prevalence in Indonesia, particularly among toddlers. It is crucial for every family to comprehend and respond effectively to prevent dengue cases from emerging in their surroundings. This study aims to determine the relationship between predisposing factors and environmental sanitation conditions and the incidence of dengue fever in toddlers and children in the Tanjung Puri Primary Health Center working area. This research employs quantitative methods with a case-control design of 1:2. The sample size comprises 45 cases and 90 controls, obtained using total sampling techniques. Research variables encompass knowledge, attitudes, economic status, presence of mosquito larvae, eradication of mosquito nests (PSN), waste disposal sites (TPS), the habit of wearing long clothes, and the use of mosquito repellent. Data analysis includes univariate, bivariate, and multivariate analysis using logistic regression tests. The results indicate a correlation between the presence of water larvae (OR=8.5; 95% CI 1.896-38,400, p=0.005), the habit of wearing long clothes (OR=2.9; 95% CI 1.126-7,660, p=0.028), landfill (OR=0.2; 95% CI 0.032-0,877, p=0.034), respondents' knowledge (OR=4.0; 95% CI 1.614-10,080, p=0.003) and the incidence of dengue fever in toddlers and children in the Tanjung Puri Primary Health Center working area. Cross-sector efforts are necessary to reduce the incidence of dengue fever, including mosquito nests eradication, educational initiatives, improving waste disposal sites (TPS) and enhancing public awareness of the risks and prevention of dengue fever.

Keywords: Dengue Hemorrhagic Fever, Environmental Sanitation, Predisposition

INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is an infectious disease that often causes outbreaks and fatalities, especially in children. DHF is caused by the dengue virus, transmitted through mosquito bites *Aedes aegypti*. It is characterized by sudden high fever, bleeding manifestations, and a tendency to lead to (*shock*) and death (Ministry of Health of the Republic of Indonesia, 2013).

Dengue fever can occur throughout the year and affect all age groups. The emergence of this disease is associated with environmental conditions and human behavior. Dengue fever is a public health problem that tends to spread more widely with increasing transportation flows and population density. This disease is found in almost all parts of the world, especially in tropical and sub-tropical countries, both endemically and with outbreaks related to the arrival of the rainy season. To date, dengue fever remains one of the main public health problems in Indonesia, with the number of cases and

distribution areas increasing along with rising mobility and population density (Ministry of Health of the Republic of Indonesia, 2016).

The incidence of dengue fever has grown tremendously worldwide in recent years. Before 1970, only nine countries were endemic for dengue. Now, this disease is present in 100 countries across Africa, America, the Eastern Mediterranean, Southeast Asia, and the Western Pacific. The Americas, Southeast Asia, and the Western Pacific are the regions most affected. Cases in the Americas, Southeast Asia, and the Western Pacific exceeded 1.2 million in 2008 and more than 3.2 million in 2015 (based on official data submitted by member countries). Recently, the number of reported cases continues to increase. In 2015, 2.35 million cases of dengue fever were reported in America alone, with 10,200 cases diagnosed as severe dengue fever, resulting in 1181 deaths (WHO, 2017).

Data from the Ministry of Health shows that during the period from January to early March 2020, dengue fever claimed at least 100 lives and forced several regions to declare a state of emergency (KLB). In 2021, dengue fever cases in Indonesia decreased to 68,614 cases and 664 deaths. In the first three weeks of January 2022, dengue fever cases reached 313, with seven fatalities and 7,316 suspected cases. This data was reported by 41 regencies/cities from five provinces (Indonesian Ministry of Health, 2022). The Case Fatality Rate (CFR) for dengue fever in Indonesia shows a decreasing trend in the 2012-2020 period, from 0.90% to 0.69%. However, this figure increased to 0.96% in 2021, exceeding the 0.7% limit set in the National Dengue Control Strategy target. West Kalimantan's CFR reached 0.60%, although still in the low category (below 1%), there are still several regencies/cities in West Kalimantan where the number of cases is increasing.

The number of dengue fever cases in Sintang Regency decreased from 2012-2021 but increased again in 2022. In the Tanjung Puri Health Center's working area, 9 cases were reported in 2021, but in 2022, it increased to 83 cases. According to data from the Tanjung Puri Primary Health Center, the highest incidence of dengue fever in health facilities was around October 2022, with 19 cases reported as of October. DHF remains a significant health issue in this country, necessitating serious attention. The program enrichment, which includes debriefing training for healthcare workers in areas prone to DHF, is one of a step towards addressing this issue (Santoso, 2023).

Predisposing factors and environmental sanitation is also an important factors related to DHF. Research conducted by Pandaibesi (2017) reveals a significant relationship between respondent behavior and the incidence of dengue fever in the Medan Sunggal Regency (Pandaibesi, 2017). Additionally, there is a significant relationship between knowledge (p-value 0.013) and attitude (p-value = 0.003) with the incidence of dengue fever (Silaban, A.O., 2016). This knowledge and behavior support the PSN (Eradication of Mosquito Nest) program. Research conducted by Kuriawan (2021) highlights the PSN program as a cost-effective and accessible method for dengue fever vector control. Its success, however, is contingent on community involvement, emphasizing the need for public engagement and education.

Meanwhile, the results of other research indicate that the habit of not wearing long clothes has a significant influence on the incidence of dengue fever. Statistical tests demonstrate an influence of the habit of not wearing long clothes on the incidence of dengue fever in children (Ariyati & Sandra, 2017).

Given these data, researchers are interested in conducting a factor analysis on *predisposing* factors and environmental sanitation conditions influencing DHF incidents in toddlers and children in the West Kalimantan border area.

METHOD

This research uses quantitative methods with a *case-control* study design (1:2 ratio). The study was conducted in the Tanjung Puri Primary Health Center working area and took place in May 2023. The case population in this study comprised all toddlers and children who experienced dengue fever in

the Tanjung Puri Primary Health Center Working Area in 2022, totaling 45 people. The control population consisted of 90 toddlers and children who did not experience dengue fever in the Tanjung Puri Health Center Working Area in 2022. The sampling technique in this study involved *total sampling*.

Data collection in this research utilized both primary and secondary data. Secondary data were obtained from the Tanjung Puri Primary Health Center dengue fever register book, while primary data collection involved interviewing selected respondents. The independent variables studied include the history of dengue fever incidents, knowledge, attitudes, economic status, presence of mosquito larvae, eradication of mosquito nests (PSN), waste disposal sites (TPS), habit of wearing long clothes, and the use of mosquito repellent. Data collection was performed through interviews and observations using a structured questionnaire. Data analysis in this research comprised univariate, bivariate, and multivariate analyses. Univariate analysis involved conducting a frequency distribution test. Bivariate analysis was used to determine the extent of the relationship between factors believed to be related to the incidence of dengue fever, using the *chi-square* test with a significance level (*p-value* = 0.05) and a *confidence interval* (CI) of 95%. To identify the most dominant risk factors, multivariable multiple logistic regression analysis was carried out on the variables resulting from the bivariate analysis that had *p-value* < 0.25 or were considered substantially important in relation to the incidence of dengue fever. The final model was obtained with a *p-value* ≤ 0.05

RESULTS

Table 1

Characteristics of research respondents

No	Variable	Frequency	Percentage (%)
1	Gender		
	Male	60	44,4
	Female	75	55,6
2	Age		
	20-25	41	30,4
	26-31	75	55,6
	32-27	19	14,1
3	Education		
	Junior High School	2	1,5
	Senior High School	110	81,5
	College	23	17
4	Work		
	Not Working/Housewife	12	8,9
	Civil servants	33	24,4
	Private	56	41,5
	Businessman	34	25,2
5	Economic status		
	<Lower than Urban Minimum Wage (UMK)	84	62,2

>Higher than Urban Minimum Wage (UMK)	51	37,8
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Table 1 shows the characteristics of the respondents in this study. The majority of respondents were women, comprising 75 respondents (55.6%), and 75 respondents (55.6%) were in the 26-31 age group. The educational level of most respondents was high school graduates, specifically 110 respondents (81.5%). Additionally, a majority of the respondents worked as private employees, totaling 56 respondents (41.5%), with incomes below the minimum wage for 84 respondents (62.2%).

Table 2
Characteristics of research variables

No	Variable	Frequency	Percentage (%)
1	Dengue fever incidence		
	Yes	45	33,3
	No	90	66,7
2	Attitude		
	Less supportive	65	48,1
	Supportive	70	51,9
3	Knowledge		
	Low	43	31,9
	Good	92	68,1
4	The presence of larvae		
	Yes	14	10,4
	No	120	88,9
5	Habit of wearing long clothes		
	Do not wear	34	25,2
	Wear	101	74,8
6	Mosquito repellent		
	Yes	18	13,3
	No	117	86,7
7	Waste Disposal Sites (TPS)		
	Yes	126	93,3
	No	9	6,7

Table 2 shows that 33.3% of respondents had a history of dengue fever, while 66.7% did not. Respondents with a less supportive attitude comprised 48.1%, and 51.9% were supportive. Those with poor knowledge constituted 31.9%, whereas 68.1% had good knowledge. The presence of mosquito larvae was noted in 10.4% of cases, while the absence of mosquito larvae was observed in 88.9%. A majority of respondents had the habit of wearing long clothes, accounting for 74.8%, while those who did not have this habit amounted to 25.2%. The majority of respondents did not use mosquito repellent, specifically 86.7%, whereas those who used mosquito repellent constituted 13.3%. The majority of respondents had a waste disposal sites (TPS), totaling 93.3%, while those who did not have a TPS were 6.7%.

Table 3
Bivariate analysis of research variables

No	Variable	Dengue fever incidence				Total		O R	95%CI	P- value
		Of		No		N	%			
		N	%	N	%					
1	Knowledge									
	Low	22	48,9	21	23,3	43	31,9	3,1	1,467-6,732	0,005*
	Good	23	51,1	69	76,7	92	68,1			
2	Attitude									
	Less supportive	23	51,1	42	46,7	65	48,1	1,2	0,584-2,446	0,761
	Supportive	22	48,9	48	53,3	70	51,9			
3	Economic status									
	<Lower than Urban Minium Wage (UMK)	25	55,6	59	65,6	84	62,2	0,6	0,316-1,365	0,346
	>Higher than Urban Minium Wage (UMK)	20	44,4	31	34,4	51	37,8			
4	Habit of wearing long clothes									
	Do not wear	17	37,8	17	18,9	34	25,2	2,6	1,170-5,809	0,030*
	Wear	28	62,2	73	81,1	101	74,8			
5	Mosquito repellent									
	Yes	11	24,4	77	7,8	18	13,3	3,8	1,372-10,726	0,016*
	No	34	75,6	83	92,2	117	86,7			
6	Waste Disposal Sites (TPS)									
	Yes	39	86,7	87	96,7	126	93,3	0,2	0,053-0,943	0,067
	No	6	13,3	33	3,3	9	6,7			
7	Eradication of mosquito nests (PSN)									
	Of	19	42,2	20	22,2	39	28,9	2,5	1,181-5,538	0,027*
	No	26	57,8	70	77,8	96	71,1			
8	The presence of larvae									
	Yes	11	25,0	33	3,3	14	10,4	9,7	2,536-36,844	0,000*
	No	33	75,0	87	96,7	120	89,6			

*<0.25 variables used in multivariate modeling

Table 2 presents the results of bivariate tests examining the relationship between knowledge, attitudes, economic status, the habit of wearing long clothes, mosquito repellent use, waste disposal sites (TPS), eradication of mosquito nests (PSN), and the presence of larvae on the incidence of dengue fever. Respondents with poor knowledge had a 3.1 times higher risk of suffering from dengue fever compared to respondents with good knowledge (OR=3.1; 95% CI 1.467-6.732, p=0.005). This indicates a significant relationship between respondents' knowledge and the incidence of dengue fever, with a statistically significant p-value of $0.005 < 0.05$. Respondents with less supportive attitudes had a 1.2 times higher risk of suffering from dengue fever compared to respondents with supportive attitudes (OR=1.2; 95% CI 10.584-2.446, p=0.761). This suggests no significant relationship between the respondent's attitude and the incidence of dengue fever, with a p-value of $0.761 > 0.05$. Respondents with incomes below the minimum wage had a 0.6 times lower risk of suffering from dengue fever compared to respondents with incomes above the minimum wage (OR=0.6; 95% CI 0.316-1.365, p=0.346). This indicates no significant relationship between the respondent's economic status and the incidence of dengue fever, with a p-value of $0.346 > 0.05$. Respondents who did not have the habit of wearing long clothes had a 2.6 times higher risk of suffering from dengue fever compared to respondents who had the habit of wearing long sleeves (OR=2.6; 95% CI 1.170-5.809, p=0.030). This shows a significant relationship between the respondent's habit of wearing long clothes and the incidence of dengue fever, with a statistically significant p-value of $0.030 < 0.05$. Respondents who did not use mosquito repellent had a 3.8 times higher risk of suffering from dengue fever compared to respondents who used mosquito repellent (OR=3.8; 95% CI 1.372-10.726, p=0.016). This indicates a significant relationship between the use of mosquito repellent and the incidence of dengue fever, with a statistically significant p-value of $0.016 < 0.05$. Respondents who did not have a waste disposal sites (TPS) had a 0.2 times lower risk of suffering from dengue fever compared to respondents who had a waste disposal sites (TPS) (OR=0.2; 95% CI 0.053-0.943 p=0.067). This indicates no significant relationship between waste disposal sites (TPS) ownership and the incidence of dengue fever, with a p-value of $0.067 > 0.05$. Respondents who did not perform eradication of mosquito nests (PSN) had a 2.5 times higher risk of suffering from dengue fever compared to respondents who did PSN (OR=2.5; 95% CI 1.181-5.538, p=0.027). This indicates a significant relationship between PSN and the incidence of dengue fever, with a statistically significant p-value of $0.027 < 0.05$. The presence of larvae resulted in a 9.7 times higher risk of suffering from dengue fever compared to respondents who did not have larvae present (OR=9.7; 95% CI 2.536-36.844 p=0.000). This indicates a significant relationship between the presence of larvae and the incidence of dengue fever, with a statistically significant p-value of $0.000 < 0.05$.

Table 4
Multivariate Analysis

No	Variable	Exp (B)	95% CI For Exp (B)		p- value
			Lower	Upper	
1	The presence of larvae	8,5	1,896	38,400	0,005 *
2	Habit of wearing long clothes	2,9	1,126	7,660	0,028 *
3	Use of mosquito repellent	3,0	0,896	10,207	0,074
4	Waste disposal sites (TPS)	0,2	0,032	0,877	0,034 *

5	Eradication of mosquito nests (PSN)	2,1	0,816	5,212	0,126
6	Knowledge	4,0	1,614	10,080	0,003*

Table 4 presents the results of multivariate analysis. The variables significantly related to the incidence of dengue fever were the presence of water larvae (OR=8.5; 95% CI 1.896–38.400, p=0.005), the habit of wearing long clothes (OR=2.9; 95% CI 1.126–7.660, p=0.028), waste disposal sites (TPS) (OR=0.2; 95% CI 0.032–0.877, p=0.034), and respondent knowledge (OR=4.0; 95% CI 1.614–10.080, p=0.003). The most important and dominant variable linked to the incidence of dengue fever is the presence of larvae with an odds ratio (OR) of 8.5. This means that respondents whose homes are found to have larvae have an 8.5 times higher risk of suffering from dengue fever compared to respondents whose homes do not have larvae.

DISCUSSION

The correlation between the presence of larvae and the incidence of dengue fever.

This research demonstrates a correlation between the presence of larvae and the incidence of dengue fever. These findings align with a study conducted by Nasifah et al. (2021), which revealed a connection between the presence of larvae in containers (p=0.001) and the incidence of dengue fever in the Kedungmundu Primary Health Center working area. Respondents who found larvae in containers around their homes were six times more likely to contract dengue fever than those who did not find larvae in similar locations. Another study by Sucipto et al. (2015) in Semarang Regency also indicated a significant relationship between water reservoirs containing larvae and the incidence of dengue fever, with a risk 8.8 times higher than respondents whose water reservoirs did not contain larvae. According to Waode et al. (2019), the presence of larvae constitutes a risk factor for causing dengue fever. The existence of mosquito larvae in a household increases the potential for dengue fever, as these larvae later develop into adult mosquitoes, serving as vectors for transmitting the disease. Therefore, if mosquito larvae are allowed to persist in or around a household, the risk of dengue fever incidence rises. People who store water in uncovered buckets or barrels still have the potential to create breeding grounds for mosquitoes. In addition to these factors, environmental conditions such as rainfall also play a significant role in the incidence of dengue fever and larvae presence. Based on the research by Widyantoro (2021) rainfall is the most dominant variable related to the incidence of dengue fever in Bantul Regency from 2016 to 2020. Aligned research conducted by Yushananta (2021) rainfall has the greatest influence in relation to DHF cases in Bandar Lampung City (36.9%). Any increase in rainfall is followed by an increase in larvae presence, and dengue fever cases. This highlights the importance of considering both biological and environmental factors in the prevention and control of dengue fever.

The correlation between the habit of wearing long-sleeved clothing and the incidence of dengue fever.

This research establishes a correlation between the habit of wearing long-sleeved clothing and the incidence of dengue fever. The results of this study align with research conducted by Sandra et al. (2019), indicating that the habit of wearing long clothes significantly influences the incidence of dengue fever (p=0.013). Respondents who do not have the habit of wearing long clothes are at a 2.7 times greater risk of experiencing DHF compared to individuals who regularly wear long clothes. Another study by Muchlis et al. (2014) found that respondents who did not wear long clothes had a 2.2 times higher risk of contracting dengue fever compared to those who wore long clothes. According to Sitepu et al. (2019), the habit of wearing long-sleeved clothing is a preventive behavior integrated into daily habits to ward off dengue fever. Wearing long clothes serves as a means to

prevent mosquito bites and minimize the potential for mosquito bites *aedes aegypti* around the house since long clothes cover body parts, such as hands and feet.

The correlation between waste disposal sites (TPS) and the incidence of dengue fever.

This research establishes a correlation between waste disposal sites (TPS) and the incidence of dengue fever. This finding is consistent with the results of research by Asbon et al. (2022) in Ogan Hilir Regency, indicating a relationship between waste disposal sites (TPS) and the incidence of Dengue Hemorrhagic Fever ($p=0.000$). Rubbish bins that meet the required standards show a 4.4 times higher tendency to prevent dengue fever compared to the presence of rubbish bins that do not meet the requirements. Similarly, research by Mawaddah et al. (2022) demonstrates a relationship between the rubbish disposal system and the incidence of dengue fever in Pontianak City ($p=0.029$), with an odds ratio (OR) value of 4.03. This implies that respondents whose homes have a poor waste disposal system are 4.03 times more likely to contract dengue fever compared to respondents with a good waste disposal system. According to Maitela (2019), waste management can impact dengue fever, especially waste that can contain standing water. Items such as used cans, bottles, drums, and used tires can become breeding grounds for *Aedes aegypti* mosquitoes if waste management is not conducted properly. According to the World Health Organization (WHO), vector control efforts should promote effective waste management and prioritize environmental considerations by enhancing "reduce, reuse, and recycle" programs.

The correlation between knowledge and the incidence of dengue fever.

This research establishes a correlation between respondents' knowledge and the incidence of dengue fever. This aligns with research by Novikasari (2018), which indicates that respondents in the poor knowledge category are 4.5 times more likely to experience dengue fever in their children compared to respondents in the good knowledge category. Additionally, the results of research conducted by Trisnawati (2023) reveal a relationship between good parental knowledge and the incidence of dengue fever in children at the Andalas Health Center in Padang City ($p=0.018$). Building upon this, Zicof (2022) demonstrated that there is an influence of respondent knowledge on the incidence of dengue in Padang ($p=0.042$). These findings underscore the importance of knowledge in the prevention and management of dengue fever. The lack of knowledge among parents about dengue fever has an impact on their indifference towards efforts to keep the environment free from *aedes aegypti* mosquito breeding grounds (Dewi, 2019). Knowledge about dengue fever and its prevention is crucial for the public, especially within the family environment as the smallest unit of the community system. Parents are expected to possess sufficient knowledge about dengue fever and its prevention to reduce the risk of dengue hemorrhagic fever (DHF), particularly in children (Sidiek, 2012).

CONCLUSIONS AND SUGGESTIONS

Determinant factors for the incidence of dengue fever in toddlers and children in the Tanjung Puri Primary Health Center working area include the presence of larvae, the habit of wearing long-sleeved clothing, waste disposal sites (TPS), and knowledge. Cross-sector efforts involving the government, primary health centers, and the community are necessary to reduce the incidence of dengue fever in toddlers and children in the Tanjung Puri Primary Health Center area. These efforts should encompass eradicating mosquito nests, providing education, improving TPS, and enhancing public awareness of the risks and prevention of dengue fever.

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