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THE RELATIONSHIP BETWEEN KNOWLEDGE TOWARDS DENGUE PREVENTION BEHAVIOR IN THE COMMUNITY IN MEDAN DENAI SUB-DISTRICT

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ABSTRACT

Dengue remains a major public health problem in tropical countries, including Indonesia. The increasing incidence of dengue requires active community participation in prevention efforts. Knowledge is an important factor influencing dengue prevention behavior. This study aimed to analyze the relationship between knowledge level and dengue prevention behavior among the community in Medan Denai Sub-district, Medan. This study employed an analytical observational design with a cross-sectional approach and was conducted in August 2024. A total of 131 respondents were selected using consecutive sampling. Data were collected through face-to-face interviews using a structured questionnaire and analyzed using the chi-square test. The results showed that most respondents had a very good level of knowledge (59.5%), while dengue prevention behavior was predominantly in the sufficient category (42.7%). Bivariate analysis revealed a statistically significant relationship between knowledge level and dengue prevention behavior (p = 0.007). These findings indicate that higher knowledge levels are associated with better dengue prevention behavior. Strengthening community-based health education and cross-sector collaboration at the primary healthcare level is essential to promote sustainable dengue prevention practices.

Keywords: *Dengue; Knowledge; Prevention Behavior; Medan*

1. INTRODUCTION

Dengue, previously known as Dengue Hemorrhagic Fever (DHF), is a disease caused by the dengue virus in which humans can get infected from the bite of female mosquitoes of the genus Aedes mainly Aedes aegypti and Aedes albopictus that have been infected from patients with previous dengue disease [1].

Dengue is a global public health concern, particularly in tropical regions such as Indonesia. In 2022, Indonesia reported 143,266 dengue cases [2]. North Sumatra is among the provinces contributing significantly to dengue incidence, with Medan recording the highest number of cases in the province [3].

Dengue transmission is influenced by the interaction between humans as hosts, *Aedes* mosquitoes as vectors, and environmental conditions that support mosquito breeding. One important host-related factor is community knowledge. Insufficient knowledge may lead to inadequate preventive behavior, increasing the risk of dengue transmission [3].

Efforts to prevent and control dengue prevention and control efforts can be done by involving community actively and sustainably in 3M Plus program as an effort to eradicate vectors that transmit dengue disease [3]. Community behavior that is still an obstacle behavior is that the community has not been able to be consistent in implementing the dengue prevention and control program [4].

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Although several studies have examined the association between knowledge and dengue prevention behavior in various regions of Indonesia, data specific to urban sub-districts with high dengue incidence remain limited. Medan Denai Sub-district represents an area with persistent dengue transmission and diverse sociodemographic characteristics, making it a relevant setting to explore community knowledge and preventive behavior patterns. Therefore, this study was conducted to address the research gap and provide evidence-based input for local dengue prevention strategies. Based on the above problems, this study was conducted to analyze the relationship between the level of knowledge and the behavior of dengue prevention in Medan Denai Sub-district, Medan.

2. METHODS

This study is an analytic observational study with a cross-sectional approach conducted in Medan Denai Sub-district, Medan. The sampling technique was done by consecutive sampling and using primary data by conducting direct interviews with community in Medan Denai Sub-district in the period of August 2024. Estimated minimum sample size is 131 respondents.

The knowledge and dengue prevention behavior questionnaires were developed based on previously validated instruments and national dengue prevention guidelines. A pilot test was conducted among respondents with similar characteristics to assess clarity and comprehensibility. Validity testing demonstrated acceptable item–total correlations, while reliability testing yielded a Cronbach's alpha value greater than 0.7, indicating that the questionnaire was valid and reliable for data collection.

Inclusion criteria were people aged ≥ 18 years in Medan Denai who were willing to become research respondents. Exclusion criteria were patients who did not answer the questionnaire completely and experienced intellectual disability. The dependent variable is dengue prevention behavior and the independent variable is the level of knowledge of dengue. Data collected were age, gender, latest education, occupation, income, and history of dengue.

Respondents' knowledge was assessed using a structured questionnaire consisting of multiple-choice questions. Each correct answer was scored 1 and incorrect answers were scored 0. The total score was converted into percentage values and categorized as follows: very good (≥ 76%), good (56-75%), sufficient (40-55%), and low (<40%). Dengue prevention behavior was measured using a Likert-scale questionnaire with four response options (always, often, rarely, never). The total behavior score was categorized using the same percentage-based classification to ensure consistency and transparency in data interpretation.

Univariate analysis explains the characteristics of the variables studied in detail and organized in a frequency distribution table and narrative. Bivariate analysis used Chi-square analysis test. The collected data were then processed computerized. This study has been declared ethically feasible by the Health Research Ethics Commission, University of North Sumatra according to letter number 764/KEPK/USU/2024.

3. RESULTS AND DISCUSSION

3.1. Respondent Characteristics Data

The number of samples obtained in this study was 131 respondents. Univariate test was conducted to determine the characteristics of respondents which can be seen in table 1. The characteristics of this research sample are most of the respondents aged 46-55 years, female, the last level of education is undergraduate and above, working as entrepreneur, have an income below the MSE of Medan City, and have never suffered from dengue.

Table 1. Distribution of the respondents by sociodemographic characteristics

Characteristics	N=131	%
Age Group		
19-25	27	20,6
26-35	28	21,4
36-45	28	21,4
46-55	30	22,9
56-65	11	8,4
> 65	7	5,3

Gender		
Male	49	37,4
Female	82	62,6
Education Level		
None	1	0,8
Primary	9	6,9
Secondary	11	8,4
Higher secondary	46	35,1
Undergraduate and above	64	48,9
Occupation		
Civil apparatus		
Private employee	5	3,9
Entrepreneur	31	23,7
Unemployed	45	34,4
Other	43	32,8
Monthly Income (IDR)	7	5,3
Above the MSE of Medan (≥ 3.769,082)	44	33,6
Below the MSE of Medan (<3.769.082)	87	66,4
History of Dengue		
Yes	17	13
No	114	87

3.2. Knowledge Section

To assess the knowledge of respondents using a questionnaire with questions, the following respondents' answers to the level of knowledge are presented in the table below.

Table 2. Frequency and Percentage Distribution of Knowledge about Dengue in Medan Denai Sub-district

Question	True	False
	n(%)	n(%)
Is dengue caused by a virus?	113(86,3)	18(13,7)
Can all mosquitoes transmit dengue?	86(65,6)	45(34,4)
Can Aedes mosquitoes transmit the dengue virus?	122(93,1)	9(6,9)
Can flies transmit the dengue virus?	97(74)	34(26)
Can mites transmit the dengue virus?	100(76,3)	31(23,7)
Can dengue sufferers transmit dengue through everyday contact?	93(71)	38(29)
Can the dengue virus be transmitted through food and drink?	82(62,6)	49(37,4)
Do mosquitoes carrying the dengue virus breed or lay eggs in clean and stagnant water?	131(100)	0(0)
Can using mosquito nets on windows and mosquito nets reduce mosquitoes?	116(88,5)	15(11,5)
Can using mosquito repellent spray reduce mosquitoes and prevent dengue?	126(96,2)	5(3,8)
Can tightly closing water reservoirs reduce mosquitoes?	126(96,2)	5(3,8)
Can topical mosquito repellent prevent mosquito bites?	125(95,4)	6(4,6)
Can the dengue virus only be transmitted by the bite of an infected female Aedes mosquito?	104(79,4)	27(20,6)
Can dengue cases only occur during the rainy season?	86(65,6)	45(34,4)
Can you differentiate between Aedes mosquitoes and other types of mosquitoes?	80(61,1)	51(38,9)
When do mosquitoes carrying the dengue virus bite humans?	75(57,3)	56(42,7)
The conditions or circumstances below are one of the signs or symptoms of dengue		
Headache	114(87)	17(13)
Joint pain	115(87,8)	16(12,2)
Muscle pain	85(64,9)	46(35,1)
Pain behind the eyeball	85(64,9)	46(35,1)
Bone pain	99(75,6)	32(24,4)

Nausea and vomiting	111(84,7)	20(15,3)
The appearance of a rash or red spots on the skin	128(97,7)	3(2,3)
Diarrhea	74(56,5)	57(43,5)
Abdominal pain	73(55,7)	58(44,3)
Bleeding gums	59(44,3)	73(55,7)
Can a person have dengue more than once?	123(93,9)	8(6,1)
Can dengue occur in all age ranges from infants, children, to adults?	129(89,5)	2(1,5)
Average	103(79)	28(21)

Based on table 2, most respondents demonstrated good knowledge regarding dengue etiology, transmission, and prevention. All respondents (100%) correctly identified clean stagnant water as a breeding site for *Aedes* mosquitoes. However, misconceptions persisted regarding certain clinical manifestations, as more than half of the respondents (55.7%) incorrectly identified bleeding gums as a common symptom of dengue.

Based on the respondents' answers in the table above, the level of knowledge of the respondents can be divided into several categories, for more details can be seen in the table below.

Table 3. Knowledge Level of Dengue

Knowledge	Frequency (n)	Percentage (%)
Very Good	78	59,5
Good	49	37,4
Sufficient	4	3,1
Low	0	0
Total	131	100

3.3. Prevention Behavior Section

To assess the behavior of respondents using a questionnaire with statements, the following respondents' answers for preventive behavior are presented in the table below

Table 4. Frequency and Percentage Distribution of Dengue Prevention Behavior in Medan Denai Sub-district

Statement	Always	Often	Rarely	Never
	n(%)	n(%)	n(%)	n(%)
I drain and clean the water reservoir at least once a week	38(29)	55(42)	34(26)	4(3,1)
I closed the water reservoir	46(35,1)	45(34,4)	29(22,1)	11(8,4)
I bury/burn unused items	27(20,6)	33(25,2)	43(32,8)	28(21,4)
I sprinkled abate powder (mosquito larvae killer) in the water reservoir	10(7,6)	13(9,9)	52(39,7)	56(42,7)
I keep larvae-eating fish in water reservoirs	7(5,3)	9(6,9)	13(9,9)	102(77,9)
I wear long clothes and pants to avoid mosquito bites	40(30,5)	37(28,2)	45(34,4)	9(6,9)
I use mosquito coils/spray/electric mosquito repellent	41(31,3)	34(26)	40(30,5)	16(12,2)
I use mosquito repellent ointment	34(26)	23(17,6)	51(38,9)	23(17,6)
I always check for mosquito larvae in water reservoirs	22(16,8)	28(21,4)	57(43,5)	24(18,3)
I do not allow standing water around my house	58(44,3)	36(27,5)	21(16)	16(12,2)
I do not let tree branches scatter in my yard	63(48,1)	29(22,1)	23(17,6)	16(12,2)
I am willing to do fogging if there are dengue cases in my neighborhood	59(45)	27(20,6)	32(24,4)	13(9,9)
Average	37(28)	31(24)	37 (28)	26(20)

Based on table 4, it is known that in statement number 11, 48.1% of respondents always apply the behavior of not letting tree branches scatter in the yard. Whereas in statement number 4 there were 42.7% of respondents who never sowed abate powder and in statement number 5 there were 77.9% of respondents who never kept larvae-eating fish in water reservoirs.

Based on the respondents' answers in the table above, it can be determined that the respondents' preventive behavior is divided into several categories, for more details, see the table below.

Table 5. Dengue Prevention Behavior

Prevention Behavior	Frequency (n)	Percentage (%)
Very Good	17	13
Good	48	36,6
Sufficient	56	42,7
Low	10	7,6
Total	131	100

Table 5 shows that the majority of dengue prevention behavior in Medan Denai Sub-district is moderate as many as 56 people (42.7%) and good as many as 48 people (36.6%).

The chi-square analysis demonstrated a significant association between knowledge level and dengue prevention behavior ($p = 0.007$). From a public health perspective, this finding suggests that individuals with higher levels of knowledge are more likely to adopt appropriate dengue prevention behaviors, which may contribute to reducing dengue transmission at the community level.

To see the relationship between knowledge level and dengue prevention behavior, bivariate analysis was conducted as follows.

Table 6. Cross Tabulation of Knowledge with Dengue Prevention Behavior

Knowledge Level Dengue	Dengue Prevention Behavior									
	Very Good		Good		Sufficient		Low		Total	*p value*
	F	%	F	%	F	%	F	%		
Very Good	6	4,58	24	18,32	39	29,77	9	6,87	78(59,54)	
Low	11	8,4	24	18,32	17	12,98	1	0,763	53(40,46)	0,007
Total	17	12,98	48	36,64	56	42,75	10	7,63	100`	

3.4. Discussion

The results of this study indicate that the majority of respondents' knowledge level is very good as many as 78 people (59.5%). Results were not much different obtained by research Pantouw *et al*. (2016) in Timinting Village which found that out of a total of 95 respondents 63 respondents (66.3%) had good knowledge [5]. These results are supported by Susanti *et al*. (2021) which states as many as 51.4% of the total respondents were good knowledge [6]. Similar results were also reported in research conducted in Surabaya, Selangor, and Yemen [7], [8], [9].

Most of the respondents in this study were able to answer correctly every question on the questionnaire. All respondents (100%) knew that stagnant clear water such as in bathtubs or flower vases can be a breeding site for mosquitoes carrying the dengue virus. The result of this study better than the previous study which showed that there are still many people who misunderstand and believe that trash cans and sewers with dirty water are breeding sites for Aedes mosquitoes [10]. Another study reported a high percentage of respondents who knew the breeding site of dengue stated that these results may be due to the intensified dengue campaign efforts that are increasingly knowledge of the community [8].

Regarding the etiology and vector of dengue, almost all respondents (86.3%) answered correctly to the question about the virus as the etiology of dengue. Almost all respondents (93.1%) specifically know that the Aedes mosquito is the vector of dengue, but 38.9% of respondents still cannot distinguish the morphology of

the Aedes mosquito from other types of mosquitoes. This indicates that based on the six levels of knowledge, the respondents' knowledge in this study has not yet reached the analytical stage. Knowledge about Aedes mosquitoes as dengue vectors is very important because one of the effective ways to prevent dengue is vector control. Regarding dengue transmission, almost all respondents (79.4%) already know that a person can become infected with dengue if bitten by an infected female mosquito. However, a small portion still stated that dengue can be transmitted through daily contact (29%) and food or drinks (37.4%). A similar finding was also reported by another study, which showed that 47.8% of respondents believed that dengue could be transmitted from an infected person to a healthy person through direct contact. This can happen because the education provided to the community does not sufficiently discuss the transmission mechanisms and is more focused on prevention methods. The existence of such misconceptions can lead to incorrect practices in disease prevention and control, thus necessitating the role of healthcare workers in providing more comprehensive [11].

One-third of the respondents (34.4%) still believe that dengue can only occur during the rainy season. This may happen because there is a lot of information stating that stagnant water during the rainy season is an ideal breeding ground for mosquitoes, but the public only knows the information that circulates superficially and does not seek further clarification. In fact, dengue can occur not only during the rainy season, although the rainy season and high humidity levels are important contributors to the increase in the Aedes mosquito population [12].

World Health Organization (WHO) states that the mosquitoes responsible for dengue are more active during the day [13]. Conversely, nearly half of the respondents (42.7%) in this study still believe that the mosquitoes responsible for dengue bite more often at night. Knowledge about the activity time of Aedes mosquitoes is important because the use of repellents and bed nets only at night may be less effective in preventing Aedes mosquito bites.

Regarding clinical manifestations, the majority of respondents agreed that someone infected with dengue can experience characteristic signs and symptoms such as skin rash (97.7%), headache (87%), joint pain (87.8%), as well as nausea and vomiting (84.7%). These findings are consistent with research conducted by Alyousefi *et al*. (2016) and Saied *et al*. (2015), which showed that more than 90% of respondents provided correct answers regarding headache, joint pain, and skin rash as clinical manifestations of dengue [7], [11]. The good level of knowledge might be because the community becomes more aware of the signs and symptoms of the disease when they live in areas with high disease prevalence [11]. The community's ability to recognize the early signs and symptoms of dengue is crucial so that they can be detected early, provided with prompt and appropriate management, and the transmission chain can be interrupted immediately, thereby reducing the morbidity and mortality rates due to dengue.

There is still one question where more than half of the respondents (55.7%) answered incorrectly, which is the question about whether bleeding gums are a sign or symptom of dengue. This may be because bleeding gums are not an early sign or symptom of dengue fever, but rather a manifestation of spontaneous bleeding that can only occur in patients with DHF grade II. This explanation is consistent with other research that states that few respondents know that mucosal bleeding is a danger sign of dengue and can be fatal [14].

Regarding knowledge about dengue prevention, the majority of respondents stated the use of mosquito nets on windows and bed nets (88.5%), insect repellent sprays (96.2%) and mosquito ointments (95.4%), as well as tightly covering water storage containers (96.2%) as preventive measures against dengue. The results indicate that the majority of respondents are already aware of the physical and chemical control methods that can be implemented to prevent dengue.

The majority of respondents had adequate dengue prevention behavior, with 56 people (42.7%). These findings are consistent with a study conducted by Heni Sunaryanti and Iswahyuni (2020) in Jelok Cepogo Boyolali Village, which found that the majority of respondents (39.49%) had adequate dengue prevention behavior [15]. This finding is also supported by research conducted by Peraten Pelawi and Dedu (2023) in Pakisjaya District, Karawang Regency, which showed that out of 106 respondents, 74 respondents (69.8%) exhibited sufficient behavior [16]. Similar results were also reported in studies conducted in Deli Serdang, Rejang Lebong, and Palu [17], [18], [19].

The majority of respondents have already adopted behaviors such as draining and covering water storage containers, maintaining the cleanliness of the surrounding environment, and being willing to undergo fogging

to break the chain of dengue transmission. Half of the respondents used mosquito repellent incense or ointment to prevent mosquito bites.

The results are consistent with the study conducted by Mahyiddin *et al*. (2016) in Malaysia, which stated that the majority of respondents have already adopted behaviors such as draining and covering water storage containers and trimming bushes around the house. However, only a small portion use mosquito repellents or insecticides [8].

However, there are still preventive behaviors against dengue that are rarely practiced by the community, such as sprinkling abate powder to eliminate mosquito larvae, keeping fish that eat mosquito larvae, and inspecting mosquito larvae in water storage places. Other studies also state similar findings, where only a small portion of respondents perform abatement due to low socioeconomic factors and the inability to obtain abate easily because it is not available, requiring them to travel to nearby cities to get abate [20].

These efforts may be considered costly given that most respondents have limited financial capacity. In addition, it could also be due to the perception of the community that abate is a hazardous chemical and they do not know how to use it. This shows that the government's strategy should place more emphasis on cost-effective methods to prevent dengue, such as actions and environmental control. And if the distribution of larvicides to the community is carried out, it should be accompanied by an explanation of their safety and a demonstration of how to use them.

Individual behavior arises as a result of both internal and external stimuli. The behavior exhibited can determine whether a person becomes healthy or sick. Unhealthy habits can lead to the development of various diseases, whereas healthy habits can prevent the occurrence of diseases [21].

The results of this study indicate a relationship between the level of knowledge and dengue prevention behavior. This is in line with the research conducted by Peraten Pelawi and Dedu (2023) in Telagajaya Village, Karawang Regency. In the study, it was found that out of a total of 106 respondents, the majority had a good level of knowledge, with 91 respondents (85.8%) and a sufficient level of preventive behavior with 74 respondents (69.8%) [16].

Another study conducted by Yosua Lontoh *et al*. (2016) in Malalayang 2 Village also showed similar results. In that study, out of a total of 70 respondents, the majority had a good level of knowledge, with 39 respondents (55.7%) and good preventive behavior with 49 respondents (70%). The study yielded an OR value of 3.765, meaning that respondents with good knowledge have a 3.765 times higher chance of exhibiting good preventive behavior compared to respondents with less knowledge [22]. Similarly, the same results were obtained from research conducted in Bali and Palangka Raya [23], [24].

Based on several studies, it can be concluded that there is a correlation between knowledge and dengue prevention behavior due to the abundance of information and health promotion programs that are available and easily accessible to the community, one of which is the popular PSN 3M program among the public. Furthermore, the community also believes that dengue prevention is a shared responsibility [9].

However, different results were obtained by Anggraini *et al*. (2023) who reported that there was no significant relationship between the level of knowledge and dengue prevention behavior at the Rowosari Health Center in Semarang City. The study reported that out of a total of 30 respondents, 15 people (50%) had a low level of knowledge and 17 people (56.7%) had good dengue prevention behavior. This indicates that the respondents' behavior is mostly good, where in practice, the respondents perform the 3M behavior but are not based on good knowledge. This could happen because the respondents do not know about dengue disease but still follow the recommendations given by health officers [25].

According to the researchers' assumption, these differences in results may be caused by various factors, including differences in demographic characteristics, inclusion criteria in sample selection, and the sampling techniques used. In the study, it was found that the majority of respondents, amounting to 18 people (60%), were male. Generally, women are more likely to be concerned about the impact of a disease, making them more attentive to their environmental and health conditions. Other research also mentions that it has become a cultural norm for women to play a larger role in managing family health [26].

Another difference obtained from these two studies is that the research conducted by Anggraini *et al*. (2023) included inclusion criteria, namely patients with DD, DBD, and DSS in the working area of Puskesmas Rowosari. The final difference between these two studies is that Anggraini *et al*. (2023) used a simple random sampling technique with proportional calculations per sub-district, which can lead to a more representative population and a more even distribution of respondent characteristics. Similarly, the same results were obtained from studies conducted in West Java and Saudi Arabia [14], [27].

The level of knowledge is one of the predisposing factors that influence the formation of health behaviors. The existence of a relationship between the level of knowledge and dengue prevention behavior may be due to the fact that the knowledge possessed by the community in this study is already at a high level, specifically at the application level. Where the community not only knows and understands the material to the extent that they can answer the questionnaire questions, but also has developed a sense of awareness and interest in adopting behaviors marked by the ability to practice what they have known and understood in their daily lives.

This can be influenced by various factors such as the community having received adequate information about dengue from many sources, and also supported by educational factors where the respondents of this study are predominantly from the last level of higher education, thus potentially providing a more rational response to the information obtained.

Additionally, the relationship between the two variables can also be influenced by support from other factors, such as supporting factors originating from the physical environment like health service facilities, or driving factors that strengthen behavior formation, such as government policies and the role of community leaders

4. CONCLUSION AND SUGGESTION

Based on the results of the study, the majority of people have a very good level of knowledge about dengue and sufficient dengue prevention behavior. There is a relationship between knowledge level and dengue prevention behavior. Primary healthcare centers should strengthen community-based dengue education programs that emphasize simple, practical, and low-cost preventive measures. Local governments are encouraged to enhance cross-sector collaboration and involve community leaders to support sustained dengue prevention efforts..

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