ORIGINAL ARTICLE

Dominant variables of dengue prevention: multivariate modeling of endemic areas

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ABSTRACT

The sharp increase in Dengue Fever incidence among school-age children indicates that the elementary school environment is a potentially good place for Aedes aegypti. Transmission also potentially occurs when Aedes aegypti bites while the students are studying. The purpose of this study was to determine the dominant variables influencing dengue prevention efforts in elementary schools in Bandung City. Quantitative research with a cross-sectional design was conducted from August - October 2023. The study population included 476 elementary schools, with a minimum sample size of 59 using the Slovin formula. Primary data were obtained through questionnaires filled out by 4 primary school components, namely the principal, class teacher or school health officer, students, and janitor, which were then considered as primary school data. A simple logistic regression test was conducted for bivariate selection, while multiple logistic regression was used for multivariate modeling. Chi-square analysis with a significance level of 5% found that knowledge (p-value: 0.016), attitude (p-value: 0.036), motivation (p-value: 0.050), experience (p-value: 0.013), school conditions (p-value: 0.020), and perception (p-value: 0.040) were significantly associated with dengue prevention. Bivariate selection showed that knowledge (p-value 0.011), attitude (p-value 0.018), perception (p-value 0.034), experience (p-value 0.011), school condition (p-value 0.009), motivation (p-value 0.033) and information exposure (p-value 0.044) were associated with dengue prevention. Whereas, the presence of *Jumantik* (p-value 0.485), Dengue information media (p-value 0.424), and larval density (p-value 0.453) weren't associated with Dengue Prevention. The most dominant variable in this study was Motivation with an OR 95% CI = 7.576 (1.106-51.906). Motivation needs to be developed through the right stimulus. Health education to improve knowledge as a stimulus needs to be pursued to create agents of change for Dengue prevention in the school environment from an early age. Cross-sectoral collaboration between the Health Department and the Education Department can be a problem-solving strategy for Dengue prevention.

Keywords:
dengue fever prevention; school environment; motivation; agent of change; early age

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INTRODUCTION

Dengue Fever (DF) is an infectious disease caused by the Dengue virus, which is transmitted through the bite of the Aedes aegypti mosquito. Indonesia is one of the countries with the highest occurrence of Dengue Fever. Dengue fever cases in Indonesia in the 13th week of 2024 have reached 53,131 people. Among them, the death rate from Dengue Fever reached 404 people. Dengue fever is an environment-based disease that is still endemic in Bandung City. The incidence of Dengue Fever in Bandung City from November 2023 to March 2024 ranked first in Indonesia with 1,741 cases.[1] Aedes aegypti is characterized by a small, solid black body with white stripes on its back and legs. Active in the morning and evening and able to fly as far as 400 meters, Aedes aegypti can spread the dengue virus far from where it nests. Aedes aegypti prefers rooms that aren't exposed to direct sunlight and its larvae are found in containers that aren't in direct contact with the ground. The presence of water reservoirs such as water barrels and water tanks throughout southern California has prompted local health authorities to monitor the spread of invasive mosquito species including the reintroduction and spread of Aedes aegypti.[2]

Based on the incidence rate, flying ability, potential endemic areas, biting hours, and the environment that supports Aedes aegypti habitat, the school environment in Bandung City is considered a risky environment for Aedes aegypti transmission. School students have the potential to contract Dengue Fever in the school environment considering that school hours are the same as the active hours of Aedes aegypti biting, namely in the morning and evening. Female Aedes aegypti suck blood every 2-3 days at 08.00-12.00 and 15.00-17.00.

The school environment, especially the adjoining area, has the potential to become a breeding ground for Aedes aegypti. This is certainly supported by the condition of the school environment, which can be a preferred habitat for Aedes aegypti to breed. Aedes aegypti larvae are mostly found in productive habitats, namely outside the house, but productive habitats in the house are still found even though the number is smaller. The school environment is almost the same as the house environment regarding mosquito habitat, especially water reservoirs or water containers. Aedes aegypti can breed in a variety of artificial containers.[3] The water containers in question can be in the form of bathtubs, water dispensers, flower vases, refrigerator water containers, water buckets, banana leaf axils, taro leaf axils, and ponds that may exist in the school environment.

The environment as a good habitat for Aedes aegypti can be a resting place that is cool, humid, dark, not exposed to direct sunlight, and not strong wind. Aedes aegypti prefers to be active in houses or buildings, considering the need for breeding, resting place, and getting blood, which can be found indoors. Temperature, rainfall, and humidity affect the fluctuation of the Aedes aegypti population. Aedes aegypti eggs were found in all months during the study.[4] Bandung, as a dengue-endemic area, is a favored place for Aedes aegypti to breed. Bandung has a humid and cool mountain climate with an average number of rainy days of 21.3 days per month, an average rainfall of 200.4 mm, and an average temperature of 23.5°C. Rainfall and relative humidity are significantly associated with vector density.[5] Rainfall, vegetation, and temperature will affect the oviposition activity of Aedes aegypti more than humidity, water vapor, pressure, and photoperiod.[6] A good understanding of the ecology and biology of Aedes aegypti due

to global warming provides important information regarding its distribution areas. So knowledge of the effects on the activity and host-seeking behavior of Aedes aegypti species can be understood as a prevention effort.[7]

The school environment located in the middle of a dense residential area is a challenge in itself. Bandung covers an area of 167.7 km² with 3 million inhabitants. This means there are 18,000 people per km². Flying distances and environments that are not exposed to direct sunlight are potential breeding conditions for Aedes aegypti. Densely populated neighborhoods with buildings close together, tend to block sunlight from entering the house so that the house is a potential place for mosquitoes to rest. Significant risk is indicated by the high infestation rates observed for Aedes-borne diseases. So immediate action must be taken to prevent potential outbreaks.[8] Environmental, health, political, social, and economic factors directly and indirectly influence individual and community compliance with recommended dengue prevention measures.[9] The school environment, which is part of the community environment often goes unnoticed. With the same conditions as the home environment, the school environment has the potential for high larval density. The absence of specific activities to prevent Dengue adds to the problems in Dengue prevention. By knowing the dominant variables that influence Dengue prevention, confounding variables can be identified or controlled. So real efforts will emerge for Dengue prevention programs in the school environment.

This study aims to determine the dominant variables in Dengue prevention. By knowing the dominant variables, the required Dengue prevention program can be developed properly. The contribution and participation of schools in Dengue prevention efforts will be able to reduce the density of larvae in the environment. Dengue Fever prevention efforts to break the chain of Aedes aegypti spread need to be carried out by the school communities. Based on the description above, the researcher is interested in exploring "What are the Dominant Variables influencing Dengue Fever Prevention in Elementary School Environments in Bandung City".

METHOD

This quantitative research was carried out through a cross-sectional approach. This research further analyzed the factors associated with Dengue Fever prevention, including knowledge, attitudes, perceptions, motivation, experience in conducting Mosquito Nest Eradication, information exposure through socialization, school conditions, *jumantik* activities, Dengue Fever information, and the presence of larvae. The questionnaire used was filled with the respondent's consent form. This research was conducted in elementary schools in Bandung City, considering that the school environment is similar to the home environment. There are water reservoirs and rooms that are not exposed to direct sunlight, dampness, and lack of ventilation. The exclusion criteria in this study were primary schools in areas that participated in the Wolbachia stocking program. Meanwhile, the inclusion criteria were schools that were willing to be research respondents. The four school components consisting of the school principal, teachers or school health workers, students, and janitors were willing to be respondents. This study was conducted in Bandung City which is an endemic area. This research focuses on Dengue Fever, which has a high incidence in tropical and subtropical areas, so it has a big impact on health by causing serious complications and even death. Therefore, epidemic control becomes more important to prevent the disease from becoming more severe, including effective prevention strategies through vector control. A more specific study on dengue fever is an effort

to prevent transmission of the dengue virus caused by bites from Aedes mosquito bites. The following map presents the distribution of dengue fever patients as an illustration of the geographical context of the study area map in this research.[10]

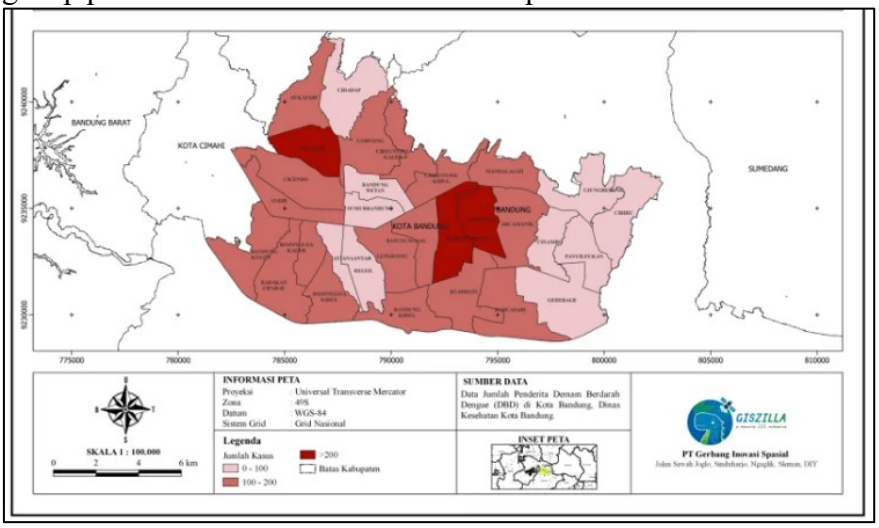

Figure 1. Distribution of Dengue Fever patients in 2021 in Bandung City[10]

Sampling Technique

The population in this study was all elementary schools in Bandung City of 476. With a confidence level of 95%, the sample of 59 primary schools was obtained. A simple random sampling technique was used through a random number generator. The representative sample of primary schools in this study were primary school components consisting of principals, class teachers or School Health Unit officers, janitors, and students. The total research response represented 59 schools with 4 respondents per school, resulting in 236 research respondents. The responses from the four school components are considered usable and representative data of elementary schools related to Dengue prevention efforts. The four school components are indeed part of the school system. The principal is the person responsible for the overall condition of the school, the teacher or person in charge of the school health efforts is someone who knows about the school health program, the janitor is responsible for the cleanliness of the school environment, and students as learners must actively participate in maintaining school hygiene. The data collected from the four school components were generalized as primary school data using average calculations.

Research Instrument

Respondents representing elementary schools filled out the questionnaires distributed. The questionnaire used questions and statements that were designed to collect data on knowledge, attitudes, perceptions, motivation, experience in conducting Mosquito Nest Eradication, information exposure through socialization, school conditions, *Jumantik*, Dengue Fever information, and the presence of larvae and Dengue Fever Prevention in Primary Schools. Validity and Reliability tests were carried out on the instrument before it was used in the study. Validity and Reliability tests were conducted on the research questionnaires before use. Validity and Reliability tests were conducted on 30 students. Valid and reliable questionnaires

were then used in the research conducted from August - October 2023.

The dependent variable in this study is Dengue prevention. The independent variables in this study were knowledge, attitude, perception, motivation, experience in performing Mosquito Nest Eradication, information exposure through socialization, school conditions, J*umantik*, DHF information, and the presence of larvae. Dengue prevention is considered effective if the score is > the mean/median value, and ineffective if the score is ≤ the mean / median value. Knowledge is said to be good if the score is between 75% - 100%, sufficient if it falls between 56% - 75%, and less if it is ≤ 56%. Attitude is said to be supportive if the score is > the mean/median value, and unsupportive if the score is ≤ the mean / median value. Perception and motivation are said to be high if the score is > mean/median value and said to be low if the score is ≤ mean/median value. For experience in Dengue prevention, it is categorized as Yes if you have participated in Dengue prevention activities and No if you have never engaged in Dengue prevention. Participation in Dengue prevention socialization is categorized as having participated if the school participated in Dengue prevention socialization and never participated in Dengue prevention socialization if the school has not. Dengue prevention media was categorized as having media if the school had media and not having media if the school did not offer any media. *Jumantik* is categorized as having *Jumantik* if the school has an active *Jumantik* and not having *Jumantik* if the school does not have an active Jumantik. The density of larvae was categorized as having larvae if larvae were found during the study and no larvae if no larvae were found during the study. School condition was categorized as good if there were no Dengue risk factors and not good if there were Dengue risk factors.

Data Analysis

The data obtained were then analyzed descriptively to examine the frequency distribution and percentage of knowledge variables in the form of knowledge, attitudes, perceptions, motivation, experience in performing Mosquito Nest Eradication, information exposure through socialization, school conditions, presence of *jumantik*, Dengue Fever information, presence of larvae and Dengue prevention efforts. A simple logistic regression test was used to determine the dominant factor and bivariate selection in the next model with multiple logistic regression to determine which factors were associated with dengue prevention and which factors were confounding factors. The aim is to determine the selection of variables that enter the multivariate. Multivariate analysis aimed to find the most dominant independent variable associated with Dengue incidence. The requirement for entering the multivariate analysis is that the variable should have a P value of <0.25. The choice of P < 0.25 as the initial phase of analysis allows researchers to capture variables that may contribute to the model but may not show strong significance at an early stage. It also allows researchers to consider variables that may have an effect but do not reach the more stringent significance level (e.g. 0.05). Statistical tools for data analysis include SPPS.

Ethical Approval

This study has obtained ethical approval. Ethical approval for this study was given by the Ethics Committee of Bhakti Kencana University with reference number 98/09.KEPK/UBK/VII/2023.

RESULT

The study was conducted from August - October 2023 in 59 elementary schools in Bandung City. Based on the data collected and analyzed from the school components, the results of the univariate analysis are shown in Table 1 and Table 2.

The results showed that prevention efforts were not systematic and comprehensive. Most of the schools did not conduct Dengue prevention activities (72.9%), had unsupportive attitudes (74.5%), perceptions (67.8%), low motivation (71.2%), no experience in conducting independent Dengue prevention (69.5%), poor school conditions (64.4%), and no larvae found (61.0%). Almost all schools had never attended socialization sessions (89.8%), no *Jumantik* (96.6%), and no special media for Dengue prevention (98.3%).

Table 1. Demographic data of elementary school components

Characteristics	Frequency	Percentage
Level of Education		
High	177	75%
Middle	33	14%
Low	26	11%
Gender		
Male	40	17%
Female	196	83%
Age		
17 - 24	36	15%
25 - 34	51	22%
35 - 44	86	36%
45 - 54	45	19%
55 - 64	18	8%
Total	236	100%

Table 2. Frequency Distribution of Research Variables

Dengue Variables	n	%
Dengue Preventage		
Take Prevention	16	27.1
No Prevention	43	72.9
Knowledge		
Sufficient	15	25.4
Insufficient	44	74.6
Attitude		
Supportive	19	32.2
Unsupportive	40	67.8
Perception		
Good	14	23.7
Poor	45	76.3
Motivation		
Good	17	28.8
Poor	42	71.2
Experience in performing Mosquito Nest Eradication		
Yes	18	30.5
No	41	69.5

Dengue Variables	n	%
Exposure to Information through socialization		
Have ever	6	10.2
Never	53	89.8
School condition		
Good	21	35.6
Poor	38	64.4
Jumantik		
Exist	2	3.4
Does Not Exist	57	96.6
Dengue prevents media information		
Exist	1	1.7
Does Not Exist	58	98.3
Jentik Existential		
Exist	23	39.0
Does Not Exist	36	61.0
Total	59	100.0

Chi-square analysis showed that knowledge (p-value: 0.016), attitude (p-value: 0.036), motivation (p-value: 0.050), experience in performing Mosquito Nest Eradication (p-value: 0.013), school condition (p-value: 0.020), perception (p-value: 0.040), and information exposure (p-value: 0.176) about Dengue Fever were associated with Dengue Fever prevention.

Table 3. The connection between Research Variables and Dengue Prevention

Variable	Dengue Prevention				P value	OR 95% CI
	Take Prevention		No Prevention			
	n	%	n	%		
Knowledge						
Sufficient	8	53.3	7	46.7	0.016	5.143 (1.443-18.334)
Insufficient	8	18.2	36	81.8		
Attitude						
Supportive	9	47.4	10	52.6	0.036	4.243 (1.259-14.299)
Unsupportive	7	17.5	33	82.5		
Perception						
Good	7	50.0	7	50.0	0.040	4.000 (1.115-14.346)
Poor	9	20.0	36	80.0		
Motivation						
Good	8	47.1	9	52.9	0.050	3.778 (1.110-12.858)
Poor	8	19.0	34	81.0		
Experience in performing Mosquito Nest Eradication						
Yes	9	50.0	9	50.0	0.013	4.857 (1.418-16.634)
No	7	17.1	34	82.9		
Exposure to Information through socialization						
Have ever	0	0.0	6	100	0.176	1.432 (1.200-1.710)
Never	16	30.2	37	38.6		
School environment condition						

Variable	Dengue Prevention				P value	OR 95% CI
	Take Prevention		No Prevention			
	n	%	n	%		
Good	10	47.6	11	52.3	0.020	4.848 (1.428-16.458)
Poor	6	15.8	32	84.2		
Jumantik						
Exist	1	50.0	1	50.0	0.472	2.800 (0.165-47.628)
Does Not Exist	15	26.3	42	73.7		
Dengue medic Infomation						
Exist	0	0.0	1	100	1.000	1.381 (1.178-1.619)
Does Not Exist	16	27.6	42	72.4		
Larvae existence						
Exist	5	21.7	18	78.3	0.658	0.631 (0.187-2.135)
Does Not Exist	11	30.6	25	69.4		

Based on bivariate selection with a P value <0.25, the variables of knowledge (p-value: 0.011), attitude (p-value: 0.018), perception (p-value: 0.034), experience in performing Mosquito Nest Eradication (p-value: 0.011), school condition (p-value: 0.009), motivation (p-value: 0.033) and information exposure (p-value: 0.044) are associated with Dengue Prevention. Whereas, the presence of *Jumantik* (p-value-: 0.485), Dengue information media (p-value-: 0.424), and larval density (p-value-: 0.453) were not associated with Dengue Prevention.

Table 4. Bivariate selection results

Variable	P Value	Information
Knowledge	0.011	Candidate
Attitude	0.018	Candidate
Perception	0.034	Candidate
Motivation	0.033	Candidate
Experience in performing Mosquito Nest Eradication	0.011	Candidate
Exposure to Information through socialization	0.044	Candidate
School conditions	0.009	Candidate
Jumantik	0.485	Not Candidate
Dengue Fever Information Media	0.424	Not Candidate
The existence of larvae	0.453	Not Candidate

Attitude and Motivation were variables significantly associated with Mosquito Nest Eradication Implementation in the final multivariate modeling. Information, perception, experience, knowledge, and school condition were confounding variables. The most dominant variable in this study was Motivation with an OR value of 95% CI = 7.576 (1.106-51.906). This means that schools with good motivation have a 7.5 times chance of performing Mosquito Nest Eradication after controlling for the variables of

information, perception, experience, knowledge, school condition, and attitude.

Table 5. Final Multivariate Modeling

Risk Factors	Category	B	P Value	OR	95% CI	
					Lower	Upper
Exposure to Information through socialization	Have Ever Never	-19.927	0.999	0.000	0.000	.
Perception	Good Poor	1.140	0.268	3.126	0.416	23.512
Experience in performing Mosquito Nest Eradication	Yes No	1.428	0.113	4.171	0.713	24.392
Knowledge	Sufficient Insufficient	1.796	0.073	6.023	0.848	42.756
School condition	Good Poor	1.709	0.065	5.522	0.901	33.830
Attitude	Supportive Unsupportive	1.992	0.046	7.328	1.033	51.955
Motivation	Good Poor	2.025	0.039	7.576	1.106	51.906

DISCUSSION

School conditions

Based on the research that has been done, it is found that most of the school conditions are not good (64.4%). Variable analysis found that most classrooms are stuffy (58%), almost all schools have puddles in the yard (32%), there are used items that hold water (47%), and almost all schools have open water reservoirs (92%). Trash cans, bromeliads (a type of plant with a leaf structure that forms a container and can collect water), and gutters have a much higher number of pupae compared to the number of larvae in old tires, which are known as productive habitats for Aedes aegypti.[11]

Based on the research data that has been analyzed, the elementary school which is part of the environment has the potential to become a breeding ground for Aedes aegypti. The absence of Dengue Fever prevention efforts in schools is an important indicator that schools haven't been given special attention to Dengue Fever prevention. Therefore, it can be said that the school environment that doesn't take precautions certainly has the potential to become a breeding ground and resting place for Aedes aegypti. A poor school environment can potentially increase the transmission of Aedes aegypti. The results also stated that the OR of the study is 4.848 (1.428-16.458). Schools with poor environmental conditions had a 4.8 times chance of not practicing Dengue Fever prevention measures. Poor school conditions include stuffy classrooms, used items that hold water, puddles in the schoolyard, open water reservoirs, discarded containers, flower pots, holes in coconut trees, and old tires can serve as the main habitats of Aedes aegypti[8]. Sanitation is an important indicator of vector breeding in an area. Climate change demands

community involvement through Health promotion aimed at addressing the prevention of vector-borne disease.[12]

The school's experience in specifically preventing Dengue Fever is still limited. The usual prevention method of draining water reservoirs which are mostly in the form of buckets is still limited. Bucket is one of the potential breeding places of Aedes aegypti and is used by schools as one of the water reservoirs that are considered practical to clean. Aedes aegypti larvae breed well in calm and clean water. Larval hatching was highest in pond water with a pH of 8 and in brackish water with a pH of 18. The lowest hatching occurred in pond water with a pH of 6. Different water types and pH values of less than 6 caused significant differences in larval hatching and adult emergence.[13]

Eradicating larvae is one of the indicators of Clean and Healthy Living Behavior in Schools. However, containers in schools aren't just buckets, considering that the breeding sites for Aedes mosquitoes are stagnant water sources that are not directly in contact with the ground and provide enough nutrients for the growth of larvae. Some other eradication efforts are closing water reservoirs, reusing used items, using mosquito barriers, not hanging used clothes, keeping larvae-eating fish, and using anti-mosquito lotion. The results showed that schools with experience in Mosquito Nest Eradication had a 4.8 times chance of preventing Dengue.

The school has never been exposed to specific information on dengue prevention. Guidance from the School Health Office is limited to maintaining a clean environment that can reduce used water containers. However, schools still need information about Dengue and its prevention. Information about dengue fever and its control can be obtained from various media, one of the examples is television. Almost all students obtained knowledge from television.[14] However, television as a

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cheap and easily accessible medium does not provide information on dengue prevention. As educational institutions, schools don't have specific policies on dengue prevention. Information exposure isn't related to dengue prevention but this condition can be directly proportional to the knowledge, attitude, perception, and motivation of schools in dengue prevention. In this regard, knowledge, attitude, perception, and motivation of schools are related to dengue prevention.

Knowledge in the form of information can be a stimulus in the behavior of an individual including health behavior. Knowledge about dengue fever and its prevention must be accompanied by up-to-date educational materials so as not to cause misunderstanding of the material so that dengue fever prevention can be sustained properly [9]. Health education to prevent dengue fever should focus on improving knowledge and perceptions related to the vulnerability of contracting dengue fever. Knowledge improvement can be done through socialization or mosquito control campaigns, especially in places where mosquito fogging is common.[15] Mosquito fogging is an instant but ineffective method because it only kills adult mosquitoes. Therefore, it's necessary to massively increase knowledge about dengue prevention. The knowledge that can be applied practically, especially in preventing Dengue Fever.[16]

Knowledge is a stimulus for behavior change, starting with attitude and perception responses and then encouraging the formation for motivation in Dengue prevention. School knowledge is limited so that responses related to Dengue prevention are not supportive and have unfavorable perceptions resulting in less motivation for the implementation of Dengue prevention. The results showed that there was a

relationship between knowledge and Dengue prevention. With an OR of 5.143, it means that schools with good knowledge have a 5x chance of preventing Dengue. Comprehensive knowledge about dengue fever needs to be developed to ensure the sustainability of behavior change in dengue fever prevention. This effort needs public awareness, especially changes in beliefs about health.[17] Motivation will not arise in individuals when the stimulus that forms the knowledge of Dengue prevention is lacking. This means that the understanding that's formed cannot encourage the emergence of motivation to make efforts to prevent Dengue.[18]

The spread of Dengue is growing rapidly with the availability of favorable habitats in the environment. Prevention efforts must be preceded by providing information to increase knowledge about Dengue. The results of research in Nepal stated that public knowledge about DF is still very low and this is directly proportional to the rapid spread of DENV.[19] Thailand with a high incidence of dengue has a dengue management policy where education, information, and activities to raise awareness about dengue in the community are pursued by the National Dengue Prevention and Control Plan(NDPCP).[20] Almost all communities have heard of dengue fever but limited literacy is a problem in accessing information. Literate communities were more aware of dengue information than illiterate communities ($p<0.001$). Knowledge about preventive measures tended to focus on mosquito bite prevention (78.3%) compared to mosquito population eradication (17.3%).[21] Education, especially increases the knowledge and the role of the community in Dengue Fever prevention, so it can encourage the increased awareness of the community in Dengue Fever management.[22] When people are aware of and understand dengue fever, they are also aware of climate change and the occurrence of dengue fever so they seek information to prevent dengue fever. In principle, efforts to prevent dengue fever must continue to be improved through various stimuli.[23]

Good knowledge will encourage a supportive attitude. Attitude is a response that remains internal and cannot necessarily be observed as a form of behavior, it serves as a foundation to encourage the formation of good behavior to prevent Dengue. Attitude in this study was associated with Dengue prevention with an OR of 4.243. Schools that support Dengue prevention have a 4x chance of effectively implementing Dengue prevention compared to schools that do not support it. Threats of vulnerability and severity and perceived barriers play an important role in health-seeking behavior, especially prevention and control.[24] In the prevention of Dengue, the community and health workers must actively participate. The reality is that most health workers have moderate knowledge, neutral attitudes, and low practices toward dengue prevention.[25]

A favorable attitude will lead to a good perception. Perception with OR 4.000 means that schools with a good perception have a 4x chance of preventing Dengue. Perception is a sensing process that requires a variety of stimuli to trigger the formation of motivation. The formation of perception is a process of stimuli forming subjectivity through experience, culture, expectations, needs, emotions, and motivation. Nepalese people's knowledge and awareness of Dengue and its prevention is still at a low level although they have a very high attitude towards Dengue. In this case, access to sources of information on dengue prevention can come from television (71.8%) and radio (51.5%) [26] (Phuyal et al., 2022).

Perception is a variable between attitude and behavior to prevent dengue fever. Increased knowledge as a perceptual stimulus through health promotion with health messages as a perceptual stimulus related to the possibility of outbreaks,

severity, and complications can influence prevention efforts. Information as knowledge can help improve attitudes that encourage dengue prevention.[27] Future socialization should contain information and messages from the research recommendations. The goal is to make socialization more effective in influencing community perceptions and behavior.[28]

Good perception will lead to motivation within the driver of the formation of good behavior. Motivation both from within and from outside will stage the formation of behavior. Strong motivation for fulfilling the achievement of needs will make it easier for prevention programs to be carried out responsibly. The results showed that motivation is related to dengue prevention with a 4x chance of carrying out dengue prevention. Schools through students as individuals who are easily mobilized can effectively carry out dengue prevention efforts well. [29]

The absence of School *Jumantik* and information media on dengue prevention indicates that schools haven't made efforts to prevent dengue. School *Jumantik* is a 1-House 1 *Jumantik* program. School *Jumantik*, as larva monitors, can break the chain of the infestation cycle as well as play a role in disseminating information on dengue prevention in schools. *Jumantik* activities and Dengue information are not related to Dengue prevention. This situation can happen because infrastructure and support as enabling and reinforcing factors will not be effective without predisposing factors. Knowledge, attitudes, perceptions, and motivation related to Dengue prevention must be considered first so that infrastructure support and the support of *Jumantik* schools can foster lasting behavioral changes. Thus, it's necessary to have a Dengue Fever prevention program in schools that can increase the awareness of the school community.[30]

Knowledge, attitude, perception, motivation, experience of dengue prevention, exposure to information through socialization, and school condition were candidates in bivariate selection. The significant variables associated with Dengue prevention were attitude and motivation, with the most dominant variable being motivation with an OR of 7.576 (1.106-51.906). This means that a well-motivated school has a 7.5 times chance of conducting a Dengue prevention program after intervening in the variables of information, perception, experience, knowledge, school conditions, and attitude. Schools as a place for students to learn are obliged to make efforts to prevent Dengue but these efforts must not interfere with the teaching and learning process. If prevention is effective, the breeding ground is reduced. However, it is necessary to pay attention to the main obstacles such as irregular teaching and learning process, low frequency, lack of consistent supervision, poor communication and coordination between health and education staff and personnel, and insufficient and irregular supplies for schools such as educational materials and chemical larvicides.[31]

Motivation requires the right stimulus to encourage dengue prevention. Prevention motivation can be applied through school programs and policies that involve all components and elements of the school. There's a need for a program to increase knowledge of dengue prevention in all Jeddah schools where students showed an increase in their average knowledge after the program compared to the other 2 groups.[32] If the community is given the right knowledge of Dengue Fever prevention, the community will be able to prevent Dengue Fever properly. Increasing knowledge is aimed at enabling the community to prevent Dengue properly through health education so that important messages about Dengue prevention can be

conveyed and adopted into the desired behavior change. Health education aims to eliminate knowledge gaps about Dengue Fever prevention.[33]

Systematic and practical efforts are needed that can be applied in schools without disrupting the learning process but supporting Dengue prevention efforts in the school environment. Dengue prevention efforts are a complex behavioral unit that requires a stimulus in the form of increased knowledge to stimulate attitudes to perceive well and promote motivation in preventing Dengue. In the future, Dengue prevention requires effective efforts to disseminate information on time and with interesting content. Development of Dengue prevention materials through Information and Education Communication (IEC) that are sufficient and easy to understand is crucial to increase public awareness at different educational levels, including Health Education or Information Communication and Education (IEC) on Dengue Fever Prevention in school and university curricula that can be a school-based prevention program.[26]

Infrastructure support to realize lasting behavior of dengue prevention through policy, especially support from schools and related agencies, namely the Health Office and the Education Office, can have leverage in dengue prevention efforts. Health education interventions are carried out by considering the perceived vulnerability and severity of dengue fever.[34] This approach aligns with the Belief Model on four dimensions, namely the severity of contracting certain diseases, vulnerability to health conditions or diseases, barriers to health behavior, and perceived benefits of health behavior. Through the collaboration of the school program and the Department of Health and the Department of Education, dengue prevention can be carried out well. Another advantage of the program is that it creates agents of change for Dengue prevention in the school community and creates a generation that can prevent Dengue from an early age. This study has limitations, such as potential bias in data collection. The sampling method represented by school components with different characteristics may affect the results.

CONCLUSION

The dominant variable in this study is motivation related to Dengue Prevention. Dengue Prevention motivation needs to be pursued through the right stimulus. High motivation will encourage good behavior related to dengue prevention.

RECOMMENDATIONS

Health education can be an effort to increase knowledge as a stimulus. These efforts can create agents of change for Dengue prevention. Cross-sectoral collaboration between the Department of Health and the Department of Education can be effective for Dengue prevention through the dengue prevention model.

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