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FACTORS FOR THE OCCURRENCE OF DENGUE HEMORRHAGIC FEVER AT THE KEMILING INPATIENT HEALTH CENTER IN BANDAR LAMPUNG

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Abstract

Dengue Hemorrhagic Fever (DHF) is an infectious disease that remains a major public health problem in many tropical regions, including Indonesia. This study aims to analyze the factors influencing the incidence of DHF, including Mosquito Breeding Eradication Behavior (PSN), community participation, the use of bed nets, the use of window screens, and support from health workers. The research method used an observational analytic approach with a case-control design. A total sample of 75 respondents consisted of 25 in the case group and 50 in the control group. Statistical tests were conducted using univariate analysis, bivariate chi-square, and multivariate logistic regression. The results showed that poor PSN behavior was more frequently found in DHF cases (65.2%) compared to controls (34.8%), while good PSN behavior was dominant in controls (78.8%) compared to cases (21.2%). Support from health workers was more often received by controls (72.4%) than cases (27.6%). Both good and poor community participation were more dominant in the control group, 86.4% and 56.6% respectively. The use of window screens and bed nets was also higher among controls, 76.6% and 85.7%, compared to cases, 23.4% and 14.3% respectively. Analysis showed a significant relationship between PSN behavior (p=0.001; OR=6.98), community participation (p=0.028; OR=4.85), the use of window screens (p=0.016; OR=3.77), the use of bed nets (p=0.041; OR=4.45), and support from health workers (p=0.037; OR=3.75) with DHF incidence. PSN behavior was identified as the dominant factor with OR=4.317 in the UPT Puskesmas Rawat Inap Kemiling, Bandar Lampung, in 2025. Conclusion: PSN behavior, community participation, use of window screens, use of bed nets, and support from health workers were significantly associated with DHF incidence, with PSN behavior as the dominant factor. Recommendation: Educational institutions should regularly provide PSN education, implement environmental sanitation programs, and integrate DHF materials into curricula, while health centers need to enhance socialization, cadre training, and prevention facilities. All these efforts aim to create sustainable interventions to reduce DHF incidence.

Keywords :Mosquito Nest Eradication Behavior, Dengue Hemorrhagic Fever

Introduction

Dengue hemorrhagic fever (DHF) is still a global public health problem with a significant increase in cases in various tropical and subtropical countries. WHO noted that by 2024 there will be around 7.6 million cases of dengue globally, with more than 16,000 severe cases and 3,000 deaths. This disease is transmitted mainly by the Aedes aegypti mosquito which breeds widely in residential environments, so community-based prevention is the main challenge (Ministry of Health, 2023).

In Indonesia, dengue was first discovered in 1968 and remains an endemic disease until now. Data from the Ministry of Health in 2024 shows that there will be 119,709 cases with 621 deaths. Although the trend of cases has fluctuated, the incidence rate is still relatively high, especially in

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provinces with population density and poor environmental sanitation. The Case Fatality Rate (CFR) of dengue in Indonesia in 2021 even reached 0.96%, exceeding the national target of <0.7%.

Lampung Province is one of the regions with a fairly high burden of dengue cases. In 2022, there were 4,662 cases with 15 deaths, while in 2022 there were 4,662 cases with 15 deaths.

In 2024, the incidence rate (IR) will reach 115.35 per 100,000 population. The city of Bandar Lampung, especially Kemiling District, also shows a fluctuating but relatively high trend of cases compared to other sub-districts (Lampung Provincial Health Office, 2024).

Various control efforts have been carried out, such as the Mosquito Nest Eradication program with 3M Plus (Yudhastuti, 2018), health education, and routine monitoring by jumantik cadres. However, the success of this program is greatly influenced by community behavior, environmental conditions, and the support of health workers. Previous research has shown that factors such as water reservoir management, house density, knowledge, and community attitudes are related to the incidence of dengue (Shuaib, et al. 2010).

Given the high incidence rate and the importance of environmental and behavioral factors in dengue control, this study was conducted to analyze factors related to the incidence of dengue in the working area of the Kemiling Inpatient Health Center, Bandar Lampung City.

Method

This type of research is a quantitative analytical observational research with a retrospective design with a case-control approach. The population in this study is people living in Kemiling Raya and Kemiling Permai sub-districts in the working area of the Kemiling Inpatient Health Center in Bandar Lampung. The research instrument is a questionnaire. Data analysis was used for univariate analysis of frequency distribution, bivariate analysis using chi square test and multivariate analysis using multiple logistic regression.

In this study, the inclusion criteria include all patients with Dengue Hemorrhagic Fever (DHF) based on the diagnosis of the clinical officer recorded at the Health Center, Aged ≥ 15 years, B ersedia as a respondent and fill out the informend concent and questionnaire completely, Able to communicate well and address in the Kemiling Raya area
and Kemiling Permai.

Results

1. Analisa Univariat

Table 1 Distribution of Frequency of Respondents in Kemiling Raya Village in the working area of the Kemiling Inpatient Health Center in Bandar Lampung 2025

Variabel	Incidence of dengue fever			
	Cases (25)		Control (50)	
Mosquito nest eradication	**n**	**%**	**n**	**%**
Less good	15	60.0	8	16.0
Good	10	40.0	42	84.0
Healthcare worker support				
Less good	10	40.0	7	14.0
Good	15	60.0	43	86.0
Community participation				
Less good	22	88.0	31	62.0
Good	3	12.0	19	38.0
Use of mosquito wire				
No	13	52.0	14	28.0
Ya	12	48.0	36	72.0

Use of mosquito nets				
No	22	88.0	32	64.0
Ya	3	12.0	18	36.0

From table 1 above, it can be seen that in the dengue case group, 60.0% had poor mosquito nest eradication behavior, compared to only 16.0% in the control group. Health worker support was more in 40.0% cases compared to 14.0% controls. Poor community participation was very dominant in cases, which was 88.0%, and also quite a lot in control, which was 62.0%. The use of mosquito wire was higher in the control of 72.0% compared to the case of 48.0%. The use of mosquito nets was also higher in control, which was 36.0% compared to the case of only 12.0%.

2. Analyzes Bivariat

Table 2 Analysis of the relationship between Mosquito Nest Eradication Behavior and the Incidence of Dengue Hemorrhagic Fever in the working area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025

PSN Behavior	incidence of dengue fever				P *value*	OR (CI95%)
	Case		Control			
	n	%	n	%		
Less good	15	60.0	8	16.0	0.001	7.875 (2.619-23.678)
Good	10	40.0	42	84.0		
Total	25	100	50	100		

From table 2 using a bivariate analysis statistical test. Using the Chi Squre (Continuity Correction) test, it shows that P-value = 0.001 < 0.05, which is 5%, which shows that there is a meaningful relationship between PSN behavior and dengue incidence. From the analysis above, the OR value = 7,875 was obtained, which means that respondents who behaved poorly had a risk of 7,875 times more likely to experience dengue disease than those who behaved well in PSN.

Table 3 Analysis of the relationship between Community Participation and the incidence of Dengue Hemorrhagic Fever in the working area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025

Community Participation	incidence of dengue fever				P *value*	OR (CI95%)
	Case		Control			
	n	%	n	%		
Less good	22	88.0	31	62.0	0.017	4.495 (1.183-17.073)
Good	3	12.0	19	38.0		
Total	25	100	50	100		

From table 3 using a bivariate analysis statistical test Using the Chi Squre (Continuity Correction) test, it shows that P-value = 0.017 < 0.05 is 5%, which shows that there is a meaningful relationship between community participation and dengue incidence. From the analysis above, the OR value = 4,495 was obtained, which means that respondents who had poor community participation had a 4,495 times greater risk of experiencing dengue disease compared to respondents who had good community participation.

Table 4 Analysis of the relationship between the use of mosquito nets and the incidence of Dengue Hemorrhagic Fever in the working area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025

Use of mosquito nets	incidence of dengue fever				P *value*	OR (CI95%)
	Case		Control			
	n	%	n	%		
Does not use	22	88.0	32	64.0	0,032	4.125 (1.083-15.712)
Using	3	12.0	18	36.0		
Total	25	100	50	100		

From table 4 using a bivariate analysis statistical test using the Chi Squre (Continuity Correction) test, it shows that P-value = 0.032 <0.05, which is 5%, this shows that there is a significant relationship between the use of mosquito nets and the incidence of dengue fever. From the above analysis, the OR value = 4,125 was obtained, which means that respondents who did not use mosquito nets had a 4,125 times greater risk of developing dengue disease compared to respondents who used mosquito nets.

Table 5 Analysis of the relationship between the use of mosquito wire and the incidence of Dengue Hemorrhagic Fever in the working area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025

Use of Mosquito Wire	incidence of dengue fever				P *value*	OR (CI95%)
	Case		Control			
	n	%	n	%		
Does not use	13	52.0	14	28.0	0.02	2,786 (1.026-7.560.303)
Using	12	48.0	36	72.0		
Total	25	100	50	100		

From table 5 using bivariate analysis statistical tests. Using the Chi Squre (Continuity Correction) test, it shows that P-value = 0.02 < 0.05 is 5%, which shows that there is a significant relationship between the use of mosquito wire and the incidence of dengue. From the analysis above, the OR value = 2.786 was obtained, which means that respondents who did not use mosquito wire had a 2.786 times risk of experiencing dengue disease compared to respondents who used mosquito wire.

Table 6 Analysis of the relationship between Health Worker Support and the Incidence of Dengue Hemorrhagic Fever in the working area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025

Healthcare Worker Support	incidence of dengue fever				P *value*	OR (CI95%)
	Case		Control			
	n	%	n	%		
Not Receiving support	10	40.0	7	14.0	0,028	4,095 (1.322-12.686)
Receive support	15	60.0	43	86.0		
Total	25	100	50	100		

From table 6 using a bivariate analysis statistical test. Using the Chi Squre (Continuity Correction) test, it shows that P-value = 0.028 <0.05, which is 5%, which shows that there is a meaningful relationship between health worker support and the incidence of dengue. From the analysis above, the OR value = 4.095 was obtained, which means that respondents who did not receive support from health workers had a 4.095 times risk of experiencing dengue disease compared to respondents who received support from health workers.

3. Multivariate Analysis

Table 7 Multivariate Test Results of mosquito nest eradication behavior, community participation, use of mosquito nets, use of mosquito nets and support of health workers With the incidence of dengue in the work area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025

Variabel	B	p-Value	OR	95%CI	
				Lower	Upper
PSN Behavior	1.462	0.027	4.317	1.180	15.795
Use of mosquito wire	1.266	0.046	3.546	1.022	12.305
Use of mosquito nets	1.203	0.151	3.329	0.646	17.164
Community participation	1.241	0.134	3.461	0.683	17.543
Healthcare worker support	1.394	0.061	4.030	0.937	17.324

Based on table 7 above, it can be seen that the variables of mosquito eradication behavior and the use of mosquito wire have an influence on the incidence of dengue, the variable of mosquito eradication behavior has the largest OR value among other variables of 4,317 which means that mosquito nest eradication behavior is the dominant factor with the incidence of dengue in the work area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025. Respondents who have poor mosquito eradication behavior will have a 4,317-fold risk of increasing the incidence of dengue fever compared to respondents who have good mosquito eradication behavior after controlling for variables of community participation, mosquito net use, mosquito wire use and health worker support. Meanwhile, the variables of community participation, the use of mosquito nets, the use of mosquito nets and the support of health workers are fariabel confounding.

Discussion

1. The Relationship between Mosquito Nest Eradication Behavior and the Incidence of Dengue Hemorrhagic Fever

Based on the results of this study, it is proven that there is a significant relationship between the behavior of mosquito nest eradication (PSN) and the incidence of Dengue Hemorrhagic Fever (DHF) (p-value = 0.001), as shown by the OR value of 7.875. This means that individuals who have poor PSN behavior have almost 7 times higher risk of experiencing dengue than individuals with good PSN behavior. These findings are consistent with some of the latest research in Indonesia and abroad. A study by the Abdul Hamid Research Journal (2023) found that there was a significant relationship between mosquito nest eradicating behavior and dengue incidence, where PSN efforts routinely reduced the risk of infection in families and communities (p value < 0.05). Another study by Brenda Mils (2024) also showed that PSN behavioral factors are significantly related to the incidence of dengue in Wijaya Kusuma Village.

In theory, these results are also supported by the Health Belief Model and other health behavioral theories, which assert that behavioral changes based on individual knowledge, attitudes, and beliefs about disease risk greatly influence daily preventive practices (Notoadmodjo, 2018). The predisposing, enabling, and reinforcing components in the health education approach place active PSN behavior as the main factor in community protection against dengue transmission.

2. The Relationship of Community Participation with the Incidence of Dengue Hemorrhagic Fever

Based on the results of the study, it was found that there was a meaningful relationship between community participation and the incidence of Dengue Hemorrhagic Fever (DHF), which was shown by a p-value of 0.028 and an Odds Ratio (OR) of 4.495. This means that individuals or environments with less community participation in dengue prevention efforts, such as the implementation of 3M Plus or routine hygiene activities, have almost 5 times greater risk of developing dengue compared to communities that actively participate in prevention.

These findings are in line with several national research results. Atika (2021) reported that good community participation, both through routine education, mutual cooperation activities, and larval surveillance with jumantic cadres, significantly reduced the incidence of dengue cases in the community from household-based prevention to the RT/RW level. Another study by Agung Kurniawan (2023) shows that the behavioral variables of hygiene, sanitation, and community participation are the most influential factors in dengue prevention, with dominant OR values and significant p-values; the higher the involvement and collective action of the community in the PSN and vector control programs, the lower the risk of dengue in the region. In addition, community empowerment through the formation of jumantic cadres, environmental mutual cooperation groups, and periodic PSN campaigns has been proven to strengthen awareness and effectiveness of early detection and breaking the chain of dengue transmission in a number of regions (Sulistyawati, 2021).

In terms of theoretical approach, these findings are very much in line with models and theoretical frameworks of epidemiology and health behavior, such as the Host-Agent-Environment model and Lawrence Green's theory (PRECEDE-PROCEED). In the epidemiological paradigm, community participation is part of the "environment" factor that strengthens the control of vector sources and transmission chains because eradication efforts must be carried out simultaneously, collectively, and intensively, not only by individuals or the government.

3. The Relationship between the Use of Mosquito Nets and the Incidence of Dengue Hemorrhagic Fever

Based on the results of the study, there was a significant relationship between the use of mosquito nets and the incidence of Dengue Hemorrhagic Fever (DHF), namely a p-value of 0.041 and an Odds Ratio (OR) value of 4.125. This means that individuals who do not use mosquito nets are about 4.5 times higher at risk of developing dengue than individuals who use mosquito nets regularly. These findings are in line with the results of the analysis of the determinants of dengue incidence in several national studies; for example, research in Sumatra by Rini. (2024) noted that the use of mosquito nets as a physical barrier to mosquito bites has been shown to be statistically significant in reducing the risk of dengue fever (p-value = 0.041; OR = 3.6). Research by Henny (2021) in the city of Jambi also strengthens that the use of mosquito nets is one of the statistically significant behavioral variables for dengue prevention (p-value < 0.05) and individuals who do not use mosquito nets are more likely to be in the dengue group than in the non-DB group.

In epidemiological theory, physical protection such as mosquito nets is a form of environmental intervention that breaks the chain of transmission of the Aedes aegypti vector directly, especially during naps during periods when dengue mosquitoes are very active biting (day and evening). The approach to health behavior through the Health Belief Model and Lawrence Green's theory (PRECEDE-PROCEED) also supports the importance of using mosquito nets as a preventive measure based on risk perception and individual belief in the benefits of self-protection. Social learning and community education strengthen the adoption of mosquito net use behavior as a collective norm in families and densely populated environments (Green, L.W., 2011: Wong, L.P, 2013)

4. **The Relationship between the Use of Mosquito Wire and the Incidence of Dengue Hemorrhagic Fever**

Based on the results of the study, it was found that there was a significant relationship between the use of mosquito wire and the incidence of Dengue Hemorrhagic Fever (DHF), where the p-value was 0.016 and the Odds Ratio (OR) was 2.786. This shows that individuals who do not use mosquito wire are almost 4 times greater at risk of developing dengue than those who install mosquito wire in their homes. This relationship is also in line with several recent national journals, such as reported by Rahmani (2024) that the use of gauze significantly minimized the entry of Aedes aegypti mosquitoes into the room and statistically reduced the incidence of dengue (p=0.001); Daariy (2023) research also emphasized that the installation of wire mesh on door and window sills reduces the chance of mosquitoes entering the house thereby reducing the risk of dengue, with a similar OR value (OR=2.74). In addition, Nadhiya Sahira. (2022) stated that environmental-based prevention such as the installation of mosquito wire on ventilation and windows is one of the effective efforts to reduce the incidence of dengue in endemic areas of Indonesia.

From the perspective of epidemiological theory, the effectiveness of mosquito wire in reducing the incidence of dengue can be explained through the concept of breaking the chain of transmission between humans (host), dengue virus (agent), and environment (environment). By restricting the access of virus-carrying mosquitoes into the home through the installation of mosquito wire on doors and windows, the chance of contact between the host and the agent becomes minimal.

5. **The Relationship between Mosquito Health Worker Support and Dengue Hemorrhagic Fever Incidence**

Based on the results of the study, there was a meaningful relationship between the support of health workers and the incidence of Dengue Hemorrhagic Fever (DHF), where the p-value was 0.037 and the Odds Ratio (OR) of 4.095 showed that individuals or families who did not receive the support of health workers were almost 4 times higher at risk of developing dengue fever compared to those who received such support. The support of these health workers includes counseling, education, home visits, larvicide/abate distribution, larval monitoring, and assistance in the implementation of PSN in the community. These findings are strengthened by various national studies, such as Khairatunnisa's research (2021) which proves that the active role of health workers directly increases community compliance in dengue prevention behavior, fosters knowledge and positive attitudes, and significantly reduces the number of dengue cases. In addition, Tyagita Widya Sari's (2024) research obtained results There is a relationship between health worker support (p-value 0.000; PR = 3,150) with dengue prevention behavior in the working area of the Payung Sekaki Health Center, Pekanbaru City.

In terms of epidemiological theory, the support of health workers can break the chain of transmission through effective education, motivation, surveillance coordination, and family and community-based interventions. This is in line with the concept of Host-Agent-Environment, where changes in population behavior and environmental management can be optimally suppressed if there is external stimulation or reinforcement from health workers as role models and sources of information that are trusted by the community. Based on health behavioral theory, especially Green and Notoatmodjo theories, health workers are reinforcing factors that can increase self-efficacy, provide social strengthening, and encourage sustainable healthy behavior transformation in the community through counseling, regeneration, and environmental health advocacy.

6. Analysis of Dominant Factors with the incidence of Dengue Hemorrhagic Fever

The results of the study showed that the mosquito nest eradication behavior (PSN) had the largest odds ratio (OR) value among other variables, which was 4.317, indicating that PSN behavior is the dominant factor for the incidence of dengue in the work area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025. This means that respondents whose PSN behavior is not good have a 4.317 times higher risk of developing dengue than those whose PSN behavior is good, after the influence of other variables such as community participation, mosquito net use, mosquito net use, and health worker support are controlled. The results of this study are in line with Enggar's (2023) research in the work area of the PALI Regency Health Office where it was obtained that PSN action was the dominant factor in the incidence of dengue. Similarly, research by Muhammad (2024) in the working area of the Bengkuring Health Center, North Samarinda District, Samarinda City, where the most dominant factor influencing the incidence of dengue is the behavior of PSN 3M. In line with what was done by Rianasari et al. (2016) found that the most contributing factor was the action of 4 M Plus.

In the context of epidemiology and public health, this shows that the approach of individual behavior in performing 3M Plus (draining, closing, recycling/burying used items, and other additional measures) is very influential in breaking the chain of transmission of the Aedes aegypti vector even stronger than the intervention of other factors separately. Other variables (community participation, use of mosquito nets, mosquito nets, and support of health workers) in this study played a confounding role, which also influenced but the strength of the association was not as large as the behavior of PSN.

The epidemiological theory of Host-Agent-Environment also strongly supports this finding: efforts to control vectors at the source of their environment (where eggs/larvae develop) are the key to breaking the chain of exposure to the virus. Meanwhile, in the perspective of health behavior theories such as PRECEDE-PROCEED and the Health Belief Model, people's active behavior in PSN is the main outcome of the successful education, motivation, and reinforcement process by cross-health sectors (Green, L.W., 2011: Wong, L.P, 2013).

Conclusion

Based on the analysis of the data from the research results regarding the factors for the occurrence of Dengue Hemorrhagic Fever at the Kemiling Inpatient Health Center in Bandar Lampung, the following conclusions were obtained:

1. Poor PSN behavior was more common in the case group (65.2%) than in the control group (34.8%). On the other hand, good PSN behavior was more dominant in the control group (78.8%) than in the case (21.2%). The support of health workers was more received by the control group (72.4%) than the cases (27.6%). Poor community participation was dominant in control (86.4%). The use of mosquito nets and mosquito nets was also higher in controls, at 76.6% and 85.7%, respectively, compared to only 23.4% and 14.3%. (56.6%) and also the participation of good people is dominant in
2. There is a significant relationship between mosquito nest eradication behavior and the incidence of dengue hemorrhagic fever. From the above analysis, *p–value* = 0.001 with *an OR* value = 7.875
3. There is a significant relationship between community participation and the incidence of dengue hemorrhagic fever. From the above analysis, *p–value* = 0.028 with *an OR* value = 4.495
4. There is a significant relationship between the installation of mosquito wire and the incidence of dengue hemorrhagic fever. From the above analysis, *p–value* = 0.016 with *an OR* value = 2.786
5. There is a significant relationship between the use of mosquito nets and the incidence of dengue hemorrhagic fever. From the above analysis, *p–value* = 0.041 with *OR* value = 4.125

6. There is a significant relationship between the support of health workers and the incidence of dengue hemorrhagic fever. From the above analysis, *p–value* = 0.037 with *OR* value = 4.095
7. PSN behavior is the dominant factor for the incidence of dengue in the work area of the Kemiling Inpatient Health Center in Bandar Lampung in 2025. From the above analysis, *the OR* value = 7.875 was obtained.

Advice

1. For Educational Institutions
   The integration of dengue prevention materials in the curriculum is also recommended so that students become agents of change
2. For Researchers
   conduct a more in-depth and longitudinal follow-up study to understand the dynamics of changes in PSN behavior and its effect on the incidence of dengue over time. It is also important to explore the supporting and inhibiting factors in the implementation of PSN comprehensively, including social, cultural, and environmental aspects that play a role in the success of the intervention
3. Divide Research Places
   It is recommended to increase socialization, training, and monitoring of PSN behavior in the work environment and the surrounding community. Strengthening cross-sector coordination and providing supporting facilities such as larvicides and vector control devices need to be improved.

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