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Factors Influencing Mosquito Nest Eradication in Dengue Hemorrhagic Fever Prevention

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A R T I C L E   I N F O

A B S T R A C T

Dengue hemorrhagic fever (DHF) poses a significant public health risk in Indonesia. Despite government efforts to control disease vectors, the rising population density and mobility in Tangerang Regency have contributed to the rapid spread of DHF. This highlights the urgent need to eradicate mosquito nests for outbreak management and prevention. This study aims to identify risk factors associated with mosquito nest eradication in the Tangerang Regency. A cross-sectional design was used, with 400 participants selected through convenience sampling. Data were analyzed using logistic regression. The results of the multivariate analysis revealed age (p-value = 0.012), knowledge (p-value = 0.001), and support from healthcare workers (p-value = 0.003) as variables linked to mosquito nest eradication. Knowledge was the most dominant variable (OR = 5.857); individuals with low knowledge levels were 5.8 times less likely to engage in mosquito nest eradication compared to those with high knowledge after being controlled for age and support from health workers. These findings underscore the urgency of addressing these risk factors. Nurses can play a key role by providing health education to the community, emphasizing the importance of regularly draining and cleaning water containers, covering water storage, and reusing or recycling waste to reduce mosquito breeding sites.

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INTRODUCTION

Dengue hemorrhagic fever (DHF) is a severe viral illness transmitted by the Aedes aegypti mosquito, characterized by a sudden onset of high fever, weakness, rash, bleeding, and, in severe cases, shock (WHO, 2024; Wild et al., 2019). Globally, the incidence of DHF has increased significantly over the past few decades, with reported cases rising from 505,430 in 2000 to 5.2 million in 2019 (WHO, 2024). In Indonesia, DHF remains a significant public health issue. The number of persons infected and the geographical spread has grown along with increased mobility and population density. Indonesia ranks second among the 30 DHF-endemic countries in terms of total cases (Ministry of Health RI, 2018; Sanyaolu, 2017). Tangerang District experienced a notable surge in DHF cases in

2016, with 1,253 cases and 22 deaths, a significant increase from the 373 cases reported in 2015 (Ministry of Health RI, 2018). This surge underscores the urgent need for more effective vector control measures.

The government has faced significant challenges in eradicating mosquito nests through epidemiological investigations, fumigation, case finding, and treating victims throughout Tangerang Regency. A community-based strategy has been implemented by forming *juru pemantau jentik* (*jumantik*) or larval monitoring cadres. These specialized groups conduct periodic larval checks to monitor mosquito breeding sites (Ministry of Health RI, 2016). The local government has also taken active steps and actively engages in socialization efforts, especially training community members to become *jumantik* at home. However, the goal of controlling dengue outbreak is limited due to the increasing population density and mobility of residents within the region. This challenge is exacerbated by the expanding transportation network, contributing to the broader spread of the dengue virus. Moreover, the efficacy of mosquito nest eradication activities is hindered by inadequate behavioral factors and insufficient population involvement (Rau et al., 2019).

Despite the widespread nature of DHF, it can be controlled through implementing vector control strategies such as mosquito nest eradication. However, this strategy requires a community-wide effort to ensure its success. A study conducted in Airmadidi Village, North Minahasa, highlighted the significance of knowledge and practice in mosquito nest eradication (Torondek et al., 2019). Additionally, another study in South Birobuli Village identified a correlation between knowledge, attitudes, the availability of health facilities, and the active involvement of health workers in community-based prevention in eradicating mosquito nests (Rau et al., 2019). Ultimately, the effectiveness of these programs depends on the community's knowledge, awareness, and attitudes toward DHF prevention (Hossain et al., 2021). Tangerang represents a densely populated and rapidly developing area in Indonesia that continues to experience periodic surges in DHF cases. Despite government efforts to promote community-based prevention, such as the implementation of jumantik programs, the recurrence of outbreaks suggests potential gaps in behavioral, environmental, or systemic factors. Understanding what influences community actions in mosquito nest eradication in this region is crucial for refining public health strategies, tailoring health education campaigns, and strengthening community engagement. Therefore, this study explores the factors influencing mosquito nest eradication

in the context of DHF prevention in the Tangerang Regency.

METHOD

This is a cross-sectional study. A total of 400 respondents were selected using convenience sampling in Tangerang Regency. This method was chosen due to limited access to a complete sampling frame and the need to conduct the survey online during public health restrictions. Inclusion criteria include residents of Tangerang Regency over 17 who provide consent to participate. A web-based survey was designed by the researchers and disseminated among a professional network of research members specializing in the study area. The survey was developed using Google Forms and distributed digitally via messaging applications (e.g., WhatsApp). Participants accessed the survey via a secure link and completed it voluntarily after reading an informed consent form. Participants were asked to complete a five-part questionnaire consisting of (1) Participants' characteristics including initials, gender, age, highest education level, and occupation; (2) Knowledge about DHF and its prevention, with 20 items, was measured on a scale indicating poor, moderate, and good knowledge; (3) Attitudes toward preventing DHF, with 14 items, were measured on a scale of negative and positive attitudes; (4) Support from healthcare workers in preventing DHF, with two items, is measured by the presence or absence of support; (5) Community actions in mosquito nest eradication, with six items, measured by yes or no responses (Dewi, 2015). The researchers conducted a validity and reliability test with a separate group of 30 respondents who were not part of the final sample, and the results showed that the questionnaire was valid and reliable (Cronbach's Alpha $\geq$ 0.7). Data were analyzed using logistic regression to determine the variables most closely associated with mosquito nest eradication. This research was approved by the Research Ethics Committee of the Faculty of Nursing, Universitas Pelita Harapan (No. 055/RCTC-EC/R/I/2021).

RESULT

A total of 400 participants were recruited for the study. The majority were aged 40 years or younger (53.3%), female (59.5%), and had attained a higher level of education (56.0%). Most respondents demonstrated good knowledge (68.3%) and held a positive attitude (56.7%) toward mosquito nest eradication. Additionally, the majority were employed (61.5%) and reported receiving support from healthcare workers (65.8%) in efforts to eradicate mosquito nests (Table 1).

Table 1. Participant characteristics (n = 400)

Characteristics	Total	Percentage (%)
Age		
≤ 40 years old	213	53.3
>40 years old	187	46.8
Gender		
Male	162	40.5
Female	238	59.5
Educational Level		
Low	176	44.0
High	224	56.0
Knowledge		
Inadequate	35	8.8
Adequate sufficiently	92	23.0
Adequate	273	68.3
Attitude		
Negative	173	43.2
Positive	227	56.7
Working		
Not working	154	38.5
Working	246	61.5
Support from health workers		
No	137	34.3
Yes	263	65.8

Chi-square analysis demonstrates a relationship between age and mosquito nest eradication (p-value = 0.044) and knowledge and mosquito nest eradication (p-value = 0.000). Participants with lower levels of knowledge were 4.3 times less likely to engage in mosquito nest eradication. Similarly, attitude (p = 0.003) and support from health workers (p = 0.001) were also significantly associated with mosquito nest eradication. Those with a negative attitude or lacking support from health workers were 1.9 and 5.1 times less likely, respectively, to perform mosquito nest eradication. No significant associations were found between gender, education level, or occupation and mosquito nest eradication (p-value = 0.747; 0.056; 0.448) (Table 2).

Table 2. Chi-Square analysis (n = 400)

Variable	Mosquito Nest Eradication				Total		p-value	OR
	No		Yes					
	n	%	n	%	N	%		
Age								
≤ 40 years old	81	20,3	132	33,0	213	53,3	0.044	0,645
>40 years old	53	13,3	134	33,5	187	46,8		(0,423-0,982)
Gender								
Male	56	14,0	106	26,5	162	40,5	0.747	1.084
Female	78	19,5	160	40,0	238	59,5		(0,711-1.653)
Educational Level								
Low	68	17,0	108	27,0	176	44,0	0.056	1,507
High	66	16,5	158	39,5	224	56,0		(0.993-2.289)
Knowledge								
Inadequate	28	7,0	7	1,8	35	8,8		4,367
Adequate sufficiently	51	12,8	41	10,3	92	23,0	0.001	(3,010-6,336)
Adequate	55	13,8	218	54,5	273	68,3		
Attitude								
Negative	73	18,3	102	25,5	175	43,8	0.003	1.924
Positive	61	15,3	164	41,0	225	56,3		(1.264-2.929)
Working								
Not working	48	12,0	106	26,5	154	38,5	0.448	0,842
Working	86	21,5	160	40,0	246	61,5		(0,548-1.295)

Support of health workers								
No	79	19,8	58	14,5	137	34,3	0.001	5.151
Yes	55	13,8	208	52,0	263	65,8		(3.282-8.085)

The interaction test between knowledge and support produced a p-value greater than 0.05, indicating no significant interaction. Consequently, interaction variables were removed from the model (Table 3).

Table 3. Interaction analysis (n = 400)

Variable	P-value	OR
Age	0.014	2.716
Knowledge	0.009	11.196
Support from health workers	0.114	7.167
Knowledge* Support from health workers	0.451	0.637

Multivariate analysis revealed three significant variables related to mosquito nest eradication, namely age, knowledge, and support from health workers. Among these, knowledge emerged as the most influential factor (OR = 5.857). After controlling for age and support from health workers, individuals with low levels of knowledge were 5.8 times less likely to engage in mosquito nest eradication compared to those with high knowledge levels (Table 4).

Table 4. Logistic regression analysis (n = 400)

Variable	P value	OR
Age	0.012	2.783
Knowledge	0.001	5.857
Support from health workers	0.003	1.439

DISCUSSION

This study identified several variables significantly associated with mosquito nest eradication practices, including age, knowledge, attitude, and support from health workers. For instance, a study in Vietnam revealed that older individuals have experienced dengue infections, demonstrate high levels of knowledge, and practice protective behaviors such as sleeping under a mosquito nest. Moreover, older adults may have developed partial immunity due to prior exposure to the virus. In contrast, younger adults are typically more mobile, increasing their exposure risk (Nguyen-Tien et al., 2021). Similarly, research in Indonesia found that people over 40 exhibited better dengue prevention practices than younger individuals (Rakhmani et al., 2018). In this study, many adults aged 18–39 spend long hours commuting to Jakarta's industrial zones and are rarely home during weekday inspections, when indoor larvae are most visible. Future strategies could include scheduling inspections on weekends or evenings and sending digital reminders to increase the participation of this age group.

Another variable associated with protective behaviors is having relevant knowledge. Low knowledge levels were associated with a 4.3 times higher likelihood of not practicing mosquito nest eradication compared to individuals with higher knowledge levels. This finding is consistent with previous studies that link knowledge with improved dengue prevention behavior (Wharton-Smith et al., 2019; WHO, 2024). People with a better understanding of dengue transmission are more likely to take action. While knowledge of dengue prevention is beneficial, it does not guarantee the adoption of preventive measures (Jeelani et al., 2021).

In addition to knowledge, attitude is key in determining a person's behavior. Over half of the participants in this study displayed a positive attitude toward mosquito nest eradication, aligning with research from Bangladesh, where 61.3% of respondents viewed dengue as a serious threat and supported preventive actions (Hossain et al., 2021). In contrast, negative attitudes or lack of awareness have been shown to hinder community participation, as demonstrated by poor waste management or indifference toward health-related responsibilities.

Interestingly, education level did not show a significant association with mosquito nest eradication in this study, despite 56% of participants having attained higher education. This differs from a study in the Soroti District, Uganda where education was the most important factor influencing the use of mosquito nest (Akello et al., 2022). Likewise, a study in Kinshasa also found that women with secondary school or higher education were 3.4 times more likely to own and 2.8 times more likely to use a mosquito nest than women with lower levels of education (Ndjinga & Minakawa, 2010). In Tangerang, the widespread use of smartphones allows public health information to spread quickly through neighbourhood chat groups. This may help reduce knowledge gaps between people with different education levels. As a result, education may no longer be a strong factor in influencing behavior.

Similarly, no significant association was found between gender and mosquito nest eradication practices. Gender affects how individuals experience and access healthcare services (Wharton-Smith et al., 2019), and can be a significant factor in determining disease exposure and vulnerability. For example, prevailing societal gender norms may place women in charge of household chores, including collecting and storing water (Wharton-Smith et al., 2019). In some instances, women may even demonstrate better mosquito nest eradication practices than men, even though prevention should be a shared responsibility regardless of gender (Wong et al., 2015). Despite the lack of statistical significance, 40% of women in this study reported participating in eradication efforts, indicating meaningful engagement.

This study also found no statistically significant association between employment and mosquito nest eradication despite 60% of participants reporting being employed. Employed individuals are generally aware of the importance of maintaining their health to remain productive in their work roles (Heryanto & Meliyanti, 2021). Many respondents reported that they still engage in mosquito nest eradication during their free time, either before or after work. These findings are consistent with a previous study that found that working is not related to mosquito nest eradication (Istiqomah et al., 2017). In contrast, the involvement of health workers emerged as a critical factor influencing community behavior in dengue prevention. Health workers contribute to behavior change through motivation, coordination, and the implementation of public health policies (Marha et al., 2020). In the community, they play a key role in educating and empowering residents to adopt preventive practices against dengue fever (Veras-Estévez & Chapman, 2017). One of the campaigns carried out by health workers is eradicating mosquito nests and combating Aedes aegypti (de Oliveira et al., 2016). Consistent with the findings of this study, support from health workers showed a significant association with mosquito nest eradication. Prior studies have also confirmed the positive impact of health worker involvement. Previous studies also reported an association between support from health workers and mosquito nest eradication. For instance, Rau et al. (2019) emphasized that encouragement and support from health workers can enhance community knowledge and attitudes, ultimately leading to improved mosquito control behaviors. Health workers are responsible for conducting home visits and counseling the community so that they understand and carry out dengue control, performing larva checks, mobilizing and supervising mosquito nest eradication, and reporting on the results of larvae inspections (Torondek et al., 2019). Their active role highlights the importance of strengthening health system involvement at the community level to enhance the effectiveness of dengue prevention strategies.

CONCLUSION

This study concludes that knowledge is the most influential factor associated with mosquito nest eradication, with attitude and perceived support from healthcare workers also showing significant associations. These findings highlight the pivotal role of healthcare workers in dengue prevention efforts, particularly through routine health education aimed at increasing public awareness of dengue transmission, prevention strategies, and the importance of eradicating mosquito breeding sites. To improve mosquito nest eradication efforts, future programs should focus on younger, working-age groups by using weekend or evening outreach, mobile app reminders, and workplace-based activities. Strengthening the involvement of healthcare workers through interactive communication strategies, and integrating digital literacy components into public health campaigns and future research, may further increase the effectiveness of community-based dengue prevention programs.

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