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Determinants of Mosquito Nest Eradication Dengue Hemorrhagic Fever and The Presence of Larvae

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ABSTRACT

Various efforts have been made to prevent and eradicate Dengue Hemorrhagic Fever (DHF), including breaking the chain of dengue transmission by preventing vector breeding through Dengue Hemorrhagic Fever Mosquito Nest Eradication. The community hopes that it can be healthier and can minimize the incidence, morbidity, or death caused by DHF. This study aimed to determine the relationship between community characteristics regarding the eradication of dengue hemorrhagic fever mosquito nests and the presence of larvae. Cross-sectional studies were used as the research methods. The sampling method used random probability sampling with a sample of 85 respondents. Data analysis was performed using the chi-squared test and Pearson's chi-squared test. No significant relationship was found between age ($p = 0.151$) and education level ($p = 0.073$) on dengue mosquito nest eradication practices, while a meaningful relationship was found between knowledge ($p = 0.013$), employment status ($p = 0.021$) on dengue mosquito nest eradication practices. The results related to the practice of eradicating dengue mosquito nests showed a relationship with the presence of mosquito larvae in water reservoirs ($p = 0.042$). It was concluded that several community characteristics played a role in eradicating dengue mosquito nests.

Keywords: Community; Dengue; Eradication of mosquito nests; Presence of larvae.

ABSTRAK

Berbagai upaya yang dilakukan dalam pencegahan dan pemberantasan Demam Berdarah Dengue (DBD) yaitu dengan memutus rantai penularan DBD dengan cara mencegah perkembangbiakan vektor melalui kegiatan Pemberantasan Sarang Nyamuk Demam Berdarah Dengue. Harapan masyarakat dapat lebih sehat dan dapat meminimalisir angka kejadian atau kesakitan maupun kematian yang disebabkan oleh DBD. Tujuan penelitian ini adalah mengetahui hubungan karakteristik masyarakat tentang pemberantasan sarang nyamuk demam berdarah dengue dan keberadaan jentik. Metode penelitian yang digunakan *cross-sectional study*. Metode penarikan sampel dilakukan secara *random probability sampling* dengan jumlah sampel 85 responden. Analisa data menggunakan uji chi-square dan uji pearson chi-square. Hasil yang ditemukan tidak

terdapat hubungan yang bermakna antara karakteristik usia ($p=0,151$), tingkat pendidikan ($p=0,073$) terhadap praktik pemberantasan sarang nyamuk DBD sedangkan ditemukan hubungan yang bermakna antara karakteristik pengetahuan ($p = 0,013$), status pekerjaan ($p=0,021$) terhadap praktik pemberantasan sarang nyamuk DBD. Hasil terkait praktik pemberantasan sarang nyamuk DBD ditemukan hubungan terhadap keberadaan jentik nyamuk di penampungan air ($p=0,042$). Disimpulkan bahwa beberapa karakteristik masyarakat mempunyai peran dalam praktik pemberantasan sarang nyamuk DBD.

Kata Kunci: Demam berdarah; Keberadaan jentik; Masyarakat; Pemberantasan sarang nyamuk

INTRODUCTION

Dengue fever remains a priority public health problem throughout the tropics and subtropics. Currently, 40% of the world's population is at risk of dengue, and 2.5 billion people are at risk, especially those living in urban areas in tropical and subtropical countries (World Health Organization (WHO), 2022). It is estimated that 390 million dengue cases occur worldwide every year (Kemenkes RI, 2021; World Health Organization (WHO), 2022). One of the provinces in Indonesia, which is a dengue endemic area, is East Nusa Tenggara Province (Kemenkes RI, 2020). According to the Dengue Hemorrhagic Fever, this province has Indonesia's second highest dengue fever morbidity rates, with the highest number of dengue sufferers in 2020. The incident rate (IR) report in 2020 reached 107.7 per 100,000 people, with a case fatality rate (CFR) of 1.0%. In 2019, the CFR reached 1.36%, which is included in the high category because it is more than 1.0%, even exceeding the National CFR

figure of 0.67% (Kemenkes RI, 2020, 2021). Meanwhile, 79.2% of the ABJ data (free flick number) is still needed to achieve the national target of >95%. The area in East Nusa Tenggara Province, which also has a very high CFR value, is Ende Regency, with a CFR value of 1.6%, where the number of cases in 2020 reached 253. The most were in East Ende District, namely the working area of the Ende City Health Center, which reached 61 cases and increased from the previous year to 35 cases (Dinas Kesehatan Kabupaten Ende, 2020; Luan and Hidajah, 2021; Dinas Kesehatan Kab. Ende, 2022). Various efforts have been made to prevent and eradicate DHF, such as breaking the chain of dengue transmission by preventing vector breeding via DHF mosquito nest eradication activity (Sanyaolu *et al.*, 2017; Sutriyawan, Anri and Akbar, 2022). These preventive activities aim to eradicate eggs, larvae, and mosquitoes of *Aedes aegypti* (Harapan *et al.*, 2019). One of the dengue mosquito nest eradication that can be

performed by implementing 3M and other prevention measures commonly referred to as 3M plus is 3M activities accompanied by the prevention of mosquito bites (use of mosquito nets, use of mosquito repellent), hampering breeding sites, and stopovers for mosquitoes that transmit dengue disease (by not hanging clothes) (Dirjen P2P Kemenkes RI, 2017).

The high incidence of morbidity and death among patients with dengue is a significant concern. Therefore, one of the things that can be done is to increase the eradication of dengue fever mosquito nests and the presence of larvae in the community. This is an important concern in controlling and preventing dengue transmission in the community (Luan and Hidajah, 2021). Various obstacles in implementing dengue mosquito eradication practices can arise from the characteristics of the community itself. The introduction of community characteristics supports efforts to improve and prevent dengue mosquito transmission so that community expectations can be healthier and minimize the incidence, morbidity, or death caused by dengue fever.

METHOD

This study used quantitative research with a descriptive cross-sectional design. The study was conducted from March 28 to July 2, 2023, in the Working Area of the Ende City Health Center, Ende Regency, East Nusa Tenggara Province. The study population comprised all heads of families in the Ende City Health Center Working Area. The sampling method was random probability sampling, namely, random sampling with a sample of 85 respondents (Syapitri, Amila and Aritonang, 2021). The independent variables in this study were patient characteristics (age, education, and occupation level), and the dependent variables included knowledge, dengue mosquito nest eradication practices, and the presence of mosquito larvae. The questionnaire was tested for validity and reliability in the research area before use. It was declared valid with a calculated r-value greater than the table r-value and a reliability value of 0.840. Bivariate analysis was performed using the unpaired categorical comparative chi-square and Pearson's chi-square tests. This study was approved by the Health Research Ethics Team of the Kupang Ministry of Health's Poltekkes (LB.02.03/1/1002/2023).

RESULTS AND DISCUSSION

The results of data analysis obtained from March 28 to July 2, 2023, found from 85 respondents can be illustrated from the results of the study as follows:

1. Characteristics of Respondents

Table 1. Characteristics of respondents by age, gender, education, and work activities

Characteristics	n (85)	%
Age (Years) :		
(26-35 years)	21	24,7
(36-45 years)	41	48,2
(>45 years)	23	27,1
Total	85	100
Gender :		
Male	62	72,9
Female	23	27,1
Total	85	100
Education :		
Not in school	4	4,7
Graduated from elementary school	34	40,0
Graduated from junior high school	31	36,5
Graduated from high school	11	12,9
Academy/College	5	5,9
Total	85	100
Work activities :		
Working	73	85,9
Not Working	12	14,1
Total	85	100

Based on the calculation results in Table 1, the research respondents were between 36 and 45 years old and 41 people (48.2%). The characteristics of the respondents based on gender were that the majority of respondents had male gender of 62 people (72.9%), for

education respondents known to most research respondents to have graduated from elementary school, which is 34 people (40.0%), and for jobs, the majority of respondents worked 73 respondents, (85.9%).

2. Knowledge and Practice of Dengue Hemorrhagic Fever Mosquito Eradication

Table 2. Knowledge and prevention practices of respondents on the eradication of dengue fever mosquitoes

Variable	n (85)	%
Knowledge Level		
Good	37	43,5
Less	48	56,5
Dengue Mosquito Nest Eradication Practices		
Good	23	27,1
Less	62	72,9
Total	85	100

Based on Table 2, of the 85 respondents, most knew about dengue fever and had less category knowledge, namely 48 respondents (56.5%), as well as for dengue mosquito nest

eradication practices. Most respondents (62, 79.9%) had poor mosquito nest eradication practices.

3. The Presence of Mosquito Larvae in Water Reservoirs

Table 3. The presence of mosquito larvae in the respondent's water reservoir

The presence of mosquito larvae in water reservoirs	n	%
Exist	43	50,6
None	42	49,4
Total	85	100

Based on Table 3, the data obtained from 85 respondents found the presence of mosquito larvae in water reservoirs as many as 43

respondents (50.6%) more than respondents who did not have mosquito larvae in their water reservoirs.

4. The Relationship of Age to Mosquito Nest Eradication Practice

Table 4. Age with dengue hemorrhagic fever mosquito eradication practices

Age	Dengue Mosquito Nest Eradication Practices				Total		p
	Good		Less		n	%	
	n	%	n	%			
(26-35 years)	2	2,3	19	22,4	21	24,7	0,151
(36-45 years)	16	18,9	25	29,3	41	48,2	
(>45 years)	5	5,9	18	21,2	23	27,1	
Jumlah	23	27,1	62	72,9	85	100	

Table 4 shows that of 85 respondents, all age ranges had poor practices regarding eradicating dengue mosquito nests. Of the 62 respondents with poor mosquito nest eradication practices, the majority were 36-

45 years old, as many as 25 respondents, 29.3%). The analysis results show no relationship between respondents' age and the practice of eradicating dengue mosquito nests (p = 0.151).

5. The Relationship of Education Level to Mosquito Nest Eradication Practice

Table 5. Education with dengue hemorrhagic fever mosquito eradication practices

Education level	Dengue Mosquito Nest Eradication Practices				Total		p
	Good		Less		n	%	
	n	%	n	%			
Not in school	0	0	4	4,7	4	4,7	0,073
Graduated from elementary school	9	10,6	25	29,4	34	40,0	
Graduated from junior high school	5	5,9	26	30,6	31	36,5	
Graduated from high school	7	8,2	4	4,7	11	12,9	
Academy/College	2	2,4	3	3,5	5	5,9	
Total	23	27,1	62	72,9	85	100	

Table 5 shows respondents with the highest level of education, namely the elementary 34 respondents (40.0%). Of these, nine respondents (10.6%) had good dengue mosquito eradication practices, and 25 (29.4%) had poor practices. From the

analysis above, there was no relationship between the characteristics of respondents' education level and the practice of eradicating dengue mosquito nests (p = 0.073).

6. The Relationship of Work Activities to Mosquito Nest Eradication Practices

Table 6. Work activities with dengue hemorrhagic fever mosquito eradication practices

Work activities	Dengue Mosquito Nest Eradication Practices				Total	p	
	Good		Less				
	n	%	n	%	n		%
Working	16	18,9	57	67,0	73	85,9	0,021
Not Working	7	8,2	5	5,9	12	14,1	
Total	23	27,1	62	72,9	85	100	

Table 6 shows the highest employment status: most respondents with a working status of 73 (85.9%). Of these, 57 respondents (67.0%) had poor knowledge about the eradication of dengue mosquito nests, while of the 12 respondents (14.1%) who did not work, it was found that the

majority had good knowledge about the eradication of dengue mosquito nests, which was seven respondents (8.2%). The results showed a relationship between respondents' job characteristics and their knowledge about dengue mosquito nest eradication ($p = 0.021$).

7. Knowledge Relationship with Mosquito Nest Eradication Practices

Table 7. Knowledge of dengue hemorrhagic fever mosquito eradication practices

Knowledge Level	Dengue Mosquito Nest Eradication Practices				Total	p	
	Good		Less				
	n	%	n	%	n		%
Good	21	24,7	16	18,8	37	43,5	0,013
Less	2	2,4	46	54,1	48	56,5	
Total	23	27,1	62	72,9	85	100	

Based on Table 7, 48 respondents (56.5%) needed better knowledge of DHF. Of these, 46 (54.1%) had poor mosquito nest eradication practices. Meanwhile, of the 37 respondents (43.5%) whose knowledge about dengue is good, the most had good

dengue mosquito nest eradication practices, namely 21 respondents (24.7%). The analysis showed a relationship between respondents' knowledge and dengue mosquito nest eradication practices ($p = 0.013$).

8. Relationship between dengue mosquito nest eradication practices and the presence of mosquito larvae in water reservoirs

Table 8. The practice of eradicating dengue hemorrhagic fever mosquitoes with the presence of mosquito larvae in respondents' water reservoirs

Dengue Mosquito Eradication Practices	The presence of mosquito larvae in water reservoirs				Total		p
	Exist		None		n	%	
	n	%	n	%			
Good	11	12,9	12	14,1	23	27,1	0,042
Less	32	37,7	30	35,3	62	72,9	
Total	43	50,6	42	49,4	85	100	

As shown in Table 8, the results of the data obtained by respondents with the highest level of knowledge of dengue mosquito eradication out of 85 respondents had as many as 62 respondents (72.9%). Of the 62 respondents (72.9%) whose level of knowledge of dengue mosquito eradication was poor, 32 (37.7%) had mosquito larvae in their water reservoirs, and 30 (35.3%) did not have mosquito larvae. The above results show a relationship between respondents' knowledge about eradicating dengue mosquito nests and mosquito larvae in their water reservoirs ($p = 0.151$).

Selvarajoo et al. (2020) state that good knowledge can be obtained from a good learning process. However, someone with less knowledge can also cause a lack of interest in obtaining additional information

by watching the news, reading information, and listening to health services, especially regarding mosquito nest eradication or mosquito larva eradication measures (Lun *et al.*, 2023). Having good knowledge of DHF will minimize the occurrence of DHF transmission. Knowledge/cognition is a significant domain for forming one's behavioural habits (overt behaviour). If the process of accepting new behaviours or /adopting behaviours is based on knowledge, awareness, and positive attitudes, then the behaviour will be continuous and become a habit (long-lasting).

In general, respondents with good knowledge feel anxious and afraid of dengue disease transmission; therefore, respondents with a good level of expertise will be more responsive and diligent in carrying out DHF mosquito nest eradication activities in the surrounding environment (Izhati, Astuti and Fadly, 2023). In terms of one's knowledge about how to eradicate dengue mosquito nests and the benefits of their activities, some respondents already know how to implement mosquito nest eradication and the benefits obtained if they do, but some respondents do not understand that mosquito nest eradication actions are the responsibility of all community members. They sometimes still think mosquito nest eradication practices are only carried out by fogging and forging activities, which are the government's responsibility. They assumed the government would only work if fogging was done in their environment to eradicate dengue mosquitoes (Arham *et al.*, 2023).

The results of statistical tests related to respondents' age characteristics showed no relationship between respondents' age characteristics and dengue mosquito nest eradication practices. These results differ from the reality in society. Of all age groups of respondents, more had terrible practices related to eradicating dengue mosquito nests. Most people in society place high

hopes in older population groups. The dependence on this hope makes each other indifferent and challenging to understand the importance of prevention practices or eradicating dengue mosquito nests better. A person's age can play an essential role in environmental modification in preventing disease if supported by sound knowledge and awareness to behave cleanly and healthily in the community (Baitanu *et al.*, 2022). Limitations regarding a person's age also affect their ability to move, so there is excellent interdependence with other people or families.

The limitations can inhibit determining the importance of eradication practices and preventing dengue mosquito transmission. Thus, the results of this study show that age cannot be used as a standard to determine a person's behaviour. This can occur due to a need for more awareness, knowledge, information, and socialization about the benefits of eradicating dengue hemorrhagic fever mosquito nests.

Data obtained about the education level of respondents show that a person's education level cannot be a benchmark for dengue mosquito eradication practices. Higher education can gain more knowledge and understanding than lower education. The educational process can be one of the means of obtaining more information so that

understanding there are new things that have more potential to be known in the educational process. However, from the results of this study, it was found that there was no relationship between the respondents' education level and the practice of DHF mosquito nest eradication in the working area of the Ende City Health Center, Ende Regency. The length of time someone has received education is not a guarantee of the expected behaviour. However, some respondents have a low level of education, and some can practice DHF mosquito nest eradication well. This may be because some respondents are housewives who have good habits in maintaining the cleanliness of their home environment and are responsive to family health problems.

Likewise, respondents who have a high level of education but lack good knowledge of DHF mosquito nest eradication practices can be attributed to the lack of public awareness in implementing health messages to prevent and eradicate mosquito nests, even though those who are highly educated can absorb and understand the health information they receive (Yandika, 2022). This follows research conducted by Kasenda et al. (2020), which states that broader insight and knowledge will affect individual behaviour in response to a problem. A good

education can motivate, set an example, and encourage family members to eradicate dengue mosquito nests.

The analysis results related to employment status found that many respondents were working but accompanied by fewer mosquito nest eradication practices. This lack of awareness can arise because of a person's busy life with other daily work activities; therefore, implementation efforts to eradicate mosquito nests should be addressed. This habit will create negative behaviour that ignores the importance of maintaining the spread of mosquitoes due to DHF. Active participation from all groups of society and families is needed to enable them to work. Together, they carry out the 3 M Plus Movement in the surrounding environment (Harisnal, 2019).

In the results of the research data related to the presence of larvae in the respondent's home environment, it was found that there were more mosquito larvae in water reservoirs than in respondents who did not have mosquito larvae in their water reservoirs in the working area of the Ende City Health Center, Ende Regency. This examination aims to check mosquito larvae to prevent dengue transmission and to motivate family and community awareness to be routine in eradicating dengue mosquito nests. These activities include motivating.

The community to eliminate mosquito nests. According to Allen et al. (2023), each family must protect and maintain the surrounding environment by actively eradicating mosquito nests so there is no breeding container for *Aedes aegypti* mosquito larvae.

If families and communities carry out mosquito nest eradication practices correctly and periodically, they have carried out preventive measures with health maintenance behaviours and implementing health behaviours in their environment. The presence of mosquito larvae that breed in water storage containers will likely increase the risk of dengue transmission. Therefore, if mosquito larvae are left unchecked, there is an increase in the incidence of DHF. If the behaviour of eradicating mosquito nests in preventing the presence of larvae is carried out properly, and if it can break the chain of transmission of dengue mosquitoes, the expected result is that the incidence of dengue disease can decrease (Ernawati *et al.*, 2021).

Observations revealed the presence of mosquito larvae in residents' water reservoirs, almost as much as those that did not find mosquito larvae in water reservoirs. Data on the practice of eradicating dengue mosquito nests with the presence of

mosquito larvae in water reservoirs found good practices in 23 respondents (27.1%). Respondents with good mosquito nest eradication practices had no larvae in their shelters. Most respondents with poor knowledge about dengue mosquito eradication found mosquito larvae in their water reservoirs. From these data, mosquito nest eradication can influence the presence of larvae in the water reservoirs owned by respondents. Good mosquito nest eradication practices encourage participation in preventing mosquito larvae caused by dengue fever (Dawe, Romeo and Ndoen, 2020).

The implementation of behaviour results from a person's awareness drive to maintain the cleanliness of their water storage containers. This effort will be illustrated in the habit of constantly draining water reservoirs regularly to protect against mosquito breeding due to dengue. Thus, better knowledge of respondents can provide awareness of the importance of continually draining and protecting the water reservoirs they use from mosquito larvae that can cause dengue. The discovery of the presence of larvae in water reservoirs could be due to a need for more awareness and the opportunity for respondents who do not drain water in the tub in one week. Another study by Simatupang and Yuliah

(2021) suggested that houses with bathtubs and toilet tubs do not tend to have larvae because they hold water in basins that are sometimes left for a long time and are rarely drained.

CONCLUSION

There was a significant relationship between knowledge and employment status on dengue mosquito nest eradication practices. No meaningful relationship was found between age and education level in dengue mosquito nest eradication practices. Regarding the practice of eradicating dengue mosquito nests, a correlation was found with the presence of mosquito larvae in water reservoirs. The importance of public awareness in carrying out dengue prevention efforts and recommendations to remind each other can positively impact public health.

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