Original Article

JHSMR Journal of Health Science and Medical Research

The Association Between Level of Education and Source of Information with Community's Optimal Prevention Measures Against Dengue Haemorrhagic Fever: A Cross-Sectional Study in The Coastal Area of Suli Village, Maluku, Indonesia

Elsy Novendri Solaulu, S.Ked.[1], Christiana Rialine Titaley, Ph.D.[2], Melda Yunita, M.Sc.[3], Ritha Tahitu, M.D., M.Kes.[2], Dylan Tamalsir, S.Kep., M.Biomed.[4], Is Asma'ul Haq Hataul, M.D., Sp.PD.[5], Maxwell Landri Vers Malakauseya, M.D.[6]

[1]Medical Student, Faculty of Medicine, Universitas Pattimura, Ambon 97233, Indonesia.
[2]Department of Public Health, Faculty of Medicine, Universitas Pattimura, Ambon 97233, Indonesia.
[3]Department of Microbiology, Faculty of Medicine, Universitas Pattimura, Ambon 97233, Indonesia.
[4]Department of Biomedical Science, Faculty of Medicine, Universitas Pattimura, Ambon 97233, Indonesia.
[5]Department of Internal Medicine, Faculty of Medicine, Universitas Pattimura, Ambon 97233, Indonesia.
[6]Faculty of Medicine, Universitas Pattimura, Ambon 97233, Indonesia.

Received 10 January 2024 ● Revised 27 March 2024 ● Accepted 4 April 2024 ● Published online 24 September 2024

Abstract:

Objective: This study aimed to examine the relationship between sociodemographic factors and sources of information about dengue haemorrhagic fever (DHF) and the level of DHF prevention measures in the coastal community of Suli Village, Maluku Province, Indonesia.

Material and Methods: The data were derived from a survey conducted in December 2022 involving 217 participants living in the coastal area of Suli Village, Central Maluku District. The dependent variable was the level of DHF prevention measures (i.e., high if the score was 8 to 10 points and low if the score was 7 points or lower). The independent variables included respondents' age, sex, occupation, education level, household income, and sources of information about DHF. Logistic regression analyses were performed to examine the associations between sociodemographic factors and sources of information about DHF and levels of DHF prevention measures.

Contact: Christiana Rialine Titaley, Ph.D.
Department of Public Health, Faculty of Medicine,
Universitas Pattimura, Ambon 97233, Indonesia.
E-mail: christiana_rialine@yahoo.com

J Health Sci Med Res 2025;43(2):e20241091
doi: 10.31584/jhsmr.20241091
www.jhsmr.org

Results: Only 31% of the respondents had high DHF prevention measures. The odds of having a high level of DHF prevention measures were lower in respondents with junior/senior high school education (adjusted odds ratio (aOR)=0.23; 95% confidence interval [CI]: 0.09–0.57; p-value=0.002). The odds were also lower in respondents who received information about DHF from family/friends/neighbours compared to those who received the information from health workers (aOR=0.22; 95% CI: 0.07–0.71; p-value=0.011).

Conclusion: Health workers play an important role as health educators. Future studies should consider using both qualitative and qualitative methods to explore motivations, beliefs, and various contextual factors that influence DHF prevention measures in a community.

Keywords: DHF control, health information, Maluku

Introduction

Dengue haemorrhagic fever (DHF) is an acute viral infection caused by the dengue virus transmitted by *Aedes spp.* mosquitoes[1,2]. DHF is widely found in regions with tropical and sub-tropical climates, particularly in urban and semi-urban areas[3,4]. In 2021, the World Health Organization (WHO) reported approximately 100–400 million cases of dengue infections annually, with approximately 70% of cases reported in Asia[5].

According to the Ministry of Health of the Republic of Indonesia, DHF cases in Indonesia have seen a noticeable increase in the last decades[6]. In 2020, there were 103,509 DHF cases reported, and by the end of 2022, the number had increased to 143,000 cases[5,6]. In Maluku province, the largest archipelago in Indonesia, an increased number of DHF cases has been reported. There were 77 DHF cases in 2021, which increased to 169 cases in 2023[6,7].

DHF prevention measures are vital, given the significant health burden of DHF, particularly in tropical and subtropical regions where the disease is endemic. As the global prevalence of DHF has increased remarkably in recent decades, increased morbidity and mortality associated with DHF have also been reported[8]. The economic impact is also profound, with increased healthcare costs due to hospitalizations and reduced productivity[9,10]. To reduce this burden, DHF prevention measures should be more stringently followed, such as the use of mosquito repellents, maintaining clean water storage, and the use of mosquito nets[11,12].

Although DHF prevention measures are widely recognized as important, promoting and facilitating their implementation is crucial. Previous studies have shown that various factors, such as education level[13] and exposure to information[14], are associated with a community's prevention measures against DHF[12,15]. Specifically, individuals with a higher education level are more likely to have improved prevention measures than those with a lower education level[16]. Additionally, when people obtain information from reliable sources, they are more encouraged to adopt positive health practices[17].

The highest number of reported cases in Maluku was reported in the catchment area of Suli Health Center, located in Central Maluku district, Ambon Island[7]. Suli Village is one of the most popular tourist destinations in Ambon Island. It has several coastal areas that generate a lot of waste, which could become a breeding ground for *Aedes aegypti* mosquitoes[18]. This shows that prevention measures against DHF are required in Suli Village. However, there is a notable lack of research on DHF prevention measures in Ambon city, particularly in the Suli area. Insights from such studies are crucial for developing interventions specifically designed to address the unique conditions and needs of

each local community. Factors including the proliferation of Aedes aegypti mosquito breeding sites and the high volume of visitors pose an increased risk of DHF transmission to the local community. Addressing this gap, in 2022, a household survey was carried out to investigate the community's DHF prevention strategies in the coastal regions of Suli Village. Using data from this survey, this study aimed to test the hypothesis that sociodemographic factors and sources of information about DHF were associated with the community's level of DHF prevention measures in the coastal areas of Suli Village, Maluku province, Indonesia. It was expected that the findings of this research could contribute to the development of effective DHF prevention programs in Suli Village and Ambon city in general.

Material and Methods

Data source and survey design

In December 2022, we conducted a household health survey in the coastal areas of Suli Village in Central Maluku district (Figure 1). This study used a cross-sectional design.

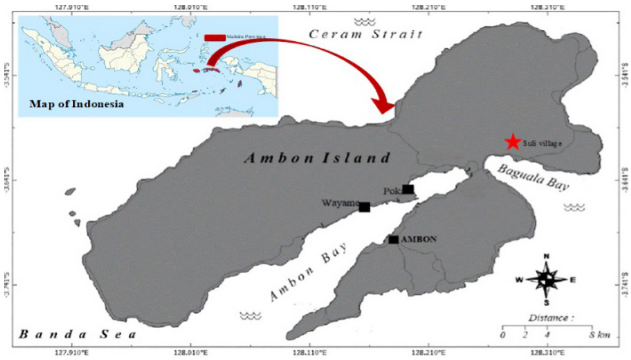

Figure 1 Map of Suli Village, central Maluku, Indonesia[12]

Study sites and respondents

Suli Village, located in the Salahutu Sub District of Central Maluku District, had a high number of DHF cases among the catchment areas of the Suli Health Center in 2022. The Village has several highly popular tourist areas with many community activities[19,20]. The Salahutu Mountains border the Village to the north, Baguala Bay to the south, Tulehu and Tial Villages to the east and Passo Village to the west. There are four hamlets in Suli Village: Amalaluei, Latuslamu, Wainusalaut, and Amarumatena. The only coastal hamlet within Suli Village is Amalatuei. The respondents of this survey were residents living in Amalatuei hamlet.

A total sampling method was used with the following inclusion criteria: (1) living in the coastal areas of Suli Village, (2) aged 25–45 years, and (3) willing to participate in the study. All houses in the hamlet were visited, and all household members who met the eligibility criteria were interviewed (total sampling). In total, we interviewed 217 respondents who met our inclusion criteria.

Study instruments

The questionnaire used in the survey was adapted from a previous study in Serdang district, Indonesia, by Nasution[21]. The questionnaire was in the Indonesian Language (Bahasa Indonesia) and covered several aspects, including sociodemographic characteristics, sources of information about DHF, and prevention measures against DHF. The questionnaire was tested for validity and reliability with a Cronbach's alpha value of 0.901 and a validity threshold value at the r table of 0.361[21].

The DHF prevention measures consisted of 10 practices, i.e., (1) closing windows, (2) airvents/doors with mosquito netting, (3) spreading Abate powder into water storage areas that are difficult to clean, (4) conveying information about DHF to neighbours, (5) participating in community services or environmental cleaning with residents, (6) draining and scrubbing the water container in the bathroom once a week, (7) burying or destroying unused old items, (8) using mosquito nets and mosquito repellents when sleeping, (9) eliminating clothes hanging or piling up in the room, and (10) using mosquito repellent.

The questionnaire also included information on socio-demographic variables, including sex (male/female), age (25–35 years/36–45 years), highest education level (university/junior to senior high school), occupation (not working outside the home/formal worker/informal worker), and monthly family income based on the Regional Monthly Wages (<RMW or ≥RMW). The term "formal worker" was defined as an employee who had an established contractual agreement with a registered employer. "Informal worker" referred to an individual employed through non-contractual arrangements or without formal contracts. The RMW in Central Maluku district was approximately Indonesian Rupiah 2.379.462[18]. The questionnaire had a question on the source of information about DHF (health workers/community health workers/friends-family-neighbors/tv-newspapers-magazines/social media).

Variables

The study's dependent variable was the level of DHF prevention, which was measured as a binary variable (high or low). Participants were asked 10 questions about DHF prevention measures, and correct answers were given a score of 1, while incorrect answers were given a score of 0. The total scores for DHF prevention measures were calculated by summing the scores for all 10 questions and then dividing them into two categories. Scores ranging from 8–10 (76–100%) were categorized as "high", while scores ranging from 0–7 (≤75%) were categorized as "low". This categorization was based on the cut-off point used by Nasution21 and aligns with established norms within the social sciences[22], wherein cut-off points ranging from 8–10 and 0–7 are recognized as standards indicative of success. The analysis included socio-demographic information such as age, sex, occupation, education level, and household income as potential confounding factors. The selection of these variables was based on the findings from previous studies showing associations between those variables and the adoption of positive health practices[21,23–25].

Data collection

We obtained a research permit from the administrative leaders at our research site before collecting the data. The data collection process took place over 20 days, and we conducted the interviews in the respondents' homes. Our interview team comprised four final-year students from the Faculty of Medicine at Universitas Pattimura in Ambon. Each interviewer attended a one-day training session on the questionnaire and data collection methods before conducting the interviews. During data collection, voluntary community health workers locally knows as *kader* guided the interviewers to the houses where the interviews were conducted. Each interview lasted approximately 15 minutes.

Statistical analysis

In the first stage, descriptive statistics were used to examine the distributions of all variables in the analysis. In the second stage, bivariate logistic regression was performed to obtain each potential predictor's unadjusted odds ratio (OR) to assess the estimated associations between the dependent and independent variables without controlling for other covariates. Finally, multivariate logistic regression was performed to obtain the adjusted odds ratios (aORs) of variables significantly related to the study outcome after controlling for other covariates. All analyses were performed using the STATA/MP software (version 17.0).

Ethical and humane considerations

This study was approved by the Ethics Commission of the Faculty of Medicine at the Universitas Pattimura (no. 170/FK-KOM. ETIK/VIII/2022). All respondents were informed of the study and provided their written consent to participate.

Results

We analysed data collected from 217 respondents living in the coastal areas of Suli Village. Table 1 shows the frequency distribution of the respondents in this analysis. Nearly 74% of the respondents had a secondary education status, 56% had informal occupations, and more than 64% had an income lower than the RMW. More than half of the respondents (55.3%) received information about DHF from health workers, whereas only 6% received it from mass media, as shown in Table 2.

Our findings revealed that the prevalence of individuals with high DHF prevention measures was only 31.3%. The frequency distribution of each preventive measure assessed in this survey is presented in Figure 2. The most commonly adopted DHF prevention method by the respondents was the use of mosquito repellent, at 99.5%, followed by the use of mosquito nets and repellents while sleeping, at 97.6%. The least common preventive method was draining and scrubbing the bathroom water container weekly (3.95%).

Table 1 Univariable and multivariable analysis of factors associated with a high level of DHF prevention measures

Variable	Univariate analysis		Multivariate analysis	
	OR (95% CI)	p-value	aORs (95% CI)	p-value
Sex				
Male	Reference		Reference	
Female	1.36 (0.75–2.46)	0.298	0.89 (0.42–1.88)	0.775
Age (years)				
25–35	Reference		Reference	
36–45	0.81 (0.45–1.44)	0.480	1.09 (0.556–2.12)	0.798
Education				
University	Reference		Reference	
Junior/senior high school	0.22 (0.11–0.43)	<0.001	0.22 (0.09–0.56)	0.002
Occupation				
Not working outside the home	Reference		Reference	
Formal worker[1]	2.80 (1.19–6.61)	0.018	1.44 (0.42–4.98)	0.555
Informal worker[2]	0.91 (0.43–1.95)	0.823	1.42 (0.57–3.49)	0.442
Income				
<RMW*	Reference		Reference	
≥RMW	0.95 (0.52–1.74)	0.893	0.52 (0.23–1.16)	0.112
Source of information about DHF**				
Health workers	Reference		Reference	
Community health workers	1.44 (0.53–3.91)	0.464	1.76 (0.61–5.08)	0.293
Friends/family/neighbors	0.18 (0.06–0.54)	0.002	0.21 (0.06–0.70)	0.011
TV/newspapers/magazines	0.12 (0.01–0.95)	0.046	0.12 (0.01–1.05)	0.056
Social media	0.28 (0.10–0.80)	0.018	0.45 (0.15–1.38)	0.167

[1]Formal worker refers to employees established through contractual agreements between a registered employer and an individual worker.
[2]Informal worker refers to individuals employed through non-contractual arrangements or without formal contracts.

RMW=regional minimum wage, DHF=Dengue Hemorrhagic Fever, OR=Odds Ratio, aORs=adjusted odds ratios, CI=confidence interval

Table 2 Distribution of information sources related to Dengue Hemorrhagic Fever

Variable	N	%	DHF preventive measures			
			Low		High	
			n	%	n	%
Health workers	120	55.3	71	59.17	49	40.83
Friends/family/neighbour	36	16.59	32	88.89	4	11.11
Social media	30	13.82	25	83.33	5	16.67
Community health workers	18	8.29	9	50.00	9	50.00
TV/newspapers/magazines	13	5.99	12	92.31	1	7.69

DHF=Dengue Hemorrhagic Fever

Table 3 Characteristics of respondents analyzed in this study

Variable	N	%	DHF preventive measures			
			Low		High	
			n	%	n	%
Sex						
Male	91	41.9	66	72.53	25	27.47
Female	126	58.1	83	65.87	43	34.13
Age (years)						
25–35	103	48.0	69	66.35	35	33.65
36–45	114	52.0	80	70.80	33	29.20
Education						
University	57	26.3	25	43.86	32	56.14
Junior/senior high school	160	73.7	124	77.50	36	22.50
Occupation						
Not working outside the home	48	22.2	35	72.92	13	27.08
Formal worker[1]	47	21.6	23	48.94	24	51.06
Informal worker[2]	122	56.2	91	74.59	31	25.41
Income						
<RMW*	141	65.0	95	68.35	44	31.65
≥RMW	76	35.0	54	69.23	24	30.77

[1]Formal worker refers to employees established through contractual agreements between a registered employer and an individual worker.
[2]Informal worker refers to individuals employed through non-contractual arrangements or without formal contracts.
*RMW=regional minimum wage, DHF=Dengue Hemorrhagic Fever

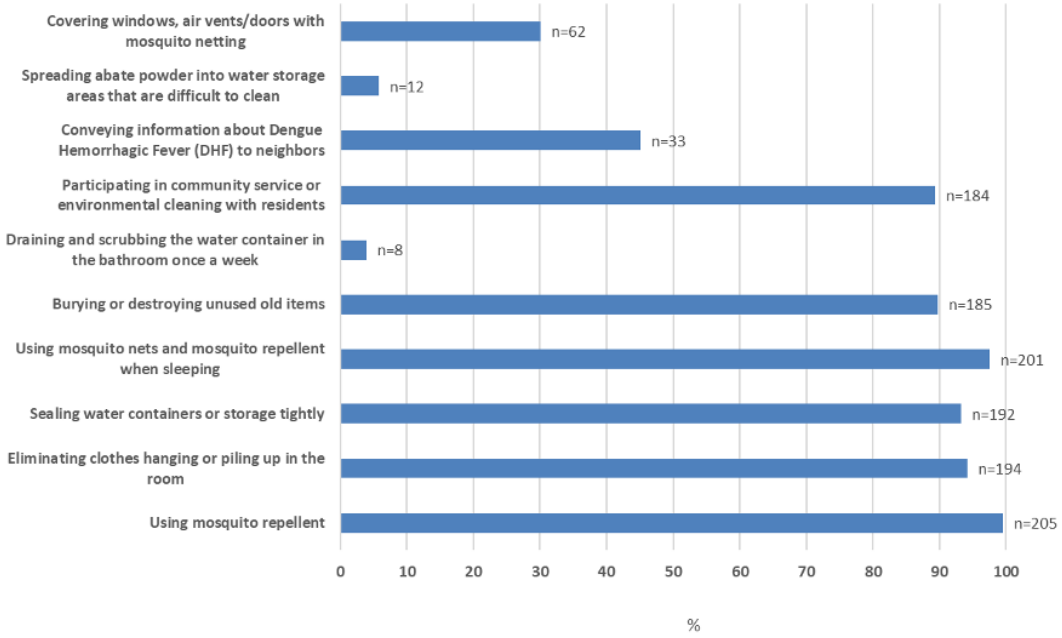

Figure 2 Frequency distribution of each component of DHF prevention measures in Suli Village

Table 3 shows the results of the univariate logistic regression analysis of the factors associated with a high level of DHF prevention measures. Without adjusting for other covariates, the results showed that the factors associated with DHF prevention measures were the respondents' education level, occupation, and source of information about DHF prevention measures.

In the multivariable logistic regression, the factors significantly associated with a high level of DHF prevention measures after controlling for other covariates were the respondents' education level and source of information about DHF prevention behaviour (Table 3). The odds of having a high level of DHF prevention measures was lower in those who graduated from senior high school than from an academy/university (aOR=0.23; 95% confidence interval [CI]: 0.09–0.57; p-value=0.002). As expected, the odds of having a high level of DHF prevention measures were lower in respondents who received information about DHF from friends/family/neighbours (aOR=0.21; 95% CI: 0.06–0.70; p-value=0.011), compared to the odds of those who received information from health workers.

Discussion

Our research revealed that only a small percentage of people in the coastal area of Suli Village took adequate measures to prevent DHF. Our study also identified two factors significantly associated with a high level of DHF prevention measures: education level and source of information about DHF. We found that individuals who graduated from an academy or university were more likely to have a higher level of DHF prevention measures than those who completed senior high school. Additionally, respondents who received information on DHF from health workers were more likely to have a higher level of preventive measures than those who received information from friends, family, or neighbours. Our results could be used as guidance for the development of tailored programmatic interventions to address and mitigate the risk of DHF more effectively.

Improving DHF prevention measures in the community

We identified a low level of DHF prevention measures in the community of Suli, as seen in other areas of Indonesia[26]. This was also reported in a study in West Sumatra, Indonesia[27], as more than half of the respondents in this study did not have a positive attitude toward DHF prevention. Similarly a study from the Pamulang Sub-district Indonesia reported that more than half of the respondents did not practice DHF prevention measures[26]. These findings highlight the need for enhancements in DHF prevention strategies, particularly in areas like Suli Village, which is recognized as a notable tourist attraction. The increasing number of visitors from DHF-endemic areas in tourist hubs might increase the prevalence of DHF cases in Suli Village[28], as more than 150 people visit Suli Village daily[20]. This high number of visitors is also likely to result in increased waste production, serve as a breeding ground for mosquitoes that will elevate the risk of DHF transmission[29]. This indicates that a comprehensive waste management strategy is essential[29], including regular waste collection, eco-friendly disposal methods, and promoting recycling and composting initiatives. Promoting intersectoral collaboration between the public and the private to support communities in waste management would be beneficial.

Association between education and DHF prevention measures

Our study found a significant association between the level of education and the adoption of DHF prevention measures in the community. This finding is consistent with previous studies that showed a strong relationship between higher education levels and better health awareness that promoted positive health practices[30–32]. Individuals with higher education levels were more likely to recognize the risk factors of DHF and understood the need to take preventative measures, such as using mosquito repellents, practicing proper waste disposal, and maintaining clean water storage[33]. This shows that public health campaigns should focus on educational outreach, particularly in communities with lower education levels. Tailoring messages to be accessible and engaging for all educational backgrounds will enhance understanding and adoption of DHF prevention practices.

The community should be encouraged to practice the three main principles of DHF prevention: draining, covering, and burying (known as the 3Ms in Bahasa Indonesia: *menutup, mengubur dan menguras*)[26,34]. It is essential to consider the relationship between people's understanding of health issues and their educational background to create effective health promotion strategies. Different demographics require tailored approaches[35,36]. A study found that incorporating audio-visual media into health education programs significantly improved family attitudes and behaviors toward preventing DHF[34]. Furthermore, educating the younger generation about DHF management through school-based initiatives is also essential[30,37]. Various media types, such as posters, community meetings, and social media campaigns, could be used to reach the community. Program managers need to ensure that the health promotion methods used could reach the intended audience to improve their knowledge and behavior[38].

Association between the source of information and DHF preventive measures

Our analysis showed that those who received DHF-related information from health workers were more likely to adopt a high level of DHF prevention measures. This finding is consistent with results from other studies[13,39]. Health workers had a strong role in providing accurate information to the community to enhance preventive measures against DHF. Being trained professionals, health workers possess a level of authority and trustworthiness that other sources of information lack. As a result, individuals are encouraged to value and adhere closely to the health

recommendations provided. Health workers are also skilled at tailoring their advice to the community's specific needs[40]. Since interactions with health workers typically occur in a healthcare setting, this might psychologically affect the community, motivating them to act on the advice given and even follow up on it.

These results show that health workers have a key responsibility in spreading trustworthy and practical information about DHF and its prevention measures. Therefore, health workers should take advantage of every opportunity to educate community members about DHF during their interactions. It is necessary to improve the skills and knowledge of health workers in providing practical health advice so that they can positively influence the attitudes and practices of community members, including DHF prevention measures.

Strengths and limitations of the study

It is important to note that very few studies have been conducted on the factors associated with controlling DHF in the coastal areas of Indonesia. To the best of our knowledge, this is the first study to examine the measures taken to prevent DHF in the coastal area of Suli, which is one of the most popular tourist destinations in Ambon city. The use of the total sampling method in this study also made the data representative of the coastal area of Suli Village. However, some limitations of this study should be considered. We recognize that categorizing DHF prevention measures into "high" and "low" is limited in capturing the complexity of individual approaches to DHF prevention. The survey instrument was also limited to capturing the entire practices for DHF prevention measures, indicating potential discrepancies between our findings and actual behaviors. Some potential confounding factors could be associated with DHF prevention measures yet not controlled due to the data limitation in this survey, such as respondents' levels of knowledge and attitudes specifically on DHF, each respondent's specific role in health, e.g., community health volunteers that could have more positive health practices than the general population, as well as housing and environmental conditions. Furthermore, the participants' ability to recall the conditions asked about in the survey was relied upon and there was no further validation of their answers. We could not exclude the potential for social desirability bias in this study, as participants may have provided responses that they perceived as socially acceptable or favourable. This could have resulted in an overestimation of positive behaviours or an underestimation of negative behaviours among the respondents. For the variable of DHF's source of information, we did not include detailed information on the frequency of contact with the source or the length and nature of exposure to the information.

Conclusion

This study concludes that more efforts are needed to educate and raise awareness about DHF prevention measures in the coastal community of Suli Village. Public–private sector partnerships could be useful in conducting awareness–raising campaigns for both the local community and visitors regarding the dangers of DHF and its spread. Therefore, it is important to design health promotion programs that target individuals with a low level of education. Health workers should continuously improve their knowledge and skills in order to educate their communities and distribute reliable information on DHF prevention programs. They should take every opportunity to disseminate health–related information in their communities. Future research should explore the content, context and frequency of information exchange to assess its effectiveness in promoting preventive practices against DHF. Further studies could also investigate the role of different communication

channels and their relative influence on behavioural changes within the community. Studies integrating quantitative and qualitative methods would enable a deeper exploration of the motivations, beliefs, and contextual factors influencing an individual's DHF prevention measures.

Acknowledgement

We would like to express our gratitude to the head and staff of the Suli health center, Ambon city, and the administrative leader of Suli Village for allowing us to conduct the survey. We would also like to thank the dean and staff of the Faculty of Medicine Universitas Pattimura for their support in the analysis, and all respondents who were willing to participate in the study.

References

1. Bhatt P, Sabeena SP, Varma M, Arunkumar G. Current understanding of the pathogenesis of dengue virus infection. Curr Microbiol 2021;78:17–32.
2. Brady OJ, Hay SI. The global expansion of dengue: how aedes aegypti mosquitoes enabled the first pandemic arbovirus. Annu Rev Entomol 2020;65:191–208.
3. Ministry of Health Republic of Indonesia. Dengue fever stuation in Indonesia in 2017 [homepage on the Internet]. Jakata: Ministry of Health Republic of Indonesia; 2018 [cited 2023 Jul 15]. Available from: https://www.kemkes.go.id/article/print/19011500007/situasi-penyakit-demam-berdarah-di-indonesia-tahun-2017.html
4. Sandra T, Sofro MA, Suhartono S, Martini M, Hadisaputro S. Faktor-faktor yang berpengaruh terhadap kejadian demam berdarah dengue pada anak usia 6-12 tahun di kecamatan tembalang. JEKK 2019;4:1–10.
5. World Health Organization. Dengue and severe dengue [homepage on the Internet]. Geneva: WHO; 2023 [cited 2023 Jul 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue
6. Ministry of Health Republic of Indonesia. DHF cases increase, ministry of health encourages 1 house 1 jumantik movement (G1R1J) [homepage on the Internet]. Jakarta: Sehat Negeriku; 2022 [cited 2023 Jul 15]. Available from: https://sehatnegeriku.kemkes.go.id/baca/umum/20220615/0240172/kasus-dbd-meningkat-kemenkes-galakkan-gerakan-1-rumah-1-jumantik-g1r1j/
7. Statistics of Maluku Province. Maluku province in figures [Provinsi Maluku Dalam Angka 2022] [homepage on the Internet]. Ambon: Statistics of Maluku Province; 2022 [cited 2023 Jul 15]. Available from: https://maluku.bps.go.id/
8. Oo PM, Wai KT, Harries AD, Shewade HD, Oo T, Thi A, et al. The burden of dengue, source reduction measures, and serotype patterns in Myanmar. Trop Med Health 2017;45:35.
9. Junior JBS, Massad E, Lobao-Neto A, Kastner R, Oliver L, Gallagher E. Epidemiology and costs of dengue in Brazil: a systematic literature review. Int J Infect Dis 2022;122:521–8.
10. Castro M, Sánchez L, Pérez D, Sebrango C, Shkedy Z, Stuyft PV der. The relationship between economic status, knowledge on dengue, risk perceptions and practices. PLoS One 2013;8:e81875.
11. Atri M, Srivastava R, Oberoi SS, Chadha M, Rastogi S, Maurya N, et al. Determinants of socio-demographic and environmental barriers in prevention of COVID-19 pandemic. J Family Med Prim Care 2021;10:4558–64.
12. Nur Ain M, Omarulharis S, Azfar H, Maryam A, Hafizah S, Akmal N. Knowledge, attitude and practice of dengue prevention among sub-urban community in Sepang, Selangor. IJPHCS 2017;4:73–83.
13. Prabaningrum A, Fitryasari R, Wahyudi A. Analysis of dengue hemorrhagic fever prevention behavior factors based on the theory of planned behavior. Int J Psychosoc Rehabil 2020;24:2926–32.
14. Damanik HD, Astuti I, Kamsul. The dengue hemorrhagic fever (DHF) behavior to prevent. J PROMKES 2023;11:65–70.
15. Folayan MO, Abeldaño Zuñiga RA, Virtanen JI, Ezechi OC, Yousaf MA, Jafer M, et al. A multi-country survey of the socio-demographic factors associated with adherence to COVID-19 preventive measures during the first wave of the COVID-19 pandemic. BMC Public Health 2023;23:1413.
16. Chandren JR, Wong LP, AbuBakar S. Practices of dengue fever prevention and the associated factors among the Orang Asli in Peninsular Malaysia. PLoS Negl Trop Dis 2015;9:e0003954.
17. Manulang CS, Samino, Amirus K, Sari FE. Influence of community knowledge and attitude with dengue fever prevention

behavior (DHF) in the padang cermin health center working area. JPPIPA 2023;9:4666–72.
18. Sulidah, Damayanti A, Paridah. Behavior preventtion of dengue hemorrhagic fever in coastal communities. [Perilaku Pencegahan Demam Berdarah Dengue Masyarakat Pesisir]. Poltekita J Ilmu Kesehatan 2021;15:63–70.
19. Tourism Office of Maluku Provincial. Tourist destinations of maluku province [homepage on the Internet]. Ambon: Dinas pariwisata provinsi maluku; 2023 [cited 2023 Jul 15]. Available from: https://dispar.malukuprov.go.id/
20. Fidmatan F. Public relations activities of the tourism office in promoting natsepa beach (Study at the culture and tourism office of Maluku Province) [homepage on the Internet]. Maluku: University of Muhammadiyah Malang; 2012 [cited 2023 Jul 1]. Available from: https://eprints.umm.ac.id/27986/
21. Nasution HA. Hubungan faktor lingkungan dan perilaku masyarakat dengan kejadian demam berdarah dengue (DBD) di wilayah kerja puskesmas plus perbaungan kabupaten serdang berdagai tahun 2018 [monograph on the Internet]. Medan: Universitas Islam Negeri Sumatera Utara; 2019 [cited 2023 Jul 15] Available from: http://repository.uinsu.ac.id/8550/1/HILYA%20AUNI%20NASUTION_81154039.pdf
22. Arikunto S. Prosedur penelitian: suatu pendekatan praktik [monograph on the Internet]. Jakarta: Rineka Cipta; 2011 [cited 2024 Feb 28]. Available from: https://opac.perpusnas.go.id/DetailOpac.aspx?id=217760
23. Rakhmani AN, Limpanont Y, Kaewkungwal J, Okanurak K. Factors associated with dengue prevention behaviour in Lowokwaru, Malang, Indonesia: a cross-sectional study. BMC Public Health 2018;18:619.
24. Heryanto E, Meliyanti F. The Relationship between knowledge, occupation, and counselling with family head's action in preventing dengue fever (DHF). Lentera Perawat J 2021;2:8–16.
25. Yustati E, Astriana W, Haryanti I. Analysis of factors associated with dengue fever (DHF). J Aisyiyah Medika 2024;9:1–11.
26. Sutriyawan A, Darmawan W, Akbar H, Habibi J, Fibrianti F. Factors affecting the eradication of mosquito nests (EMN) through 3M plus in efforts to prevent dengue hemorrhagic fever (DHF). JIKM 2022;11:23–32.
27. Nur YM, Eliza E, Haria WE. Predisposing factors related to DHF prevention in Tanjung Basung working area of Pasar Usang Health Center. J Akademika Baiturrahim Jambi 2020;9:131–42.
28. Alvira N, Satoto TBT, Wibawa T, Frutos R, Maguin S, Kadek I, et al. Knowledge, attitudes and practices on community with dengue haemorrhagic fever in Mataram, West Nusa Tenggara. Balaba 2020;16:149–58.
29. Aziz R, Dewilda Y, Khair H, Faklin M. Development of waste management system for pariaman city beach tourism area with reduce-reuse-recycle approach. J Serambi Engr 2020;5:1188–94.
30. Ahbi Rami R, Zuharah WF. School-based health education for dengue control in Kelantan, Malaysia: impact on knowledge, attitude and practice. PLoS Negl Trop Dis 2020;14:1–23.
31. Diaz-Quijano FA, Martínez-Vega RA, Rodriguez-Morales AJ, Rojas-Calero RA, Luna-González ML, Díaz-Quijano RG. Association between the level of education and knowledge, attitudes and practices regarding dengue in the Caribbean region of Colombia. BMC Public Health 2018;18:143.
32. Hasanah N. Health education in increasing prevention behavior of dengue hemorrhagic fever in families at Gubeng Village, Surabaya, Indonesia. IJPHRD 2019;10:1977–81.
33. Sillia I, Umboh A, Rampengan N. Relationship between knowledge, attitude, and preventive measures against dengue hemorrhagic fever in community. e-CliniC 2022;10:201.
34. Ramadhani F, Yudhastuti R, Widati S. Implementation of PSN 3 M plus for prevention dengue hemorrhagic fever (Case Study of Kamal Village Communit). GJPH 2019;2:139.
35. Yuniastuti T, Cahyani SD, Joegijantoro R. Study of education level in the community in Pandansari Village, Poncokusumo District, Malang Regency as an effort to control dengue fever Incidence. CIASTECH 2022;5:713–9.
36. Mulyadi E, Dewi SK. The relationship between knowledge and level of education on dengue prevention in the Baros Health Center Working Area. J Public Healtlh Innov 2023;3:164–72.
37. Suwanbamrung C, Saengsuwan B, Sangmanee T, Thrikaew N, Srimoung P, Maneerattanasak S. Knowledge, attitudes, and practices towards dengue prevention among primary school children with and without experience of previous dengue infection in southern Thailand. One Health 2021;13:1–8.
38. Rusadi N, Putra GS. Determinants of DHF prevention behavior in Kapuas Kanan Hulu Village, Sintang Regency. JKMK 2020;7:190–201.
39. Merbawani R, Munfadlila A. Health education effected public knowledge to prevention of dengue hemorrhagic fever (DHF). JSRET 2023;2:921–31.

40. Tomasouw JFC, Titaley CR, Malakauseya MLV, Kailola NE, Krentel A. Diverse information sources and the community's high level of knowledge about lymphatic filariasis in air salobar and waihaong, Ambon City, Indonesia. Natl J Community Med 2024;15:11–8.