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The Demographic and Socioeconomic Factors in Dengue Hemorrhagic Fever Incidence: A Cross-Sectional Analysis in Manado, Indonesia

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ABSTRACT

In Indonesia, dengue hemorrhagic fever (DHF) is one of the most serious public health issues. Analyzing host factors associated with the occurrence of DHF in Manado is the aim of this study. This study uses a cross-sectional technique and is observational in nature. This study was conducted in Manado City between July and December of 2024. Age, gender, education, occupation, and the incidence of DHF were the host factors that were examined.271 individuals completed the questionnaire utilized in this study. The Chi square test was then used to assess the data. A significant connection was found between the incidence of DHF and education level (p=0.035), but not between the incidence of DHF and age (p=0.882), gender (p=0.872), or occupation (p=0.936). The incidence of DHF among Manado City residents was found to be associated with the host's level of education

INTRODUCTION

One form of infectious disease brought on by a dengue virus infection is dengue hemorrhagic fever (DHF). All age groups are susceptible to dengue fever, which can occur at any time of year. When Aedes aegypti (Aedes aegypti) and Aedes albopictus (Aedes albopictus) mosquitoes feed on the blood of infected humans, the virus can enter their bodies (Khormi & Kumar 2012). Infections with different serotypes of the dengue virus (DEN-1, DEN-2, DEN-3, and DEN-4) or secondary infections might cause patients to have dengue again. In regions with tropical and subtropical climates, including Southeast Asia, Central America, America, and the Caribbean, this disease is prevalent (Chandra 2010).

There were 138,127 DHF cases reported nationwide in 2019. This figure was higher than the 65,602 cases recorded in 2018. Between 2018 and 2019, the number of dengue fever-related deaths rose from 467 to 919. The indicator incidence rate (IR) per 100,000 people and the case fatality rate (CFR) in percentage terms can be used to characterize illness and mortality. In 2019, there were 51.48 cases for every 100,000 people. A rise over the two years prior, in 2016 and 2017, when the incidence rate of dengue was 26.1 and 24.7 cases per 100,000 people, respectively. North Sulawesi province has a dengue case rate of 94.97 per 100,000 residents in 2019, placing it sixth out of 34 provinces (Health Ministry of Republic Indonesia 2021).

DHF has been attacking North Sulawesi Province for the past five years. According to data from the North Sulawesi Provincial Health Office, there have been 6,130 cases overall, and 74 individuals have died. With 2,217 cases, 2016 had the highest number of DHF cases in the previous five years. DHF cases rose once more in 2018, reaching 1,713 cases after declining to 587 cases in 2017. The greatest number of fatalities—24—was also noted in 2018. The North Sulawesi Provincial Health Office confirmed that the current situation has not been classified as an Extraordinary Event (Kejadian Luar Biasa/KLB), only an increase in the number of DHF cases (Dinkes Sulut 2019; Ottay 2015; Ottay 2016). In early 2019, DHF attacked 24 people, three of whom died.

Due to the increased number of mosquito breeding grounds brought on by the increased rainfall, DHF often starts to rise in the middle of the rainy season. Aedes mosquitoes like shade because it protects them from the sun and human stench. Public settings, including schools, can spread dengue, particularly in dimly lit and wet classrooms. The occurrence of dengue is caused by numerous causes. These include host characteristics (age, gender, education, socioeconomic status, knowledge, and community actions), environmental factors (physical, biological, and chemical), and causal factors (dengue virus) and dengue vectors (Ae. aegypti) (Ayudhya et al 2014; Lumingas 2017; Teurlai et al 2015).

LITERATURE RIVIEW

Environmental, ecological, and demographic factors are some of the elements that affect the DHF's spread. High humidity and warm temperatures are associated with a higher prevalence of dengue. High temperatures have the potential to promote mosquito biting behavior and boost vector reproduction. In

addition, health services are influenced by age group shifts, rural spread, social and biological determinants of race and gender are also contributing factors (Sumampouw 2020; Musfantor et al 2019; Ottay et al 2024).

Research that looked at the relationship between the incidence of DHF and host factors (age, sex, habit of using mosquito repellents, and behavior of eradicating mosquito nests) revealed a correlation between the two. Specifically, the habit of using repellents had a p-value of 0.002, OR=4.580, and the behavior of eradicating mosquito nests had a p-value of 0.025, OR=3,100. Additionally, the habit of utilizing medications to repel mosquitoes was discovered. According to this study, individuals should always become used to using repellent at home. However, since burning repellant is not ecologically friendly, it is not advised. Instead, people should use lotions, electric repellents, and spray repellent medications. When children leave the house in the morning or evening, make it a habit to apply mosquito repellent lotion, preferably at home with gauze. eliminating mosquito nests once a week, minimizing water reservoirs, routinely draining landfills, and refraining from hanging clothes (WHO 2020; Ismail 2019; Widyorini et al 2016). Analyzing host factors associated with the occurrence of DHF in Manado is the aim of this study.

METHODOLOGY

This study use observational analysis. In this study, all research variables were collected simultaneously using a cross-sectional methodology. The study will take place in Manado City between July and December of 2024. The information used in this study came from the outcomes of interviews conducted with residents of Manado. According to the Identity Card (ID Card), there are 271 respondents in the city of Manado. The accidental sampling method was used for sampling. The variables under investigation were DHF incidence as bound variables and host factors, specifically age, gender, education, and occupation as independent variables. A filling sheet is the tool utilized. Both univariate and bivariate data analysis were used in this investigation. The frequency distribution of the research variables is explained using univariate analysis. The Chi square test is used in bivariate analysis to explain the relationship between free and bound variables.

RESULT

Univariate Analysis

In this section, the researcher explained the description of the distribution of respondents based on the research variables. This can be seen in Table 1.

Table 1. Distribution of Respondents Based on Research Variables

Variabel penelitian		N	%
Age	Young adults (19-44 years)	172	63,5
	Older adults (45 years and older)	99	36,5
	Total	271	100,0
Gender	Man	92	33,9
	Woman	179	66,1
	Total	271	100,0
Education level	Primary school	12	4,4
	Junior High School equivalent	32	11,8
	Senior High School equivalent	165	60,9
	Universities	62	22,9
	Total	271	100,0
Occupation	Work	166	61,3
	Not working	105	38,7
	Total	271	100,0
DHF Incidence	Yes	38	14,0
	No	233	86,0
	Total	271	100,0

According to the above table, the majority of respondents are female (66.1%), young adult (63.5%), have completed high school (60.9%), are employed (61.3%), and have never experienced DHF (86.0%).

Bivariate Analysis

Furthermore, the correlation between free and bound variables is described in Table 2.

Table 2. The Results of the Chi Square Test

		DHF incidence		Total	p-value
		Yes	No		
Age	Young adults	23	149	172	0,822
	Dewasa tua	15	84	99	
	Total	38	233	271	
Gender	Man	12	80	92	0,872
	Women	26	153	179	
	Total	38	233	271	
Education level	Primary school	0	12	12	**0,035***
	Junior High School equivalent	0	32	32	
	Senior High School equivalent	27	138	165	
	Universities	11	51	62	

	Total	38	233	271	
Occupation	Work	24	142	166	0,936
	Not working	14	91	105	
	Total	38	233	271	

A significant connection was found between the incidence of DHF and education level (p=0.035), but not between the incidence of DHF and age (p=0.882), gender (p=0.872), or occupation (p=0.936).

DISCUSSION

According to Table 1, there is no significant association between age and DHF incidence, as indicated by the p-value of 0.822 (p>0.05) for the relationship between the two variables. Age is one of the risk factors that should be taken into account when determining the incidence of DHF, particularly in youngsters, which is why this result was achieved. These risk factors interact with other risk factors like behavior, environment, and immunological state rather than existing alone. Furthermore, the study's findings can differ according on the demographic under investigation. Since the study population consisted of people aged 19 to 60 and did not include children as respondents, the age-group differences in risk may not be as noticeable. The incidence of dengue can also be influenced by other risk factors, such as behavior, living conditions, and socioeconomic position, which can obscure the impact of age. The findings of this investigation are consistent with those of a study conducted in Serdang Bedagai Regency by Marbun et al. (2021), which did not find a significant relationship between age and the incidence of DHF. Permatasari et al. (2013) found no significant association between age and the incidence of DHF, which is also consistent with this study.

A p value of 0.882 (p>0.05) was found for the correlation between sex and DHF incidence, indicating that there is no significant relationship between gender and DHF incidence. According to Halstead in Guha-Sapir & Schimmer (2015), there are theoretically more male DHF patients than females because of immunological components in the body. The immunological response of women is superior to that of men. The reason for this is that women produce more cytokines than males do. This hormone, a cytokine, controls the strength and length of an individual's immunological response (Novrita et al., 2017). Men can also go to locations where DHF is endemic because of their high mobility and work activities (Rojali and Amalia 2020). However, as the majority of study participants were female, it is believed that this is the reason why no association between sex and the incidence of DHF was discovered in this investigation. Furthermore, the incidence of DHF is not primarily influenced by gender. Environmental factors, such as the presence of Aedes aegypti mosquito nests, population density, sanitation conditions, and climate change, as well as behavioral factors, such as exposure to mosquito bites, particularly during the day, and immune status, such as a history of prior DHF infection, have a greater

impact on the incidence of DHF. In conclusion, despite minor variations in the distribution of DHF cases between men and women in certain studies, these variations were typically not statistically significant and may not be regarded as a substantial risk factor. The findings of this study are consistent with those of Tansil et al. (2021), who discovered no relationship between the incidence of DHF and sex characteristics, humidity, or morning and evening sleep patterns.

A p-value of 0.035 (p0.05) was identified in the association between the incidence of DHF and education level, indicating a substantial relationship between the two. Education level does have a significant correlation with the incidence of DHF. The lower a person's education level, the higher the risk of developing DHF. This is due to several interrelated factors such as knowledge, clean and healthy living behavior, access to information and socioeconomic status. People with higher levels of education tend to have a better knowledge of DHF, including how it is transmitted, its early symptoms, and prevention efforts. With this information, they can take the necessary precautions to shield themselves and their loved ones from Aedes aegypti bites. Higher education makes it easier for someone to absorb information and increases their understanding, claims Notoatmodjo (2013). Important ideals of environmental cleanliness, such as keeping the house tidy, throwing away trash properly, and routinely eliminating mosquito nests, will be instilled by adequate teaching. Maintaining a clean and healthy lifestyle is essential to stopping dengue mosquito reproduction. Higher educated people typically have easier access to health information via the media, the internet, or medical facilities. They can use this information to identify dengue symptoms early and get medical care right away. Socioeconomic position and educational attainment are frequently connected. Higher educated people typically hold better occupations and have easier access to high-quality medical services. This is consistent with a study by Dalending et al. (2024) that looked at the factors influencing the prevalence of DHF in East Likupang District, North Minahasa Regency, and discovered a strong link between education and DHF incidence. Tanjung's (2016) research also revealed a link between the occurrence of DHF and education. Additionally, studies by Novrita et al. (2017) demonstrate a link between the occurrence of DHF and education.

A p value of 0.936 (p>0.05) was found for the association between occupation and DHF incidence, indicating that there is no significant relationship between work and DHF incidence. The findings of this study are consistent with Monintja's (2015) research, which found no link between the incidence of DHF in Malalayang I Sub-district, Malalayang District, Manado City, and employment. There is no relationship between the occurrence of DHF and employment among respondents whose typical occupations are workers, independent contractors, government employees, and business owners whose workplaces are typically not all that different from their homes. Except for those who work as farmers in rice fields or in shady gardens, who may also be at risk of being bitten by Aedes albopictus, another DHF vector, as these mosquitoes typically prefer to live in bushes and in shady gardens, the spread of DHF vectors that cause DHF is almost evenly distributed throughout the world, meaning that both people who work

and those who do not have nearly the same probability of contracting DHF (Rojali & Amalia 2020).

CONCLUSIONS AND RECOMMENDATIONS

It can be concluded that the education factor is a determinant factor of DHF incidence in the people of Manado city. Therefore, efforts to prevent and control dengue must be carried out comprehensively by involving various parties, including the government, the community, and the private sector. Prevention remains key, although we cannot completely avoid the risk of dengue, we can reduce the risk by maintaining the cleanliness of the environment, avoiding mosquito bites, and getting vaccinated against dengue if available.

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