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SUBMITTED 21 March 2025

ACCEPTED 18 April 2025

PUBLISHED 26 May 2025

VOLUME Vol.06 Issue 05 2025

CITATION

Dahrul Fakri, Said Usman, Irwan Saputra, M. Yani., & T. Maulana. (2025). Analysis of Dengue Hemorrhagic Fever (Dhf) Prevention Behavior Using the Health Belief Model (Hbm) Approach in Banda Aceh City. International Journal of Medical Science and Public Health Research, 6(05), 83–97. <https://doi.org/10.37547/ijmsphr/Volume06Issue05-07>,

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Analysis of Dengue Hemorrhagic Fever (Dhf) Prevention Behavior Using the Health Belief Model (Hbm) Approach in Banda Aceh City

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Abstract

Dengue is a mosquito-borne viral infection that has remained a global public health concern for more than five decades. Commonly referred to as Dengue Hemorrhagic Fever (DHF) in the community, it continues to be a significant health issue. In 2024, the number of DHF cases in Aceh Province reached 3,044. In Banda Aceh City, the trend has been fluctuating, with 400 reported cases in 2024—the highest in the last five years—resulting in three deaths. This study aimed to analyze the relationship between dengue fever prevention behaviors using the Health Belief Model (HBM) approach. This research employed a quantitative analytic observational design with a cross-sectional approach. The study population consisted of heads of households or housewives across 9 subdistricts in Banda

Aceh. Data analysis was conducted using Partial Least Squares (PLS) with the SmartPLS version 4.0 application. Hypothesis testing revealed that age group was significantly associated with perceived benefits ($p = 0.035 < 0.05$) and perceived severity ($p = 0.035 < 0.05$). Perceived susceptibility was significantly related to dengue prevention behavior ($p = 0.000 < 0.05$), as were perceived benefits ($p = 0.000 < 0.05$), perceived barriers ($p = 0.000 < 0.05$), and cues to action ($p = 0.000 < 0.05$). This study provides recommendations for government and community stakeholders in formulating effective dengue prevention policies in Banda Aceh City.

Keywords: Dengue Prevention Behavior, Health Belief Model.

Introduction: Dengue can be defined as a viral infection disease transmitted through mosquitoes and has become a health problem in the world. For more than five decades, dengue or commonly known as dengue fever has become a public health problem in the world, not only in Indonesia. (Ministry of Health of the Republic of Indonesia, 2022).

Until now, dengue disease has not been well controlled, as evidenced by the significant increase in dengue cases worldwide and the outbreaks that occur every year in Indonesia. This raises ongoing public concerns about dengue infection. Therefore, it is necessary to strengthen the management of dengue control programs and strategies. (Ministry of Health, Republic of Indonesia, 2021).

Dengue infection is one of the infectious diseases that can cause outbreaks and cause death. Transmission of dengue infection is caused by the dengue virus through the bite of the female *Aedes aegypti* mosquito. The spread of adult female *Aedes aegypti* mosquitoes is influenced by several factors including the availability of egg-laying sites and blood, but the place is limited to a distance of 100 meters from the location of emergence (Ministry of Health of the Republic of Indonesia, 2022).

Dengue infection is one of the infectious diseases that still attacks the population in Indonesia and is still one of the public health problems that cannot be overcome. Dengue infection has even become endemic in almost all provinces. In the last 5 (five) years, the number of cases and affected areas has continued to increase and spread widely and often causes KLB (Extraordinary Events). Dengue infection in Indonesia in 2022 has reached 131,265 cases, with the highest number of dengue cases in the provinces of West Java, East Java and Central

Java (Ministry of Health of the Republic of Indonesia, 2022).

Dengue cases in Indonesia continue to increase, in 2021 there were 73,518 cases with a death toll of 705 people, in 2022 there were 131,265 cases with a death toll of 1,183 people, in 2023 there were 114,720 cases with a death toll of 894 people. Dengue fever infections in Indonesia in 2023 saw an increase in the Incidence Rate (IR) and a decrease in the Case Fatality Rate (CFR). Meanwhile, the number of dengue fever cases as of October 2024, there were 203,921 dengue cases with 1,210 deaths originating from 482 regencies/cities in 36 provinces in Indonesia (Ministry of Health of the Republic of Indonesia, 2024).

Aceh Province with a population of 5,515,839 people consisting of 2,759,685 men and 2,756,154 women, it is known that in 2024 DHF infections reached 3,044 cases spread across 23 districts/cities and was the largest number of DHF cases in the last five years. In addition, information obtained by province, it turns out that the most significant increase in DHF occurred in Banda Aceh City, namely 400 cases and a death rate of 3 people compared to 22 other districts/cities (Aceh Health Office, 2024).

The increasing number of dengue fever cases in Banda Aceh City with a population of 259,538 people, with details of 129,400 men and 130,138 women spread across 9 sub-districts and making Banda Aceh City an endemic area for dengue fever with the highest number of cases in Aceh Province from year to year. The trend of dengue fever cases tends to fluctuate, namely in 2019 there were 344 cases, in 2020 there were 98 cases, in 2021 there were 19 cases, in 2022 there were 366 cases, in 2023 there were 274 cases and in 2024 there were 400 cases.

The number of DHF cases per sub-district in 2024 in Banda Aceh City consists of Meuraxa sub-district 66 cases, Jaya Baru sub-district 72 cases, Banda Raya sub-district 43 cases, Baiturrahman sub-district 30 cases, Lueng Bata sub-district 26 cases, Kuta Alam sub-district 68 cases, Kuta Raja sub-district 27 cases, Syiah Kuala sub-district 36 cases, and Ulee Kareng sub-district 32 cases (Banda Aceh City Health Office, 2024).

Dengue Hemorrhagic Fever (DHF) infections in 2024 in Banda Aceh City amounted to 400 cases, consisting of 49 cases in January, 15 cases in February, 16 cases in March, 10 cases in April, 10 cases in May, 11 cases in June, 16 cases in July, 29 cases in August, 27 cases in September, 69 cases in October, 64 in November and 84 cases in December (Banda Aceh City Health Office, 2024).

All regions in Indonesia are at risk of contracting dengue

fever, because both the causative virus and the mosquitoes that transmit it have spread widely in residential areas and in public places throughout Indonesia except for places above 100 meters above sea level. Almost every year there are Extraordinary Events (KLB) in several areas during the rainy season. This disease is still a public health problem and is endemic in some districts/cities in Indonesia. Dengue Fever can attack all age groups. Until now, Dengue Fever has attacked more children, but in the last decade there has been a tendency for an increase in the proportion of Dengue Fever sufferers in adults.(Sukohar, 2014).

According to Glanz. K, et al, (2008) in(Elvin et al., 2016). One approach that can predict individual health behavior towards preventing Dengue Hemorrhagic Fever (DHF) is the Health Belief Model (HBM) developed by social psychologists in the United States health service in the 1950s: Godfrey Hochb, Stephen Kegels, and Irwin Rosenstock. HBM can provide output on perception patterns that lead to preventive behavior towards Dengue Hemorrhagic Fever (DHF) in Banda Aceh City.

RESULTS

Table 1. Univariate Frequency Distribution

Characteristics	Frequency (f)	Percentage (%)
Gender		
Man	123	30.9
Woman	275	69.1
Work		
Work	244	61.3
Doesn't work	154	38.7
Education		
SENIOR HIGH SCHOOL	158	39.7
Diploma	78	19.6
D4/S1	152	38.2
S2/S3	10	2.5
Age Group		
21-30 Years	114	28.6
31-40 Years	97	24.4
41-50 Years	115	28.9
51-60 Years	45	11.3
> 61 Years	27	6.8
Total	398	100

Based on Table 1.illustrates that the gender of female respondents is more dominant, namely 275 people (69.1%) compared to men, namely 123 people (30.9%). This is because women visit the health center more. Women are also more at home and are easier to interview and have a high interest in filling out the research questionnaire. Based on the employment status of the respondents, the majority of respondents in this study were employed, namely 244 people (61.3%), while those who were unemployed were 154

METHOD

The method in this study uses quantitative research with observational analytical studies with cross-sectional. This study was conducted in Banda Aceh City which consists of 9 sub-districts, 90 villages in 9 Public Health Centers (Puskesmas) consisting of Baiturrahman, Meuraxa, Kuta Alam, Kopelma Darussalam, Jaya Baru, Banda Raya, Batoh, Lampaseh Kota and Ulee Kareng Puskesmas. The selection of this research location is based on the number of sub-districts in Banda Aceh City. This research was conducted in 9 sub-districts, 90 villages in the Banda Aceh City Area from December 2024 to February 2025. The population in this study was all families in 9 sub-districts in Banda Aceh City. The selection of the population was carried out randomly based on the number of families, namely 77,515. The sampling technique used in this study used the probability sampling method with the stratified random sampling technique, so that a sample of 398 respondents was selected.

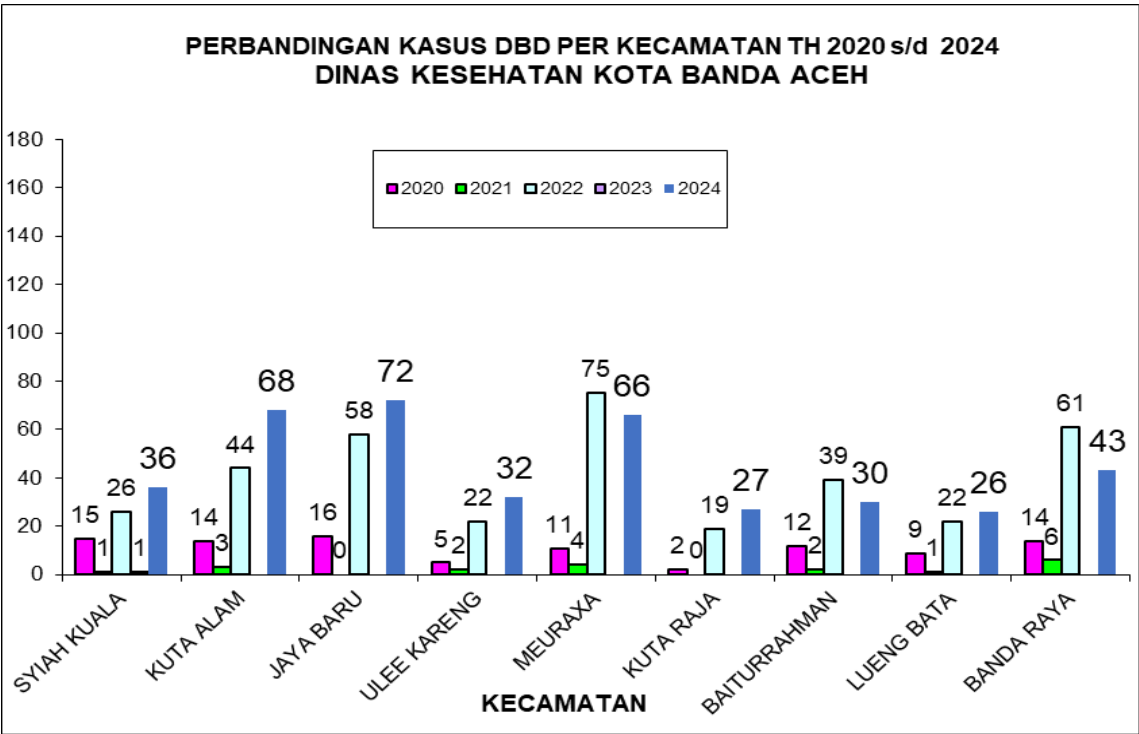
people (38.7%), namely housewives.

Based on the level of education of respondents in this study, it shows that the dominant respondents have a high school education background, namely 158 people (39.7%) and the lowest education is Masters/Doctorate, namely 10 people (2.5%).

Furthermore, the respondents in the age group category 41-50 years were 115 people (28.9%) and the age group 21-30 years were 114 people (28.6%) which were very

dominant in this study. While the category with the least (6.8%).
was the age group >60 years, which was 27 people

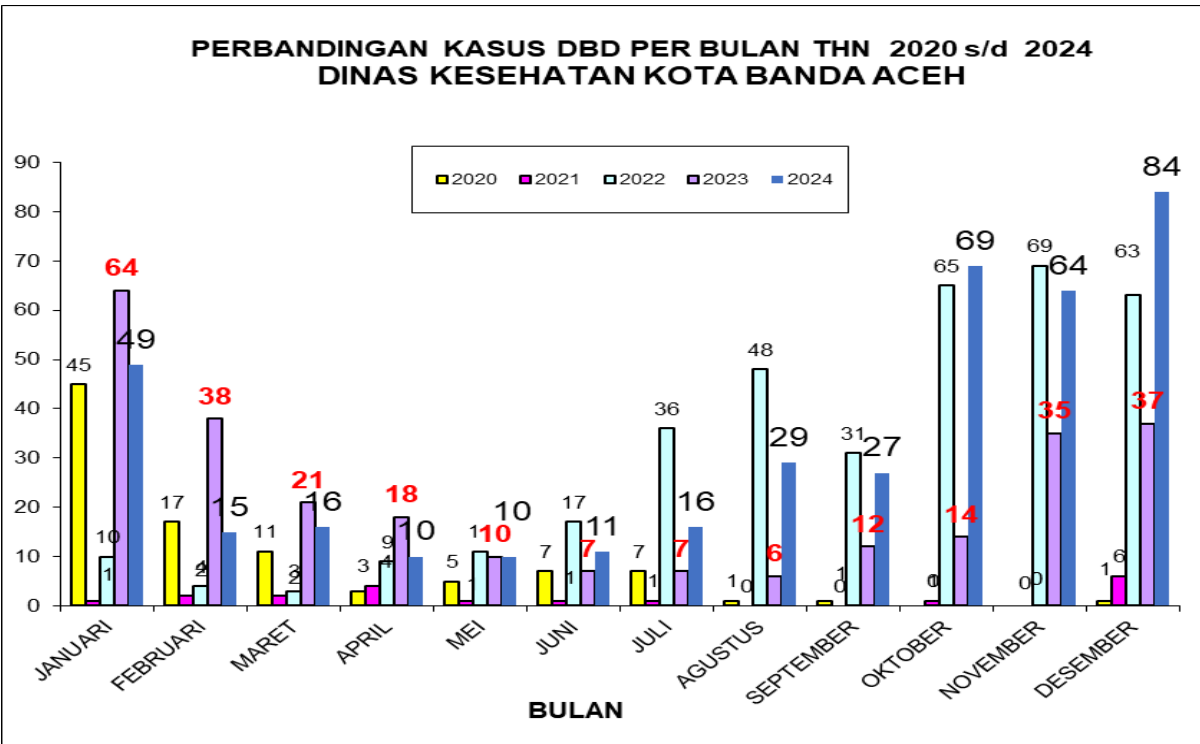
Figure 1 Dengue Fever Case Trend Graph in 5 Years



The highest sub-district analysis of DHF in 2020 in Banda Aceh City is Jaya Baru (16 cases), in 2021 Banda Raya (6 cases), in 2022 Meuraxa (75 cases), in 2023 Meuraxa (61 cases) and, in 2024 Jaya Baru (72 cases). Jaya Baru and Meuraxa sub-districts are the areas with the highest DHF

cases in the last five years. This must be a priority for handling DHF in Jaya Baru and Meuraxa sub-districts due to the behavior of people who do not maintain environmental health (inside and outside the home) properly without ignoring other sub-districts.

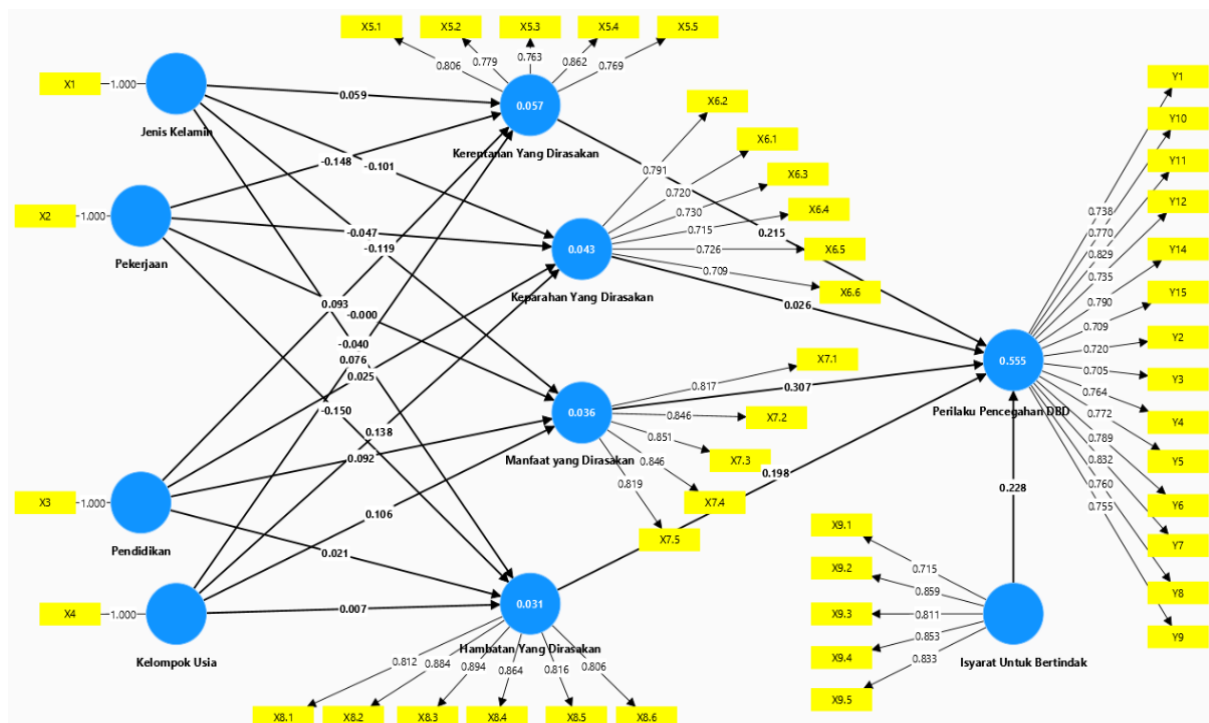
Figure 2 Monthly Dengue Fever Case Graph from 2021-2024



Trend DHF cases in the last five years in Banda Aceh City, namely 2020 (98 cases), 2021 (19 cases), 2022 (366 cases), 2023 (269 cases) and, 2024 (400 cases). DHF began to increase sharply from November to January. This is closely related to climate change. According to BMKG Class 1 Sultan Iskandar Muda (SIM) data in 2024,

the intensity of moderate rain in Banda Aceh City started in September and decreased starting in February, the decrease occurred due to the change in seasons influenced by the apparent movement of the sun to the north. The increase in rainfall is in line with the increase in DHF cases in Banda Aceh.

Figure 3. Outer Model Graph



Convergent validity or convergent validity refers to the principle that the dimensions of a construct must be highly correlated. Validity testing with Smart PLS software can be seen in the loading factor value of each indicator or construct. The rule for evaluating convergent validity is to see the loading factor value

must be more than 0.7 in the confirmatory study and between 0.6 - 0.7 in the exploratory study and the Average Variance Extracted (AVE) must be greater than 0.5. in this study, a loading factor value of 0.7 will be used.

Table 2. Outer Loading Values

No	Question	Variables	Loading Factor	Average Variance Extracted (AVE)
1	X1	Gender	1,000	1,000
2	X2	Work	1,000	
3	X3	Education	1,000	
4	X4	Age Group (X)	1,000	
5	Y1.1	Perceived Vulnerability (Y1)	0.806	0.634
6	Y1.2		0.779	
7	Y1.3		0.763	
8	Y1.4		0.862	
9	Y1.5		0.769	
10	Y2.1	Perceived Severity (Y2)	0.720	0.536
11	Y2.2		0.791	
12	Y2.3		0.730	
13	Y2.4		0.715	
14	Y2.5		0.726	
15	Y2.6		0.709	
16	Y3.1	Benefits Felt (Y3)	0.817	0.699
17	Y3.2		0.846	
18	Y3.3		0.851	

19	Y3.4		0.846	
20	Y3.5		0.819	
21	Y4.1	Perceived Obstacles (Y4)	0.812	0.717
22	Y4.2		0.884	
23	Y4.3		0.894	
24	Y4.4		0.864	
25	Y4.5		0.816	
26	Y4.6		0.806	
27	Y5.1	Signal To Action (Y5)	0.715	0.666
28	Y5.2		0.859	
29	Y5.3		0.811	
30	Y5.4		0.853	
31	Y5.5		0.833	
32	Z1	Behavior to Prevent Dengue Hemorrhagic Fever (DHF) (Z)	0.738	0.582
33	Z2		0.720	
34	Z3		0.705	
35	Z4		0.764	
36	Z5		0.772	
37	Z6		0.789	
38	Z7		0.832	
39	Z8		0.760	
40	Z9		0.755	
41	Z10		0.770	
42	Z11		0.829	
43	Z12		0.735	
44	Z14		0.790	
45	Z15		0.709	

From table 4.2 above, it can be seen that the loading factor value of each construct or indicator exceeds the limit value of 0.7. Likewise, the AVE value of each variable has met the requirements of >0.5, thus each construct with a variable has met convergent validity

because it has a loading factor value of >0.7 for the AVE value of each variable also meets it, namely >0.5, so it can be said to be valid and can be continued to carry out hypothesis testing

Table 3. Discriminant Validity Value (Cross Loading)

Variables Demographics	Vulnerability Which Felt	Severity Which Felt	Benefits Felt	Obstacle What is Felt	Signal For Act	Dengue Fever Prevention Behavior
X1:1,000	Y1.1: 0.806	Y2.1: 0.720	Y3.1: 0.817	Y4.1: 0.812	Y5.1: 0.715	Z1: 0.738
X2:1,000	Y1.2: 0.779	Y2.2: 0.791	Y3.2: 0.846	Y4.2: 0.884	Y5.2: 0.859	Z2: 0.720
X3:1,000	Y1.3: 0.763	Y2.3: 0.730	Y3.3: 0.851	Y4.3: 0.894	Y5.3: 0.811	Z3: 0.705
X4:1,000	Y1.4: 0.862	Y2.4: 0.715	Y3.4: 0.846	Y4.4: 0.864	Y5.4: 0.853	Z4: 0.764
	Y1.5: 0.769	Y2.5: 0.726	Y3.5: 0.819	Y4.5: 0.816	Y5.5: 0.833	Z5: 0.772
		Y2.6: 0.709		Y4.6: 0.806		Z6: 0.789
						Z7: 0.832
						Z8: 0.760
						Z9: 0.755
						Z10: 0.770
						Z11: 0.829
						Z12: 0.735
						Z14: 0.790
						Z15: 0.709

Based on table 3. above, it can be seen that all indicators for the variables forming the demographic construct, vulnerability, severity, benefits, barriers, cues to action and dengue prevention behavior have met the cross

loading value > 0.7. Therefore, it can be concluded that all indicators in the variables above have good discriminant validity values and it can be said that all indicators are valid.

Table 4. Composite Reliability and Cronbach Alpha Values

Variables	Composite Reliability	Cronbach Alpha
Gender	1,000	1,000
Work	1,000	1,000
Education	1,000	1,000
Age Group	1,000	1,000

Perceived Vulnerability	0.865	0.856
Perceived Severity	0.828	0.827
Benefits Felt	0.894	0.892
Perceived Obstacles	0.921	0.921
Signal To Action	0.880	0.873
Dengue Fever Prevention Behavior	0.945	0.944

From table 4. above, it can be seen that all variables meet the reliability criteria. This can be seen from the composite reliability value greater than 0.7 and the cronbach alpha (α) value greater than 0.6 as

recommended. Thus, it can be said that the relationship between all construct indicators and their variables has been tested for reliability.

Table 5. R-Square Value

No	Variables	R-Square
1	Perceived Vulnerability	0.057
2	Perceived Severity	0.043
3	Benefits Felt	0.036
4	Perceived Obstacles	0.031
5	Dengue Hemorrhagic Fever Prevention Behavior	0.555

Table 5 shows the R-Square value for perceived vulnerability of 0.057. This shows that demographic variables are able to influence the perceived vulnerability variable by 5.7%, the remaining 94.3% is influenced by other variables. The R-Square value for the perceived severity variable is 0.043.

The R-Square value for the perceived barriers variable is 0.031 or 3.1%, which means that demographic factors are able to influence the perceived barriers variable by 3.1%, the remaining 96.9% is influenced by other factors.

This shows that demographic variables are able to influence the perceived severity variable by 4.3%, the remaining 95.7% is influenced by other factors. The R-Square value for the perceived benefits variable is 0.036 or 3.6%, which means that demographic variables are able to influence the perceived benefits variable by 2.6% and the remaining 98.4% is influenced by other factors.

Meanwhile, the R-Square value of Dengue Hemorrhagic Fever (DHF) prevention behavior is 0.555, which means that the perception of the Health Belief Model (HBM) includes variables of perceived vulnerability, perceived severity, perceived benefits, perceived barriers and cues to act that can influence Dengue Hemorrhagic Fever (DHF) prevention behavior by 55.5% and the remaining 44.5% is influenced by other factors.

Figure 4. Inner Model Graph

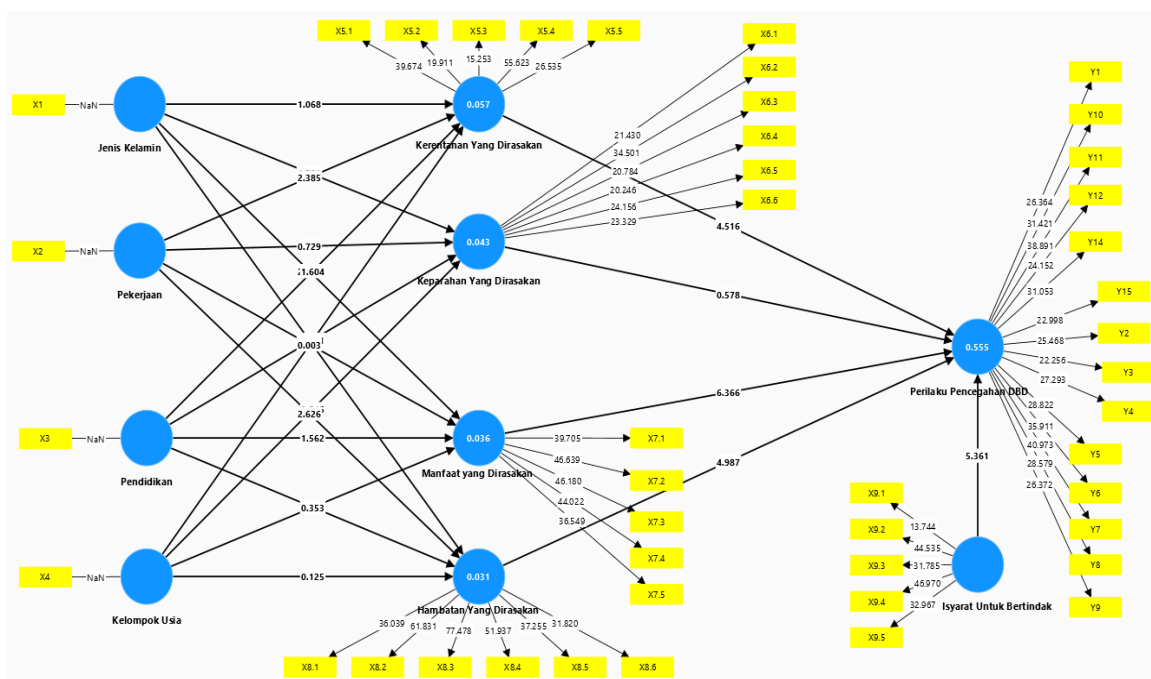


Figure 4. above shows that the demographic variable, namely gender, is related to the perceived benefits variable with a t value of 2.165. Age group is related to the perceived benefits variable with a t value of 2.109, and age group is also related to the perceived severity variable with a t value of 2.545. Occupation is related to the perceived barriers variable with a t value of 2.625, and occupation is also related to the perceived vulnerability variable of 2.385. So the variables of vulnerability, severity, benefits and perceived barriers are mediator variables that do not play a good role in mediating the relationship between demographic factors and Dengue Hemorrhagic Fever (DHF) prevention behavior in Banda Aceh City.

Next is the variable of perceived vulnerability significantly related to dengue prevention behavior with a t value of 4.516. The variable of perceived benefits significantly related to dengue prevention behavior with a t value of 6.366. The variable of perceived barriers significantly related to dengue prevention behavior with a t value of 4.987, and the variable of cues to act related to dengue prevention behavior with a t value of 5.361.

The results of this study indicate that demographic factors, namely gender, are related to perceived benefit variables, age group is related to perceived benefit variables, age group is also related to perceived severity variables, occupation is related to perceived barrier variables, and occupation is also related to perceived vulnerability variables. Vulnerability, benefit, perceived barrier and cues to action variables are significantly related to dengue prevention behavior with a t table value > 1.96.

DISCUSSION

Gender

Based on the results of data processing with SPSS software to see the frequency distribution of respondents, the results can be seen that the gender of respondents, namely the female category totaling 275 people (69.1%) is more dominant than the male category, namely 123 people (30.9%). In the results of hypothesis testing with Smart PLS software, it shows that the gender factor has a significant relationship with the perceived benefits variable with a calculated t value of 2.165 > t table 1.96.

While the gender factor does not have a significant

relationship with the perceived vulnerability perception variable with a t-value of 1.604 < t table 1.96, the gender factor with the perceived severity variable with a t-value of 1.701 < t table 1.96, the gender factor with the perceived barriers variable with a t-value of 0.706 < t count 1.96, and indirectly the gender factor does not have a significant relationship with dengue fever (DHF) prevention behavior with a t-value of 1.024 < t count 1.96. Gender is the difference between women and men biologically since birth.

Thus, according to Notoatmodjo, (2014). Gender is a characteristic that is owned or inherent in men or women who are included socially or culturally. So far, no difference in susceptibility to Dengue Hemorrhagic Fever (DHF) attacks has been found in relation to gender differences (Baitanu et al., 2022).

According to the World Health Organization, (2021), gender is a biological characteristic of humans that is defined as male or female. Research conducted in Malaysia by Muhammad Azami et al., (2021), that gender does not affect the incidence of Dengue Hemorrhagic Fever (DHF)(in Baitanu et al., 2022).

According to the research assumption, female gender has great potential that can be mobilized for Dengue Hemorrhagic Fever (DHF) prevention activities in Banda Aceh City because the role of women in society and families today is so complex. Women also have an important role in maintaining the cleanliness of the house and the environment around the house. The researcher's experience in various social activities in the community, women have high participation in every activity, both those carried out by the government and Non-Governmental Organizations.

According to researchers, in the future, Banda Aceh City needs to make a breakthrough where in addition to the existence of village jumantik cadres, it is also necessary to mobilize and train One House One Jumantik (G1R1J), this is very effective for women as housewives to prevent Dengue Hemorrhagic Fever (DBD). Where in 2024, DBD cases in Banda Aceh City reached 400 cases with 3 deaths due to DBD (Banda Aceh City Health Office, 2024).

Work

The results of data processing with SPSS software to see

the frequency distribution of respondents, in this study showed that the majority of respondents worked, either as ASN/TNI/Polri, BUMN/BUMD Employees, Private Employees, Traders, Farmers/Fishermen and other jobs totaling 244 people (61.3%), the rest were unemployed (housewives) as many as 154 people (38.7%). The results of the hypothesis test using Smart PLS software showed that the work factor had a significant relationship with the perceived vulnerability variable, namely with a calculated t value of 2.385 > t table 1.96, the work factor with the perceived obstacle variable, namely with a calculated t value of 2.625 > t table 1.96.

Meanwhile, those that do not have a significant relationship are the work factor with the perceived severity variable with a t-value of 0.729 < t table 1.96, the work factor with perceived benefits with a t-value of 0.003 t table < 1.96, and indirectly the work factor is not significantly related to Dengue Hemorrhagic Fever (DHF) prevention behavior with a t-value of 1.674 < t table 1.96. Work is an activity that is carried out routinely and continuously based on the expertise possessed and earns income from the results of the hard work carried out (Ministry of National Education, 2005).

The results of this research have a correlation with research (Ramadani et al., 2023) at the Haji Hospital in Medan, showed that work has a significant relationship with the incidence of Dengue Hemorrhagic Fever (DHF) with a p value of 0.000 < 0.05. Employment status, which is related to DHF, is the place of work related to the incidence of DHF (Sujariyakul, 2005) (in Hermansyah, 2022).

According to researchers, Banda Aceh City is the provincial capital that acts as the center of government, Banda Aceh City is the center of economic, educational, health, political and cultural activities, making the mobility of people from other areas to Banda Aceh City high, thus increasing the risk of spreading DHF. Banda Aceh City can also potentially spread DHF to other areas that are not endemic for DHF through community mobility if the destination area has many aedes aegypti mosquitoes that can be a vector for transmission.

Education

The results of data processing with SPSS software to see the frequency distribution of respondents, in this study showed that the majority of respondents had a high

school education of 159 people (39.7%) and the least education was S2/S3 of 10 people (2.5%). While the results of hypothesis testing with Smart PLS software, showed that the education factor did not have a significant relationship with the perception of vulnerability felt with a t-count value of 1.604 < t-count 1.96, the severity felt with a t-count value of 0.415 < t table 1.96, the benefits felt with a t-count value of 1.562 < t table, the obstacles felt with a t-count value of 0.353 < t table 1.96.

And indirectly, the education factor does not have a significant relationship with the behavior of preventing Dengue Hemorrhagic Fever (DHF) with a t-value of 1.559 < t-value of 1.96. Education is a level or stage of formal education at school that has been carried out or completed by someone which can be proven by a Certificate of Completion of Education (Ministry of National Education, 2005). The education factor does not have a direct effect on the occurrence of DHF, but has an effect on preventing DHF. In terms of efforts to prevent DHF, individuals with higher education will tend to behave and act better than those with lower education (Sutomo, 2003) (in Hermansyah, 2022).

The results of the research above are different from previous research by (Putra et al., 2023) where the results obtained are a relationship between Education and the incidence of Dengue Hemorrhagic Fever (DHF) in Mayangrejo, Bojonegoro Regency, with a p value of 0.024 < 0.05. Research from Utami (2021) states that there is a significant relationship between education and the incidence of DHF with a p value = 0.001 < 0.05.

The researcher's assumption that in general, education has a close relationship with DHF because it can increase awareness efforts for DHF prevention, there are other factors such as climate change, high rainfall, and urbanization can increase DHF cases, even in areas with high levels of education such as Banda Aceh City. Family knowledge about DHF in Banda Aceh City is good, but even though someone knows how to prevent DHF, they do not always apply it. For example, someone can have good knowledge about DHF but still let water stagnate in their house because they are busy or lack of concern for the cleanliness of the surrounding environment.

Age

The results of data processing with SPSS software to see

the frequency distribution of respondents, based on age group, in this study showed that the majority of respondents were aged between 41-50 years, totaling 115 people (28.9%) and the least aged > 61 years, totaling 27 people (6.8%). Based on the results of hypothesis testing with Smart PLS software, it shows that the age factor is significantly related to the perceived severity variable with a t-value of 2.545 > t table 1.96, and the age factor is related to the perceived benefits variable with a t-value of 2.109 > t table 1.96.

While those that are not significantly related are the age factor with the perceived vulnerability variable with a t-value of 1.421 < t table 1.96, the age factor with the perceived obstacle variable with a t-value of 0.125 < t table 1.96, and indirectly the age factor does not have a significant relationship with Dengue Hemorrhagic Fever (DHF) prevention behavior with a t-value of 1.743 < t count 1.96. Age is the time span from birth to the present, which is usually expressed in years (Depdiknas, 2005). The relationship between age and DHF, because usually children still do not understand about the transmission and prevention of DHF. In addition, children's activities who often play in parks or gardens often cause aedes mosquitoes to bite them (Avidsyah et al., 2024).

Meanwhile, nowadays a shift has occurred from the dengue fever epidemic which mainly attacks children to more cases in adults (Hegazi et al., 2020; Moraes et al., 2013). Research in Taiwan also stated that out of 136 respondents, the majority of dengue fever cases were adults and only five cases were children or adolescents under 18 years of age (Wei et al., 2016). However, research conducted in Sao Luís, Maranhao Brazil stated that age has a significant relationship with dengue fever cases and attacks most children aged <15 years (Dias Júnior et al., 2017), (in Baitanu et al., 2022).

The results of this study are in line with research (Ramadani et al., 2023) The results of the correlation test using the Chi-Square test with a value of $\alpha = 0.005$ age against DHF obtained a p value = 0.000 < 0.05, which means there is a significant relationship between age and DHF at the Medan Haji Hospital. Different from the results of the study (Baitanu et al., 2022) research conducted in Wulauan, Minahasa Regency, stated that age was not significantly related to the incidence of Dengue Hemorrhagic Fever (DHF) with a p value of 1,000 > 0.05.

The researcher's opinion is that there has been a shift in the age group of Dengue Hemorrhagic Fever (DHF) sufferers today, which was previously most infected in the group of children aged 5-14 years, now changing, where the age group most infected is the age group of 15-30 years. The researcher predicts that this is because the age group of 15-30 years has high activity outside the home, such as at school, college, at work, and other public places. Other things can also be influenced by urbanization and climate change.

Perceived Vulnerability

Most respondents in this study had a high level of perceived vulnerability. This is based on the results of hypothesis testing with Smart PLS software showing that perceived vulnerability is significantly related to Dengue Hemorrhagic Fever (DHF) prevention behavior in Banda Aceh City with a t-value of 4.516 > t table 1.96. Perceived vulnerability perceives individuals or families about the threat posed by a particular disease or condition.

The results of this study are in line with previous research (Elvin et al., 2016) that the perceived susceptibility perception shows that there is a significant influence between family perceptions of susceptibility to dengue fever (perceived susceptibility to diseases) on health tasks in preventing dengue fever with a p value of 0.000 < 0.05 in Bandar Raya District, Banda Aceh City. In contrast to research (Maulidiyah, 2023), where the research results found that the vulnerability perception variable was not significantly related to dengue fever prevention behavior ($p=0.805$, $r=0.024$) at the Bolo Health Center, Bima Regency, NTT.

This is in accordance with what was stated by Hochbaum, Rosenstock and Kegels (in Jones & Bartlett, 2008), namely that the perception of vulnerability includes estimates of vulnerability to a disease and one of the stronger perceptions in promoting individuals to adopt healthy behaviors. The greater the perceived risk, the greater the likelihood of engaging in behavior to reduce the risk of disease.

In relation to the results of this study, researchers found that families in the city of Banda Aceh are at risk of contracting Dengue Hemorrhagic Fever (DHF), where the endemicity of DHF is quite high in 2022 - 2024, where almost all villages have DHF cases within the

three-year period. However, village officials have not maximized their efforts to prevent DHF together, for example by mobilizing residents to carry out clean Fridays/Sundays targeting Mosquito Nest Eradication (PSN) such as water reservoirs (TPA), families have also not maximized their 3M Plus activities such as draining, burying, and covering containers that can hold water both inside the house and in the yard at least once a week.

Perceived Severity

Hypothesis testing with Smart PLS software for the perception variable of perceived severity with Dengue Hemorrhagic Fever (DHF) prevention behavior in Banda Aceh City, the results showed no significant relationship between the two with a t-value of $0.578 < t_{table} 1.96$. The proportion of severity perceived by respondents in this study showed low. Perceived severity refers to the perception of the seriousness of a particular disease or health condition.

The results of this study are different from the results of Attamimy's study, (2017), stating that the relationship between the independent variable in the form of the severity perception factor and the dependent variable in the form of DHF prevention efforts that have been carried out by the research subjects obtained a correlation coefficient of 0.406. If the correlation coefficient is between 0.4 - 0.70 then it is stated as strong, this study was conducted at the Sukorame Health Center, Mojoroto District, Kediri City. Different from the study(Elvin et al., 2016)conducted in Bandar Raya District, Banda Aceh, stated that there was no significant influence between family perceptions of the seriousness of DHF (perceived seriousness of diseases) and health tasks in preventing DHF with a p value of $0.259 < 0.05$.

McCormick and Brown (1999 in Jones & Bartlett, 2008) further stated that the perception of perceived severity of the disease includes how individuals feel the adverse consequences of a serious health condition. Severity is considered an individual's belief about the importance or magnitude of a health threat. Perceptions of severity are often based on medical information or knowledge. In addition, it can also come from the beliefs of someone who has experienced difficulties caused by the disease and has an impact on their life in general.

The researcher's assumption, in this study the level of perception of severity felt by the majority is still low by the community or family, caused by information about the dangers of Dengue Hemorrhagic Fever (DHF) has not been optimally conveyed to the community or family in Banda Aceh City. It is possible that the community or family also perceives that the symptoms caused by DHF/Dengue Fever are not too severe, because it is possible that some respondents have not been infected with DHF. For example, a housewife considers fever in her child as a symptom of a common disease. However, if a mother finds that her child has a fever and the laboratory test results show positive for DHF/Dengue Fever, so she must be treated in hospital. So, her perception of fever changes into a serious disease with a high level of severity.

Benefits Felt

The results of hypothesis testing using Smart PLS software show that the perceived benefits are significantly related to Dengue Hemorrhagic Fever (DHF) prevention behavior with a calculated t value of $6.366 > t_{table} 1.96$. Perceived benefits are a state of decision making on a particular health action or behavior that will benefit in reducing the vulnerability or severity of health risks in individuals or families.

The results of this study are the same as previous research by(Elvin et al., 2016)respondents said that the family's perception of the benefits of DHF prevention measures (perceived benefits of preventive action) on the dependent variable, namely family health tasks in DHF prevention, with a significant value (p value) of $0.000 < 0.05$. In contrast to research conducted by Attamimy, (2017), said that the perceived benefits factor with DHF prevention efforts was concluded to be weak. This is because the correlation coefficient shows 0.239. This is based on the category below 0.401 is considered weak.

The same statement was also put forward by Hayden, (2009), namely that the action taken by a person to prevent (cure) a disease is very dependent on the consideration and evaluation of the perception of perceived susceptibility to diseases or the perception of perceived benefits of preventive action. So that individuals or families will accept the recommended health action if it is considered beneficial or useful to the patient.

Researchers assume that health center officers, especially health promotion, should routinely conduct health education related to the dangers of dengue fever and procedures for preventing dengue fever in the community and families in Banda Aceh City. Where families always do 3 M Plus at least once a week, this is very important for families to do so that they feel they are getting benefits from preventing dengue fever and reducing the risk of being infected with dengue fever so that it can reduce the number of dengue fever cases in the future.

Perceived Obstacles

Based on the results of the hypothesis test with Smart PLS software, it shows that the perception of perceived barriers is significantly related to the behavior of preventing Dengue Hemorrhagic Fever (DHF) with a t-value of $4.987 > t_{table} 1.96$. The majority of respondents answered that the perceived barriers were low. The perception of perceived barriers is an obstacle in carrying out the recommended health behavior. The higher the barriers felt by individuals or families, the lower the behavior towards health. Therefore, it is expected that with low barriers, individuals or families will carry out the recommended health prevention better, such as the behavior of preventing Dengue Hemorrhagic Fever (DHF).

The results of this study differ from previous research by Attamimy, (2017) which stated that perceptions of barriers were not significantly related to Dengue Hemorrhagic Fever (DHF) prevention behavior with a result (p value) of $0.144 > 0.05$. There are several reasons why the results are not significant, including weather factors, family economic conditions, and other environmental factors. First, the weather referred to in terms of obstacles to taking DHF prevention measures is the condition of climate change at a certain time, second is the ability of the intended economic condition is the state of ownership of resources to buy mosquito repellent. and third is other environmental factors, such as lack of support in maintaining shared cleanliness.

It is also different from research (Elvin et al., 2016) with the result that the barrier variable is not significantly related to family health tasks in preventing DHF in Bandar Raya District, Banda Aceh City with a p value of $0.230 > 0.05$. According to Jones and Bartlett (2008) also

said that to improve community behavior in preventing DHF, the threat of seriousness/severity of real DHF disease will motivate the community to take preventive measures by eradicating mosquito nests and preventing the development of *aedes aegypti* mosquito larvae. Whatever obstacles are felt by the community in Mosquito Nest Eradication (PSN) can be overcome if the community feels the seriousness/high severity of DHF disease.

The researcher's assumption in this study is that the obstacles felt by the community or family in terms of preventing DHF in Banda Aceh City are the belief that DHF only occurs during the rainy season. The community or family has also not maximized the Eradication of Mosquito Nests (PSN) both in the house, yard and public places. The community or family also does not understand the life cycle of the *aedes aegypti* mosquito and how to prevent it. There is also an assumption in the community that only the government is responsible for preventing DHF and if there is a case of DHF in their residential environment, ask for fogging, if the Health Center or Health Office does not do fogging then it is considered that the government is not making efforts to prevent and control DHF.

Signal To Action

Based on the hypothesis test value with Smart PLS software, it shows that cues to act are very significantly related to dengue fever prevention behavior with a calculated t value of $5.361 > t_{table} 1.96$, with the proportion of cues to act more dominant than other latent variables, this refers to the motivation that drives individuals/families to act in a condition related to the risk of disease or health. The cues to act can be motivated by internal factors (for example, a person's condition must act or the body's condition against disease) or external factors (due to advice from others, health campaigns, mass media, newspapers, magazines, doctor's recommendations, government regulations and encouragement from family/friends). The cue to act is the most dominant and effective variable to prevent dengue fever compared to other variables.

This study is in accordance with previous studies, namely according to (Aulia Syifa et. al., 2024), that individuals with positive perceptions of cues to act have a 1,248 times greater chance of carrying out PSN practices well compared to those with negative perceptions at the

Kasih 1 Bantul DIY Health Center. The results of this study are also in line with the results of the study (Inayah et. al., 2022), that cues to act have a very strong and significant correlation (p value = 0.001) with DHF prevention behavior in Pasangrahan Tangerang Banten.

The researcher's assumption is that the role of the government starting from the Mayor, DPRK, Bappeda, Banda Aceh City Health Office and Health Centers is very much needed in relation to planning and budgeting in the Disease Prevention and Control Sector program. Another thing that is needed is to issue a Qanun on Health which includes a mechanism for preventing and controlling DHF where the One House One Jumanti Movement (G1R1J) was formed. At the village level, it is necessary to re-activate the Clean Friday/Sunday which aims to Eradicating Mosquito Nests (PSN). It is hoped that with this activity, all elements of society can be mobilized which aims to reduce DHF cases in Banda Aceh City.

Considering the lessons learned from handling the COVID pandemic and Indonesia as a dengue endemic country, a coordinated multi-sector approach needs to be strengthened to improve national and regional preparedness in dealing with problems and anticipating the impacts of dengue in the future. In order to achieve zero dengue deaths in 2030 (Zero Dengue Death 2030) in Indonesia, all components of the nation should better understand the values of mutual cooperation and jointly implement efforts to prevent and control dengue fever.

Researchers also found that families have not maximized the prevention of dengue fever, from field observations, water reservoirs (TPA), such as flower vases, bird drinking places or other containers that can hold water have not been cleaned once a week due to being busy at home, taking children to school, and many women in the city of Banda Aceh besides being housewives, some of them also work in government or in the private sector. Researchers have also not found that public places that are the responsibility of the village/district, have not been maximized in maintaining cleanliness, especially during the transition from the dry season to the rainy season.

Health Center surveillance officers routinely go to the community to monitor the presence of larvae in residents' homes/neighborhoods suspected of being breeding places for *Aedes aegypti* larvae. As well as the

role of village officials to encourage residents to always maintain good sanitation in the house, in the yard and in public places, and routinely carry out clean Friday/Sunday movements and the source of funding for these activities is taken from the Village Fund Budget (ADG).

CONCLUSION

Based on the results of this study regarding the analysis of Dengue Hemorrhagic Fever (DHF) prevention behavior using the Health Belief Model (HBM) approach in Banda Aceh City, it can be concluded that, Hypothesis testing shows that;

Age group has a significant relationship with perceived benefits ($p=0.035<0.05$), age group also has a significant relationship with perceived severity ($p=0.035<0.05$), perceived vulnerability has a significant relationship with dengue prevention behavior, namely ($p=0.000<0.05$), perceived benefits have a significant relationship with dengue prevention behavior, namely ($p=0.000<0.05$), perceived barriers have a significant relationship with dengue prevention behavior, namely ($p=0.000<0.05$), and cues to act have a significant relationship with dengue prevention behavior, namely ($p=0.000<0.05$).

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