Factors Associated with Dengue Hemorrhagic Fever Prevention Behavior in Paniki Bawah, North Sulawesi, Indonesia

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ABSTRACT

Dengue hemorrhagic fever (DHF) remains a persistent public health problem in Indonesia, including Manado City, where Paniki Bawah has been identified as one of the higher-burden areas. This study examined factors associated with DHF prevention behavior and explored the contextual conditions that either support or hinder routine prevention practices at household level.

A sequential explanatory mixed-methods design was applied. The quantitative phase used a cross-sectional survey of 56 community respondents selected through simple random sampling, followed by in-depth interviews with 8 purposively selected informants, consisting of 6 community members and 2 health workers, to help explain the survey findings. The questionnaire assessed knowledge, attitude, perception, and prevention behavior. Quantitative data were analyzed using chi-square tests and odds ratios (ORs), while qualitative data were transcribed, coded, categorized, and triangulated with observation notes.

Good prevention behavior was reported by 29 of 56 respondents (51.8%). Knowledge was associated with prevention behavior (OR 26.00, 95% CI 3.08-219.39, $p < 0.001$); attitude was also associated with prevention behavior (OR 4.13, 95% CI 1.28-13.35, $p = 0.015$); and perception was associated with prevention behavior (OR 8.98, 95% CI 2.68-30.12, $p < 0.001$). Qualitative findings further showed that preventive behavior was shaped not only by what people knew or believed, but also by infrastructure availability, family support, and the role of health workers. At the same time, fogging and abate distribution were often described as reactive measures introduced after cases had already occurred. In summary, knowledge, attitude, and perception were significantly related to DHF prevention behavior, while enabling and reinforcing factors influenced whether prevention efforts were maintained consistently at household level.

Keywords: Dengue Hemorrhagic Fever, Prevention behavior, Knowledge, Attitude, Perception

INTRODUCTION

Dengue is a mosquito-borne viral disease transmitted mainly by Aedes aegypti and continues to pose a serious challenge in many tropical and subtropical settings. According to the World Health Organization, nearly half of the global population remains at risk, with an estimated 100-400 million infections occurring each year (World Health Organization, 2025). In Indonesia, where dengue is still endemic, prevention at community level depends heavily on vector control and routine household action.

Indonesia including one of the countries endemic for dengue fever The number of districts infected in the last five years (from 2018-2022), has increased. In 2018, the number of districts/cities infected with dengue fever was 440 (85.6%), from 2019 to 2022 the number of districts/cities infected with dengue fever has exceeded 90%. The North Sulawesi Provincial Health Office recorded a total of 1,120 cases of dengue fever found in North Sulawesi from January to June 2023. Manado was the highest distribution area with 230 cases. Based on data from the Central Statistics Agency of North Sulawesi Province, dengue fever cases in Manado City in 2021 were 8.5%, in 2022 as many as 24% and in 2023 as many as 33%. Based on these data, it can be

concluded that dengue fever cases in Manado City continue to increase every year(Central Statistics Agency of North Sulawesi, 2024). The rapid pace of development, population growth and ecosystem changes, environmental health problems are becoming more complex. Dengue hemorrhagic fever (DHF) is a public health problem in Indonesia due to increasing morbidity and mortality, and frequent outbreaks (Data and Information Technology Center, Ministry of Health, Republic of Indonesia, 2023).

Dengue fever cases that also occur are related to the level of knowledge, attitude, and support of health workers. Based on the study shows that there is a significant relationship between knowledge and DHF prevention where good knowledge is 75% while poor knowledge is 24% with (p-value = 0.001), while for good attitudes 75% and poor attitudes 25% with (p-value = 0.009) which means that community attitudes are also closely related to DHF prevention. The results of the study stated that the role of good health workers is 71.9% and the role of poor health workers is 28% with (p-value = 0.012) this means there is a significant relationship between health worker support and DHF prevention (Nurkhasanah et al., 2021). Based on the results of the study through in-depth interviews, it states that the knowledge and understanding of informants regarding PSN is still mostly focused on preventing adult mosquitoes. Only a small number of informants are aware that Mosquito Nest Eradication (PSN) also includes actions to overcome and eliminate mosquito larvae. Some PSN steps that have been implemented well by most informants are closing water reservoirs (TPA) and using mosquito nets, however, there are still many informants who do not carry out other PSN actions properly, such as draining TPA, processing waste properly, using abate, using anti-mosquito lotion, and the habit of hanging clothes carelessly (Saputra et al., 2025). As many as 70.1% of respondents did not make any DHF prevention efforts, this means that there are still many people who have poor DHF prevention behavior. Then as many as 64.3% of respondents had poor knowledge, as many as 62.7% had negative attitudes, as many as 59.7% of respondents did not regularly sprinkle abate and as many as 61.4% did not have jumantik cadres. The results of the analysis showed that there was a significant relationship between knowledge, attitudes, abatement and jumantik cadres with DHF prevention efforts with p values of 0.000, 0.000, 0.008 and 0.0006.

Effort the government has implemented promotive, preventive, and curative measures to control dengue fever, but has not significantly reduced the number of cases. The Mosquito Nest Eradication Program (PSN) is the right step to prevent dengue transmission because there is no vaccine or definitive treatment for this disease. PSN in Indonesia is implemented through 3M Plus activities. 3M consists of draining water reservoirs (such as bathtubs, buckets, drinking water containers, and others), tightly closing water reservoirs, and reusing used items that can become breeding grounds. Meanwhile, Plus actions include sprinkling abate powder, using mosquito nets, raising fish that prey on larvae, planting mosquito-repellent plants, avoiding habits that can attract mosquitoes, and using spray or topical mosquito repellent. These activities must be carried out continuously to reduce dengue fever cases in Indonesia (Ebnudesita et al., 2021)**.**

Dengue Hemorrhagic Fever (DHF) that occurs is also due to the availability of inadequate infrastructure. Infrastructure is a supporting factor that will support the community in doing or behaving well in eradicating mosquitoe s(Taniansyah et al., 2020)**.**Even community perception and family support also play a role in DHF prevention efforts, in DHF prevention efforts there are mostly inadequate facilities and infrastructure 48 respondents (53.3%), insufficient family support 51 respondents (56.7%), negative public perception 73 respondents (81.1%) this means that infrastructure factors, perception and family support are also factors related to the prevention of DHF that occurs (Irianty et al., 2026)**.**

Public health Office North Sulawesi Province recorded a total of 1,120 cases of dengue fever found in North Sulawesi throughout January-June 2023. Manado was the highest distribution area with 230cases. Based on data from the Central Statistics Agency of North Sulawesi Province, dengue fever cases in Manado City in 2021 were 8.5%, in 2022 as many as 24% and in 2023 as many as 33%. Based on these data, it can be concluded that dengue fever cases in Manado City continue to increase every year(Central Statistics Agency of North Sulawesi, 2024). The Manado City Health Office also recorded 988 cases of dengue fever that occurred in Manado City during 2024(Pioh et al., 2025). The purpose of this study is to analyze and describe factors related to dengue hemorrhagic fever (DHF) prevention behavior.

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MATERIALS AND METHODS

Design, place and time

This study adopted a sequential explanatory mixed-methods design. In the first phase, a quantitative cross-sectional survey was conducted to examine the association between knowledge, attitude, perception, and DHF prevention behavior. In the second phase, a qualitative inquiry was carried out to explain the quantitative results, particularly why prevention behavior remained suboptimal among some community members despite relatively favorable levels of knowledge and attitude. The study was conducted in Paniki Bawah Village, within the working area of the Paniki Bawah Community Health Center, Manado, from April to June 2025.

Number and method of subject sampling

The quantitative phase involved 56 respondents selected by simple random sampling. The sample size was estimated from the target household population using the Slovin formula. The qualitative phase involved 8 purposively selected informants, comprising 6 community members considered at risk of DHF exposure and 2 health workers directly involved in dengue prevention and response. Thus, the mixed-methods study involved 64 participants overall, although the quantitative and qualitative datasets were analyzed separately according to their respective phases.

Types and Methods of Data Collection

Quantitative data were collected using a structured questionnaire covering respondent characteristics and four analytic domains: knowledge, attitude, perception and DHF prevention behavior. The instrument focused on household prevention practices relevant to the Indonesian 3M Plus framework, including water container management, environmental sanitation, use of mosquito repellents and actions to reduce mosquito breeding sites. Scores for each domain were summarized and then categorized into good and poor levels according to the study protocol used during fieldwork. To improve reporting transparency, the questionnaire, scoring rubric, and supporting instrument documentation should accompany the final submission as supplementary material or be made available by the corresponding author.

Qualitative data were collected through in-depth interviews guided by a semi structured protocol and supported by direct observation. The interviews explored three explanatory domains: (1) the availability of infrastructure and prevention facilities, (2) family support for routine household prevention and (3) support from health workers

Research Instrument and Variable Measurement

Data were collected using a structured questionnaire and semi-structured interview guides. The quantitative questionnaire contained four domains: knowledge, attitude, perception and DHF prevention behavior. The knowledge domain consisted of 12 items with dichotomous response options (correct/incorrect); correct answers were scored 2 and incorrect answers were scored 1. The attitude domain consisted of 12 items measured on a four point Likert scale, with scores ranging from 4 (strongly agree) to 1 (strongly disagree). The perception domain consisted of 14 items measured on the same four point scale. The DHF prevention behavior domain consisted of 12 items measured on a four point frequency scale, with scores of 4 for always, 3 for often, 2 for sometimes, and 1 for never. Total scores for each variable were obtained by summing item scores. The mean score for each domain was then used as the cut off point; respondents were categorized as good when their total score was greater than or equal to the mean and poor when it was less than or equal to the mean. Qualitative data were additionally collected using interview guides and observation sheets to explore the availability of facilities and infrastructure, family support and health worker support related to DHF prevention.

Data processing and analysis

Quantitative data were processed through editing, coding, entry, and cleaning before analysis. Univariate

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analysis was used to describe respondent characteristics and the distribution of the main variables. Bivariate analysis was performed using the chi-square test with a significance level of 0.05. To strengthen interpretation of the 2x2 tables, odds ratios (ORs) and 95% confidence intervals (CIs) were also calculated from the observed counts.

Qualitative interviews were transcribed verbatim and read repeatedly to build familiarity with the data. The researchers then carried out open coding, grouped related codes into categories, and developed themes that helped explain the quantitative findings. Observation notes were used to triangulate interview data, particularly in relation to environmental cleanliness, waste management, and the availability of prevention facilities. Integration took place at the interpretation stage, where the qualitative.

RESULTS AND DISCUSSION

RESULTS

Respondent Characteristics

Distribution of Respondents by Age

Figure 1. Respondent Characteristics Based on Age

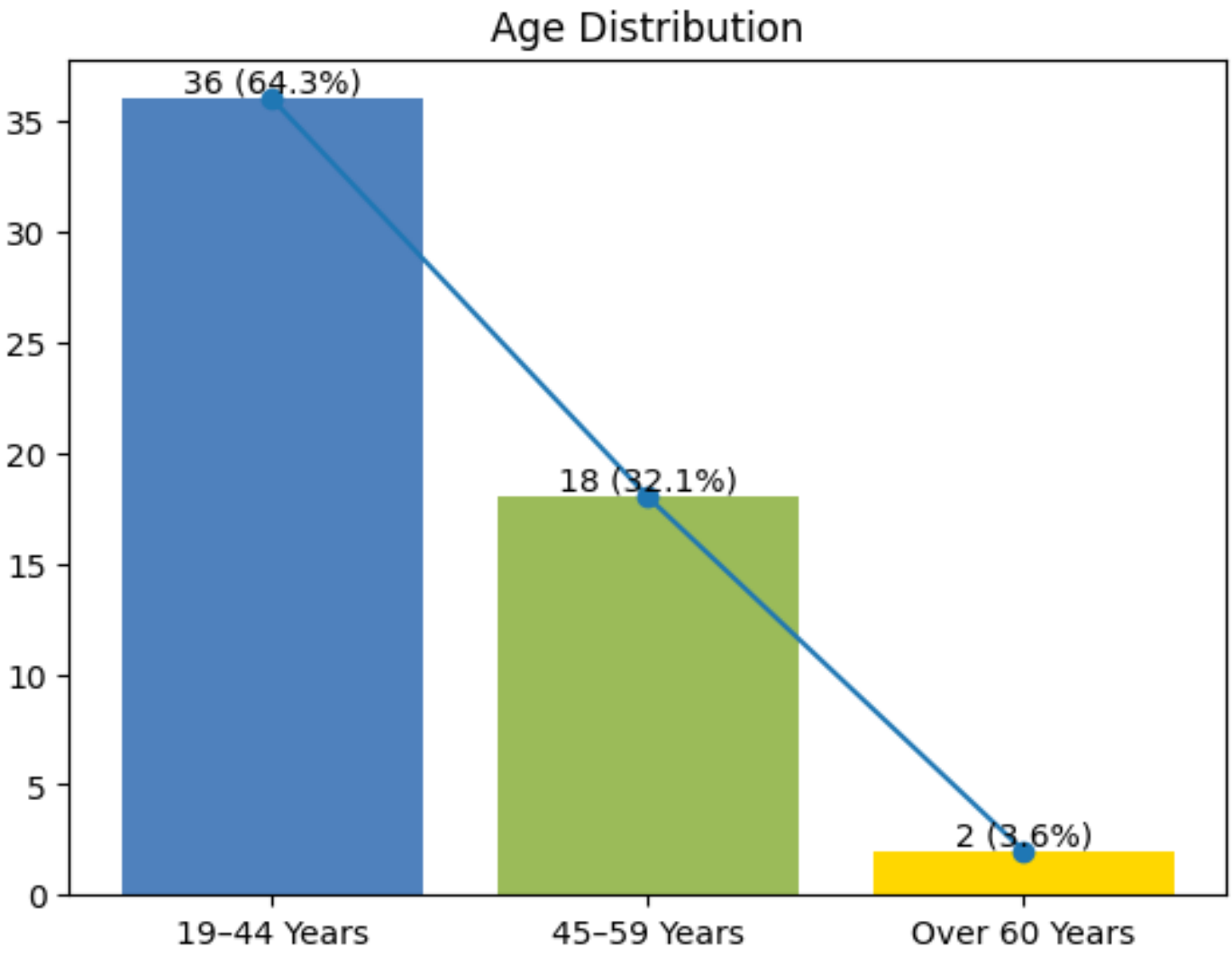

Figure 1 shows that the largest number of respondents were aged 19-44 years, amounting to 36 people (64.3%), while the smallest number of respondents was aged 60 years or more, amounting to 2 people (3.6%).

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Figure 2. Respondent Characteristics Based on Gender

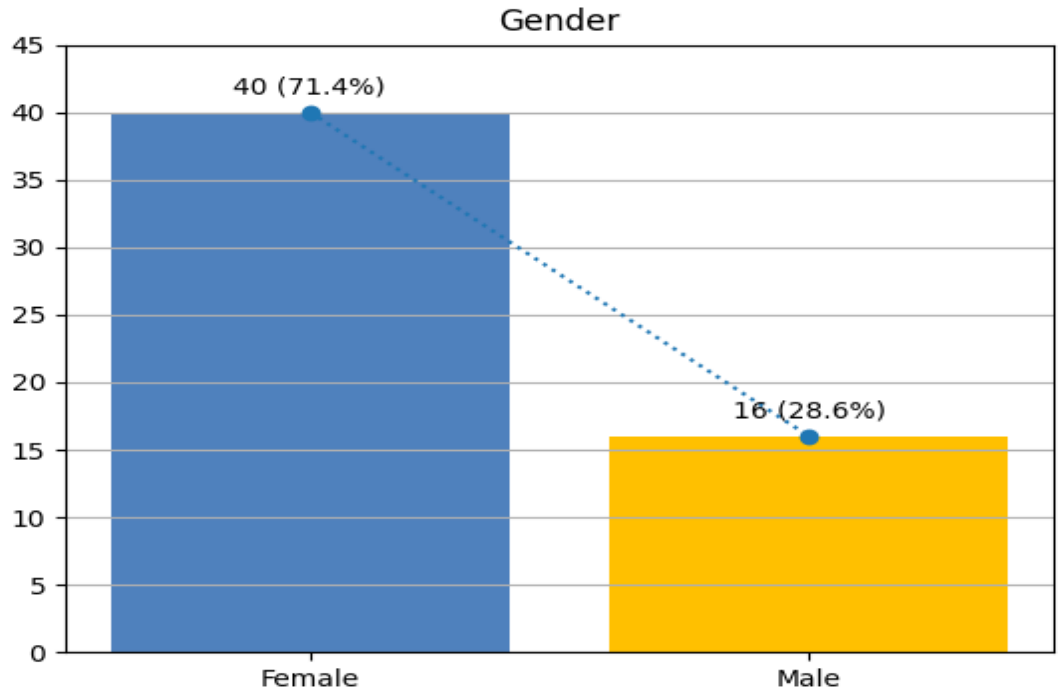
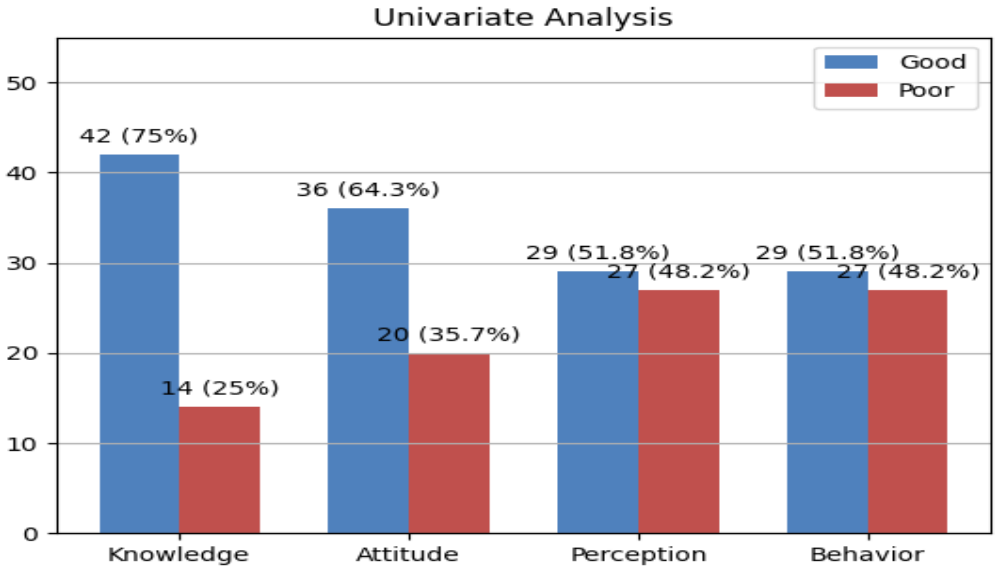


Figure 2 shows that the largest number of respondents were female, with 40 people (71.4%), while the smallest number were male, with 16 people (28.6%).

Univariate Analysis

The description of the variables studied includes the distribution of knowledge, attitudes, perceptions and actions with good and less good categories in preventing dengue hemorrhagic fever (DHF) in Paniki Bawah sub-district.

Figure 3. Distribution of knowledge, attitudes, perceptions and behavior of dengue fever prevention in Paniki Bawah Subdistrict.



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Based on Figure 3 above, it can be seen that the distribution of knowledge of dengue fever prevention in the Good category is 42 respondents (75%) and the Less Good category is 14 respondents (25%), for the distribution of attitudes towards dengue fever prevention, it is known that the Good category is 36 respondents (64.3%) and the Less Good category is 20 respondents (35.7%), for the distribution of knowledge of dengue fever prevention, it is known that the Good category is 29 respondents (35.7%). (51.8%) and the Less Good category was 27 respondents (48.2%), and for the distribution of behavior in dengue fever prevention, the Good category was 29 respondents (51.8%) and the Less Good category was 27 respondents (48.2%).

Bivariate Analysis

Table 1. Relationship between Knowledge, Attitudes, and Perceptions with Dengue Hemorrhagic Fever (DHF) Prevention Behavior in Paniki Bawah Village

Knowledge	Behavior		Total	P Value
	Good	Not good		
Good	28	14	42	0.000
Not good	1	13	14	
Total	29	27	56	
Attitude	Behavior		Total	P Value
	Good	Not good		
Good	23	13	36	0.015
Not good	6	14	20	
Total	29	27	56	
Perception	Behavior		Total	P Value
	Good	Not good		
Good	22	7	29	0.000
Not good	7	20	27	
Total	29	27	56	

Based on the data above, it shows that there is a significant relationship between knowledge and preventive behavior with a p-value = 0.000, attitudes and preventive behavior with a p-value = 0.015, and perceptions with preventive behavior with a p-value = 0.000, this data shows that there is a significant relationship between knowledge, attitudes, and perceptions with DHF behavior because the significant value is smaller than $\alpha = 0.05$.

Qualitative research results

Three explanatory themes emerged from the qualitative phase: (1) infrastructure was available, but many preventive measures were still reactive rather than routine, (2) family support shaped everyday prevention practices and (3) health workers strengthened community action through surveillance, counseling and case response. Representative quotations are presented in table 2.

Table 2. Main qualitative themes and illustrative quotations

Theme	**Summary of finding**	**Illustrative quotation**	**Interpretation**
Infrastructure availability	Trash disposal, mosquito repellents and some environmental sanitation	"Fogging was done when the incident happened ... but not recently." (Community	Prevention infrastructure existed, but response was often

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Theme	Summary of finding	Illustrative quotation	Interpretation
	practices were present, but fogging and abate distribution were commonly described as occurring after cases were identified.	participant)	reactive rather than routine.
Family support	Family members supported home cleaning, draining water containers, and reducing practices that may attract mosquitoes, such as leaving clothes hanging.	"Every day we usually drain it straight away, clean the house, and dirty clothes are taken to the back to be washed." (Community participant)	Daily household routines were important in translating intention into action.
Support from health workers	Health workers described surveillance, counseling, community outreach, jumantik activities, fogging and abate distribution as part of their support.	"When there is a new case, we go down together to provide counseling/education and then fogging will be carried out." (Health worker)	Professional and programmatic support acted as reinforcing factors for prevention behavior.

Wetting

Respondent Characteristics by Age and Gender

Based on the results of the identification of respondent characteristics by age, it shows that the majority of respondents in this study in Paniki Bawah Village were aged 19-44 years, totaling 36 people (64.3%). The productive age is a group that is cognitively able to understand health information, but often does not care about implementing clean and healthy living behaviors due to busyness or lack of perception of risk(Yunita & Syahadat, 2024). The level of knowledge about DHF is quite high in this age group, but preventive behavior is not always in line. This indicates a "knowledge-behavior gap", where knowledge is not automatically followed by real action (Mamenun et al., 2021). Based on the data above, it can be concluded that in the productive age, most people are in their busiest period in their lives, so that even though they already know to behave healthily, they often ignore these things.

Based on the results of the identification of respondent characteristics by gender, it shows that the majority of respondents in this study in Paniki Bawah Village were female, amounting to 40 people (71.4%). Women have a higher tendency to engage in preventive behavior than men, especially in the aspect of home cleanliness. This indicates that women in the family have a significant level of influence on DHF prevention efforts.(Mungall-Baldwin, 2022) Based on the above data, it can be concluded that women play an important role in home cleanliness because as housewives who are usually always at home, they tend to pay more attention to cleanliness in the house.

Knowledge and Behavior of Dengue Hemorrhagic Fever (DHF) Prevention

Based on the results of the chi-square test, the p-value = 0.000 is smaller than $\alpha = 0.05$ (<0.05) which means Ho is rejected. This shows that there is a significant relationship between knowledge and dengue fever prevention behavior. A person's knowledge plays a very important role in shaping a person's behavior, where the results show that respondents who have good knowledge are 42 people (75%) and respondents who have less good knowledge are 14 people (25%). Someone who has positive knowledge tends to have positive behavior and vice versa, seen from the results showing that 29 people (51.8%) behave well and 27 people (48.2%) behave poorly, this shows that even though people already know about the dangers of dengue fever, they do not necessarily behave well in efforts to prevent dengue fever, the higher the community's knowledge,

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the higher the community's good behavior. Knowledge is the result of the process of recognition that is obtained after someone observes an object. This process occurs through the senses, namely the eyes, ears, nose, tongue, and skin. Knowledge is also a collection of information obtained through the learning process, whether from experience, education, or training, which is stored in memory and used as a basis for making decisions or taking action.(Endah Dwi Pratiwi, 2023) This shows that the information received is the basis for someone to take action.

It can be concluded that knowledge is significantly related to dengue fever prevention behavior. Individuals with a good level of knowledge regarding the causes, symptoms, and transmission of dengue fever tend to engage in more positive preventive behaviors, such as implementing the 3M Plus program and maintaining a clean home environment. This suggests that increasing public knowledge is a strategic step in changing behavior and reducing the risk of dengue fever transmission.

Attitudes and Behaviors for Preventing Dengue Hemorrhagic Fever (DHF)

Based on the results of the chi-square test, the p-value = 0.015 is smaller than α = 0.05 (<0.05) which means Ho is rejected. This shows that there is a significant relationship between attitudes and dengue fever prevention behavior. A person's attitude greatly influences a person's behavior as in Lawrence Green's theory, which states that attitude is one of the predisposing factors that influence individual behavior, meaning that the better a person's attitude, the better a person's behavior. Based on the results, it shows that 36 people (64.3%) have good attitudes while 20 people (35.7%) have bad attitudes. This shows that more respondents have good attitudes, so if someone has a good attitude, it certainly also influences a person's behavior. Based on the results, it shows that 29 people (51.8%) behave well and 27 people (48.2%) behave poorly, this shows that even though someone already has a good attitude, there is still a chance for someone to behave badly. Attitude is an individual's closed response to a stimulus or object, which already involves opinions and emotions (happy, unhappy, agree,disagree(Yunita & Syahadat, 2024). Attitude is influenced by the level of education where higher education provides access to wider information, so that it can form a more rational and positive attitude. Then there is the influence of the social environment where support from family and people around plays a role in forming attitudes, especially in health behavior and exposure to information where every source of accurate and reliable information is very influential in forming attitudes (Nurdjaya et al., 2024)**.**

Based on the explanation above, it can be concluded that individuals with positive attitudes toward prevention efforts, such as awareness of the importance of maintaining environmental cleanliness, using mosquito repellent and mosquito nets, or implementing the 3M Plus program, tend to demonstrate better and more consistent preventive behavior. This attitude is formed from a combination of knowledge, personal experience, and social influences. Therefore, developing and enhancing positive community attitudes is a strategic step in encouraging effective preventive behavior.

Perception and Behavior of Dengue Hemorrhagic Fever (DHF) Prevention

Based on the results of the chi-square test, the p-value = 0.000 is smaller than α = 0.05 (<0.05), which means Ho is rejected. This indicates that there is a significant relationship between perception and dengue fever prevention behavior. The higher the public's perception of dengue fever, the more active they will be in taking preventive measures. This is in line with the Health Belief Model (HBM) theory, which states that perceptions of the susceptibility and severity of a disease greatly influence an individual's decision to act. In other words, the higher the perception of risk, the higher the tendency for a person to take preventive action. Based on the results, it shows that as many as 29 people (51.8%) have a good perception, while as many as 27 people (48.2%) have a bad perception. This shows that more people have a good perception, although almost half of the respondents have a bad perception, indicating that there are still many people who have a bad perception of dengue fever (DHF). A good perception will influence good behavior as well. Based on the results, it shows that 29 people (51.8%) behaved well and 27 people (48.2%) behaved poorly. This result shows that good perception will influence good behavior as well. Perception is the result of an individual's assessment or view of a particular object based on the interpretation of sensory experiences that are influenced by internal and external factors. In the context of dengue fever, public perception of the risk, severity, and effectiveness of preventive measures will influence their involvement in preventive efforts, such as 3M Plus activities

(Draining, Covering, and Recycling used goods)(Febriani & Sari, 2023)**.**Public perception of diseases such as dengue fever greatly influences their motivation to take preventive measures. This perception is shaped by personal experience, knowledge, information from the media, and local culture(Nuryani et al., 2026). This shows that what individuals receive from the outside influences perceptions that refer to real actions.

A person's perception of personal responsibility in protecting the environment also determines their level of participation in mosquito nest eradication (PSN) activities. People who perceive environmental cleanliness as a shared responsibility demonstrate more consistent behavior in maintaining a mosquito-free home. Therefore, building a positive and accurate perception of the importance of a clean home environment as part of dengue fever prevention is a crucial strategy (Andrei et al., 2026)**.** From the explanation above, it can be concluded that perception plays a crucial role in shaping disease prevention behavior, including dengue fever (DHF). Individuals who have a positive perception of the dangers of DHF, the risk of transmission, and the benefits of preventive measures tend to demonstrate better behavior in maintaining a clean home environment, such as regularly implementing 3M Plus. On the other hand, low or erroneous perceptions can be a barrier to implementing preventive behavior.

Availability of Facilities and Infrastructure in Dengue Fever Prevention

Based on the combined results of interviews with informants at risk of dengue fever, it shows that in the community the availability of infrastructure for preventing dengue fever includes the availability of adequate waste disposal sites. People usually burn dry waste and dispose of waste in its place and do not let the waste accumulate for too long, such as the statement from Mrs. YP "Oh, it's the same as burning it earlier, there was also burning, I burned my back and face." Mrs. A, K also added "We usually throw it directly downstairs for a while in the afternoon, it's not usual to pile it up for a day so it's thrown away immediately." As for the waste, it will usually be transported using a garbage truck, as stated by Mrs. K. "We usually put the waste in plastic and then there is a garbage truck that collects it." The community also uses mosquito repellent, both mosquito coils, sprays, and electricity, but there are also people who do not use mosquito repellent, because of the discomfort from the smoke it produces. The community also never uses mosquito nets, some of which are uncomfortable and some do not use them, as stated by Mrs. K "Oh, mosquito repellent usually uses Baygon so spray in the morning, spray in the afternoon, if mosquito nets why don't we use them because our house is closed so in the afternoon we immediately spray with mosquito repellent so it's safe, and if we use mosquito nets it's hot." Mrs. YP also added "Oh yes, usually use burned Baygon mosquito repellent, but also often use electric ones too, if mosquito nets because there are no mosquito nets so they don't use them but if there are they will still use them". The implementation of Fogging and the provision of abate powder is also only carried out when there is a case of DHF in the area, as stated by Mrs. AM "That was once when they did fogging, when the incident happened so everyone was fogging, it was a long time ago, but not recently". This is also supported by the results of direct observation which shows that the community's home environment is clean and there is no use of mosquito nets and mosquito repellent.

The existence of physical facilities such as closed trash bins, clean water channels, and water reservoirs with lids are important components in preventing the breeding of Aedes aegypti mosquitoes (Nuryani et al., 2026). The availability of dengue prevention infrastructure plays a key role in supporting preventive behavior in the community, making it easier to carry out PSN actions, obtain education, and ultimately reduce the risk of dengue transmission significantly. According to Green's theory, infrastructure is included in the supporting factors (Enabling Factors), namely conditions that facilitate or hinder changes in community behavior. The availability of infrastructure such as fogging tools, larvicides, and educational media (posters, banners) from the government or community health centers greatly influences the level of community participation in mosquito nest eradication (PSN) activities (Ferawati et al., 2026, 2026)**.**This shows that the implementation of fogging and abatement is a supporting infrastructure in dengue prevention. The use of spray and electric mosquito repellent has proven effective in reducing the population of adult mosquitoes in the home. However, they noted that most people do not understand the ideal spraying time, namely morning and evening, when Aedes aegypti mosquitoes are active (Kertiyasa et al., 2026)**.** Meanwhile, insecticide-treated mosquito nets are more commonly used in rural areas, especially by families with infants and toddlers. Regular use of mosquito nets in dengue-prone areas helps reduce mosquito bite rates in children

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(Watunglawar, 2024)**.** This suggests that the use of mosquito repellent and mosquito nets can prevent dengue fever, but not that using them can increase the risk of contracting the disease.

Based on the above data, it can be concluded that the availability of adequate trash bins, the use of mosquito nets and mosquito repellent, and the implementation of fogging and the application of abate powder are means that support good behavior in dengue fever prevention efforts. However, if the infrastructure is not available, it will also affect how the community will behave. Infrastructure is a supporting factor in handling dengue fever cases because without it, even if the community has good knowledge and attitudes, they will not be able to act optimally.

Family Support in Dengue Fever Prevention

Based on the combined results of interviews and observations from informants at risk of dengue fever, it shows that in the community, family support in preventing dengue fever includes house cleaning activities such as burning garbage, draining water reservoirs, not allowing piles of clothes, cleaning the gutters of the house and these activities are carried out every day for the sake of cleanliness of the house and preventing mosquito larvae from breeding. As stated by Mrs. AK "Yes, like draining, because we now use a bucket so every day we usually drain it straight away, by cleaning the house, dirty clothes are also immediately taken to the back to be washed" Mrs. YP also added "Yes, like just after cleaning, I burn the garbage and then spray the new one with weed poison, because I am no longer able to clean it so I just use weed poison so that if the grass is dry it can be burned straight away, I just sprayed it yesterday afternoon and this morning so every day, if the dry garbage is burned and if it rains I will take it under shelter so I don't have to worry if the garbage is wet when I want to burn it". This means that some people are aware of the importance of keeping the environment clean so that there are no mosquito larvae breeding, but there are also people who never talk about the dangers of dengue fever but there are also people who often talk about the dangers of dengue fever, which indicates that the more often people hear about the dangers of dengue fever, the more often they are alert to dengue fever. According to Green's theory, family support is categorized as a reinforcing factor, namely a factor that strengthens and encourages someone to carry out or maintain healthy behavior, which means that families who provide support such as motivation, supervision, and role models will strengthen the intentions and abilities of other family members in carrying out dengue prevention measures such as PSN 3M Plus. The support of mothers and heads of families is very important in encouraging children and other household members to maintain environmental cleanliness, families that have a culture of discussion and mutual cooperation are more successful in preventing dengue fever (Saibovna, 2026)**.**

Based on the explanation above, it can be concluded that family support plays a crucial role in dengue fever prevention efforts. Families who provide emotional support, information, and direct assistance can encourage other family members to engage in preventive behaviors such as the 3M Plus program. Family involvement also helps create a clean, comfortable, healthy home environment free from mosquitoes. This indicates that family support will influence other family members' behaviors in dengue fever prevention efforts.

Support for Health Workers in Dengue Fever Prevention

Based on the combined results of interviews and observation results from informants who play a role in handling DHF cases, namely health workers at the community health center, namely environmental health workers and DHF program holders, it shows that the activities carried out by community health center officers in supporting the prevention of DHF cases include activities surveillance, providing education or counseling at the integrated health post (posyandu) as well as in schools, there are also mobile ones who go directly to the community using loudspeakers, but this is rarely done, counseling activities in the community are included during the integrated health post (posyandu) where the routine posyandu schedule from the community health center is carried out in 30 existing locations, but only once a month the posyandu in one location is counted, therefore the community is less exposed to DHF counseling. There is also support from the government in the form of a jumantik program where in each environment one person will be appointed to be responsible as a mosquito larvae monitor, as stated by Mrs. EN "When we are at the health center, it is divided, so it doesn't necessarily mean that all the environmental health officers are in charge, so surveillance activities and other activities work together, we usually from the surveillance say there is a new case here, we go down together to

provide counseling/education and then fogging will be carried out, because even though we are the environmental health officers who are authorized, we have to ask directly to the surveillance, so it is safer, and in this case they are the ones who do it, we only cooperate when there is a case." Mrs. W also added, "Usually we have cross-programs, so from the community health center, we collaborate with the environmental health officers and health promotion officers, so in addition to surveillance, there are health promotion officers who will provide counseling, for the PSN (mosquito nest eradication) activities, we continue to work together. In the neighborhood where the government has them, they have jumantik (larvae monitors), so the head of the neighborhood in each neighborhood will be trained and appointed to be jumantik so that if there are 10 people at home and ten people are lazy to look at the container, at least there is one person who can monitor. Then if there is a case, we will ask for proof of lab results that say it is DHF, then we will go down fogging, which is also at the same time as giving abate powder." Health workers have made efforts in handling DHF cases where health workers are also a reinforcing factor in the community in healthy behavior. According to Green's theory, community behavior in preventing DHF will be stronger if supported and strengthened by health workers through education and monitoring. Support from health workers not only influences public knowledge but also strengthens their motivation and ability to act to prevent and control dengue fever. The active role of health workers in providing education, conducting regular mosquito larvae checks, and coordinating with health workers has been shown to significantly reduce dengue fever cases in endemic areas(Dawe et al., 2020).27 However, if health education is not comprehensive, it will also affect the level of public awareness of the dangers of dengue fever.

Based on the explanation above, it can be concluded that support from healthcare workers plays a crucial role in dengue fever prevention efforts. Through educational activities, environmental monitoring, and community empowerment, this will help increase public knowledge about dengue fever prevention, which will then lead to concrete community action.

CONCLUSION

Knowledge, attitude, and perception were significantly associated with DHF prevention behavior in Paniki Bawah. However, prevention behavior was also shaped by contextual factors identified in the qualitative phase, namely infrastructure availability, family support, and support from health workers. Strengthening routine 3M Plus practices, improving risk communication, and ensuring that community engagement is sustained beyond case-triggered fogging and abate distribution may help improve prevention behavior in high-burden areas.

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Ethics approval

Ethical approval was obtained from the Health Polytechnic Ethics Committee of the Ministry of Health Manado (No. DP.04.03/FXXX.28/218/2025; 21 July 2025) (FXXX is the official classification code assigned to Manado Health Polytechnic, Ministry of Health, Indonesia).

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REFERENCES

1. Arfan I, Rizky A, Hernawan AD. (2022). Factors associated with dengue fever prevention practices in

endemic area. International Journal of Public Health Science. 11(4):1184-1189. doi:10.11591/ijphs.v11i4.21784.
2. Center for Data and Information Technology, Ministry of Health, Republic of Indonesia. (2023). Early Detection of Dengue Hemorrhagic Fever (DHF) and Its Control in Indonesia in 2023.
3. Central Statistics Agency of North Sulawesi Province. (2024). Disease Cases by Regency/City and Type of Disease in North Sulawesi Province. Manado: BPS North Sulawesi Province.
4. Dawe, MAL, Romeo, P., & Ndoen, EM (2020). Public Knowledge and Attitudes and the Role of Health Workers Regarding Dengue Hemorrhagic Fever (DHF) Prevention. Journal of Health and Behavioral Science, 2(2), 138–147.
5. Ebnudesita, FR, Prasetyo, RH, & Artikel, I. (2021). HIGEIA JOURNAL OF PUBLIC HEALTH Abatization Knowledge with Abate Use Behavior. HIGEIA, 5(1), 72–83.
6. Endah Dwi Pratiwi, YDN (2023). The relationship of maternal knowledge and attitude to stunting. Malahayati Midwifery Journal, 9(4), 690–695. https://doi.org/DOI 10.33024
7. Febriani, RT, & Sari, NL (2023). Clean and Healthy Living Behavior and the Incidence of Scabies in Adolescent Students at the Nurul Muttaqin Islamic Boarding School in Malang. Professional Health Journal, 5(1).
8. Mamenun, Yonny Koesmaryono, Rini Hidayati, Ardhasena Sopaheluwakan, BDD (2021). Research Improvement Of Model Prediction Of Dengue Hemorrhagic Fever Using Climate Factor In Indonesia: A Systematic Literature Review. BULLETIN OF HEALTH RESEARCH, 49(4).
9. Ministry of Health of the Republic of Indonesia. (2023). Eradicating Mosquito Nests with 3M Plus. Jakarta: Ministry of Health of the Republic of Indonesia
10. Mungall-Baldwin, C. (2022). Women's participation in the prevention and control of dengue using environmental methods in the global south: a qualitative meta-synthesis. International Journal for Equity in Health, 21(140). https://doi.org/https://doi.org/10.1186/s12939-022-01726-0
11. Nurdjaya, AM, Silfia, A., Suryani, L., Isnani, T., & Putri, M. (2024). Health Promotion Strategy.
12. Nurkhasanah, DA, Sitorus, RJ, & Listiono, H. (2021). Factors Associated with Dengue Hemorrhagic Fever (DHF) Prevention. Scientific Journal of Batanghari Jambi University, 21(1), 277–281. https://doi.org/10.33087/jiubj.v21i1.1164
13. Pioh, JR, Rombot, DV, & Porajow, ZCJG (2025). Factors related to community action on dengue fever prevention in Malalayang District, Manado City. Journal of Community and Tropical Medicine, 13(2), 717–726. https://doi.org/10.35790/jkkt.v13i2.65670
14. Saputra, T., Daten, K., Takaeb, AEL, Ndun, HJN, Studi, P., Masyarakat, K., Masyarakat, FK, Cendana, N., & Kupang, K. (2025). Description of Mosquito Nest Eradication (PSN) Behavior among Housewives in the Working Area of the Nagi Community Health Center, East Flores Regency. SEHATMAS (Scientific Journal of Public Health), 4(1), 296–306. https://doi.org/10.55123/sehatmas.v4i1.4644
15. Taniansyah, DS, Widjanarko, B., Husodo, BT, Masyarakat, FK, Diponegoro, U., Masyarakat, FK, & Diponegoro, U. (2020). Factors Related To Eradication Practices. Journal of Public Health, 8(September), 707–713.
16. Wahyu Widyantoro, Nurjazuli, YHD (2021). Community-Based Dengue Hemorrhagic Fever (DHF) Control in Indonesia: A Systematic Review. Journal of Public Health Sciences, 10(3), 191–199. https://doi.org/https://doi.org/10.33221/jikm.v10i03.1008
17. Watunglawar, CE (2024). Effectiveness of Using Insecticide-Treated Mosquito Nets on Malaria Incidence Rates in Pregnant Women at Sentani Community Health Center. Jurnal Ners, 8(2), 1237–1240.
18. Yunita, J., & Syahadat, RM (2024). Health Behavior & Health Promotion (Issue June)