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Comparative Study of Determinants of Dengue Fever in Endemic and Non-Endemic Areas of Makassar City and Maros Regency

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ABSTRACT

Background: Dengue fever, an environmentally-based disease transmitted by Aedes mosquitoes, remains a health problem in tropical and subtropical countries, with 143,000 cases in Indonesia by the end of 2022.

Objective: This study aimed to analyze the differences of DHF determinants in endemic and non-endemic areas of Makassar City and Maros Regency.

Methodology: The type of research used is comparative analytic with cross sectional design. The population in this study was the entire number of households involving 222 samples taken by Proportional Random Sampling, and the hypothesis test used was the Mann whitney test.

Results: Bivariate statistical analysis showed that there were significant differences in the density of larvae (p=0.000), mosquito breeding sites (p=0.000), the number of free larvae (p=0.024), attitudes (p=0.001), hanging clothes (p=0.009), installing mosquito screens (p=0.006) between endemic and non-endemic areas. However, there was no significant difference in the level of knowledge (p=0.450), motivation (p=0.347) between the two areas. **Conclusion:** This study showed significant differences in larval density, mosquito breeding sites, larval free counts, behaviors, and measures of hanging clothes and installing wire mesh between endemic and non-endemic areas.

Keywords:
Comparison, Endemic, Non-endemic, Dengue Fever

INTRODUCTION

Zoonoses are vector-borne diseases. Vector-borne diseases include arbovirosis diseases such as dengue, malaria, chikungunya, Japanese B. encephalitis, elephantiasis (lymphatic filariasis), bubonic plague, and bush fever (typhus). Dengue fever (DHF) is an arthropod-borne infectious disease caused by dengue virus infection. (1)

Dengue fever is an acute febrile illness caused by the *dengue* virus. A single chain RNA virus that belongs to group B *Arbovirus (Arthropod Borne Virus*), family *Flaviviridea*. There are 4 serotypes of *dengue* virus namely DENV-1, DENV-2, DENV-3, and DENV-4, which are spread by *Aedes aegypti* and *Aedes albopictus* and can manifest as *Dengue* Fever (DF), *Dengue Hemorrhagic Fever (*DHF), and Dengue *Shock Syndrome (*DSS). (2). In more than 50% of cases, DENV infection is asymptomatic, but it can also mimic other endemic febrile diseases in Africa (such as malaria and chikungunya fever).(3). Dengue infection is usually flu-like. However, severe dengue hemorrhagic fever can lead to bleeding, shock and death. (4)

The World Health Organization (WHO) estimates that about 2.5 billion people worldwide are at risk of dengue, especially those living in urban areas in tropical and subtropical countries. (5) . The incidence of DHF is increasing every year. According to WHO, there are an estimated 390 million dengue infections each year. In 2015, dengue cases in the Americas, Southeast Asia and the Western Pacific reached more than 3.2 million. It is estimated that dengue will reach its peak in 2080. (6)

Based on data from the Ministry of Health of the Republic of Indonesia, dengue fever cases in Indonesia until the end of 2022 reached 143,000 cases with the highest number of dengue cases in 10 provinces, where the highest number of cases was in West Java 36,594 cases, and the lowest was in South Sulawesi province 3,543 cases.(7)

Every year in Makassar City new cases are recorded, where in 2020 - 2022 there was an increase in cases where in 2020 there were 175 cases (0.01%), while in 2021 there were 523 cases (0.03%) and in 2022 there were 583 cases (0.04%) in 14 sub-districts.(8)Meanwhile, in Maros district, DHF cases were recorded from 2020 to 2022 and experienced a decrease in cases where in 2020 there were 362 cases (0.09%) and in 2021 there were 246 cases (0.06%) and finally in 2022 there were 159 cases (0.04%) in 14 sub-districts. (9)

Agent, host and environment interact with each other and allow dengue infection to occur. However, some of the agents are the main cause of DHF incidence. Similarly, not all hosts can be infected with the dengue virus because each has a different immunity. Furthermore, the environment is the place where the Aedes vector breeds. However, not all containers are favored by the vector.(10)

DHF cases are not only caused by mosquitoes, but also by human behavior that does not lead a healthy lifestyle and a lifestyle that does not care about the environment where mosquitoes nest. These behaviors include hanging up used clothes, not draining bathtubs, and allowing stagnant water around the residence. (11).

Endemics are disease outbreaks that occur consistently but are limited to a certain area. This endemic condition makes the rate of spread of the disease predictable. An example is dengue fever, which is currently considered endemic in certain countries and regions, as the disease persists despite its limited numbers. (12)

METHODOLOGY

Research Design

The type of research used in this study used quantitative methods with a comparative analytic approach and cross sectional design. The dependent variable in this study was the incidence of dengue hemorrhagic fever. The independent variables in this study were the density of larvae (HI, CI, BI), mosquito breeding sites, the number of free larvae, knowledge, attitudes towards dengue prevention, the act of hanging clothes, the act of installing mosquito screens, and motivation. The sampling technique used was Proportional Random Sampling.

Research Location

This study was conducted in the working area of Puskesmas Pampang, Makassar City and the working area of Puskesmas Tompobulu, Maros Regency in 2024.

Population and Sample

The population in this study was the entire number of households in the working area of Puskesmas Pampang and the working area of Puskesmas Tompobulu. The sample in this study were 111 samples for the working area of Puskesmas Pampang and 111 samples for the working area of Puskesmas Tompobulu, so the total sample was 222 samples.

Data Analysis

Data analysis was carried out in 2 ways, namely univariate and bivariate analysis using the STATA 14 application. Univariate analysis aims to describe each variable studied. Bivariate analysis aims to analyze the relationship between two variables. Mann-Whitney test was used in the analysis.

Ethical Considerations

This research has been approved by the research ethics commission of the Faculty of Public Health, Hasanudin University with number: 481/UN4.14.1/tP.01.12/2024 and protocol number: 5224032069

RESULTS

Characteristics

Table 1 shows the characteristics of respondents in endemic and non-endemic areas. In endemic areas, the highest age group was 30-40 years (30.6%) and the lowest was 63-73 years (5.4%). In non-endemic areas, the highest age group was 18-29 years (31.5%) and the lowest was 63-73 years (1.0%). Females dominated in both regions (81.1% in endemic, 59.5% in non-endemic). The highest level of education was senior high school in both regions (45.9% in endemic, 47.7% in non-endemic), with the lowest level of not attending school (4.5% in endemic, 5.4% in non-endemic). The highest occupation was housewife in both areas (62.2% in endemic, 35.1% in non-endemic). Suffering from DHF in the last 6 months was higher in endemic areas (18.0% endemic, 4.5% non-endemic), as well as those who had suffered from DHF (41.5% endemic, 13.6% non-endemic).

Table 1 Distribution of Respondent Characteristics in Endemic and Non-Endemic Areas in 2024

Source: Primary Data, 2024

Respondent Characteristics	Group			
	Endemic		Non Endemic	
	n	%	n	%
Age/Year				
18-29	23	20.7	35	31.5
30-40	34	30.6	34	30.6
41-51	28	25.2	22	19.8
52-62	20	18.0	19	17.1
63-73	6	5.4	1	0.9
Gender				
Male	21	18.9	45	40.5
Female	90	81.1	66	59.5
Education				
Not in school	5	4.5	6	5.4
SD	23	20.7	9	8.1
SMP	17	15.3	18	16.2
HIGH SCHOOL	51	45.9	53	47.7
S1/D3	15	13.5	25	22.5
Jobs				
Not working	9	8.1	12	10.8
PNS	5	4.5	8	7.2
Self-employed/Merchant	24	21.6	29	26.1
Farmer/Laborer	4	3.6	23	20.7
IRT	69	62.2	39	35.1
Suffering from dengue fever in Last 6 months				
Yes	20	18.0	5	4.5
No	91	82.0	106	95.5
Have ever suffered from dengue fever				
Yes	45	40.5	14	12.6
No	66	59.5	97	87.4
Total	**111**	**100**	**111**	**100**

Comparative Analysis

Table 2 shows the results of the comparative analysis using the Mann Whitney test between endemic and non-endemic areas showed significant differences in mosquito breeding sites with a value of (p = 0.000), and the larva-free rate (ABJ) with a value of (p = 0.024). However, there was no significant difference in knowledge (p = 0.450) and motivation (p = 0.347) between the two areas. Attitudes showed significant differences with a value of (p = 0.001), as well as the actions of hanging clothes with a value of (p = 0.009), and installing mosquito screens with a value of (p = 0.006).Table 2 Comparative Analysis Results of the Variables studied in endemic areas and non-endemic areas in 2024

Table 2. Comparative Analysis Results of Variables studied in endemic and non-endemic areas in 2024

Variables	Group				P-Value
	Endemic		Non Endemic		
	n	%	n	%	
Breeding Grounds					
Yes	108	97.3	47	42.3	0,000*
No	3	2.7	64	57.7	
Flies Free Rate					
Larvae positive	38	34.2	23	20.7	
Negative larvae	73	65.8	88	79.3	0,024*
Number of houses	111	100	111	100	
Knowledge					
Less	78	70.3	59	53.2	0,450
Good	33	29.7	52	46.8	
Behavior					
Less	8	7.2	3	2.7	
Simply	89	80.2	83	74.8	0,001*
Good	14	12.6	25	22.5	
Clothes Hanging Measures					
Less	78	70.3	59	53.2	0,009*
Good	33	29.7	52	46.8	
Wire Fixing Action Gauze					
Bad	91	82.0	73	65.8	0,006*
Good	20	18.0	38	34.2	
Motiva tion					
Less	19	17.1	14	12.6	
High	92	82.9	97	87.4	0,347
Total	**111**	**100**	**111**	**100**	

Source: Mann-Whitney

Larval Density Analysis

Table 3 shows the results of comparative analysis using the *Mann Whitney* test between endemic and non-endemic areas showed significant differences in the density of larvae (HI, CI, BI) with a value of (p = 0.000).

Table 3 Results of Comparative Analysis of Flies Density Variables in endemic and non-endemic areas in 2024

Variables	Cluster				P-Value
	Endemic		Non Endemic		
	%	DF	%	DF	
Density of larvae					
House Index	30	5	20	4	
Container Index	27	6	10	4	0,000*
Breteau Index	50	7	28	4	

Source:Mann-Whitney

DISCUSSION

Flies Density House Index, Container Index, Breteau Index

The study showed significant differences between the three larval density indices, namely House Index, Container Index, and Breteau Index, when compared with the Density Figure (DF) table. The *Mann Whitney* test results indicated a value of p=0.000 (p<0.05), indicating a significant difference in the density of larvae (HI, CI, BI) between dengue endemic and non-endemic areas. This study is in line with Arwa Elaagip (2020) that there were 3,304 larvae and 390 pupae of Aedes aegypti, with a *House Index of* 32.8% and *Breteau Index of* 35.96%. These results indicate a high density of larvae in the area, signaling a significant relationship between environmental hygiene and the risk of dengue spread.(13)

Research shows that bathtubs, crocks, and drums are often found to be positive for larvae because water is stored in open containers that are rarely cleaned. The habit of hanging clothes and the close proximity of houses also increase mosquito populations. In endemic areas, the large number of containers that are rarely drained and garbage bins that are not maintained become ideal places for mosquitoes to lay eggs. According to Arsin A.A.'s research (2023) shows that people affected by DHF tend not to maintain environmental cleanliness, littering, and not regularly draining water tanks become mosquito nests.(14)

The presence of larvae is closely related to the type, location, and number of containers in the house. Containers found to be positive for Aedes aegypti larvae are generally inside the house because people collect water in open containers. Adult mosquitoes are attracted to dark, moist, and hidden places such as clothes hanging inside the house, so mosquitoes tend to be around their hosts.(15)

Mosquito Breeding Sites

The study showed significant differences between endemic and non-endemic areas in the number of mosquito breeding sites and positive larvae. Endemic areas had more mosquito breeding sites and more positive larvae compared to non-endemic areas. Mann Whitney test showed p=0.000 (p<0.05), indicating a significant difference between the two areas. This indicates that endemic areas have a higher risk of mosquito breeding sites density, thus

These results are in line with previous research conducted by Ade Kurniawan et al (2020) in which the results showed that several types of containers were found as breeding sites for Aedes aegypti larvae, such as buckets, bathtubs, dispensers, baking sheets, gutters, and plastic drums. Buckets as a potential breeding ground because buckets as a temporary and practical water reservoir (16). Then another study stated that there is a strong relationship between dengue fever and stagnant water around the house and flower pots in the house. This stagnant water has been identified as a major risk factor in dengue outbreaks in Lahore, Pakistan (17).

Mosquito breeding sites and the number of larva-positive breeding sites showed significant differences between endemic and non-endemic areas, with endemic areas having more breeding sites and larva-positive sites. Observations showed that people in endemic areas often use open containers, such as buckets and bathtubs, and have poor waste management, which supports mosquito breeding. To prevent an increase, vector control and prevention are needed by eliminating breeding sites for Aedes mosquitoes through vector control programs, household water management, and IEC activities (18).

Infestation-free rate (ABJ)

The LBW showed a significant difference between endemic and non-endemic areas with p=0.024 (p<0.05), confirming the significant difference in LBW between the two areas, with endemic areas having lower LBW and more larva-positive containers. Although both areas have not reached the LBW target of 95%, endemic areas show a higher risk of larval density, which is ideally 95%, measuring the effectiveness of mosquito control and dengue prevention. The low ABJ in both areas indicates that many water containers are positive for larvae, especially in endemic areas. The large number of unoccupied houses in endemic areas also hindered larval testing by health cadres, increasing the risk of mosquito breeding.

These results are in line with previous research conducted by Ade Kurniawan et al (2020), where ABJ was below the value set by the program, which is below 95%. One of the factors causing ABJ not to reach 95% is because in many areas there are still water shortages during the dry season and the distribution of water from the PDAM is not smooth, so the population always provides a large amount of water storage(16).

Knowledge

Knowledge about Dengue Fever. showed no significant difference between endemic and non-endemic areas with a value of p=0.450 (p>0.05) which means there is no

difference, although the level of knowledge in non-endemic areas is slightly higher, both areas have almost the same knowledge about DHF. However, high knowledge is not always enough to prevent DHF, because people's attitudes and preventive actions are still lacking. The high level of education does not automatically reduce the incidence of DHF if it is not followed by action This result is in line with the research of Fatmawati et al. (2023)(19) which showed no significant relationship between knowledge and DHF incidence (p=0.129).

Lack of knowledge can affect a person's attitude in making decisions and behavior. Healthy behaviors are essential to maintain health and prevent disease risk(20). Knowledge is not always an indicator that can prevent dengue. Studies show that there is no significant difference in the level of knowledge of the community regarding dengue prevention, both in endemic and non-endemic areas. This suggests that knowledge does not directly affect the level of endemicity of an area.

Attitude towards dengue prevention

Attitudes towards Dengue Fever prevention showed a significant difference between endemic and non-endemic areas with $p=0.001$ ($p<0.05$), which means there is a significant difference. Respondents in non-endemic areas tended to have better attitudes than those in endemic areas. This difference is also supported by a previous study by Ardhita Nurcahya (2024)(21), which found a significant relationship between attitude and DHF incidence. Higher education levels in non-endemic areas also contributed to more positive attitudes. However, it is important to note that positive attitudes must be translated into concrete actions to reduce endemicity. Therefore, continuous educational efforts, government support, and adequate facilities are needed to encourage effective preventive actions in the community, with the aim of reducing the risk of DHF spread and changing the endemicity status of an area.

The more information a person has will contribute to the formation of a positive attitude, a good attitude can be influenced by personal experience, more information about PSN DHF so that the respondent's attitude is dominantly positive. Families will carry out PSN well when the family knows and understands(21).

Clothes Hanging Measures

The act of hanging clothes inside the house is a major concern in the context of dengue hemorrhagic fever (DHF) prevention, especially in endemic and non-endemic areas. The study showed a significant difference in this habit between the two regions with a $p=0.009$ ($p<0.05$), which means there is a significant difference in the habit of hanging clothes. More respondents in endemic areas still practiced this habit compared to non-endemic areas, indicating a higher risk in endemic areas. This finding is in line with the results of a previous study by Fatin Mawaddah et al. (2022)(22), which confirmed the association between hanging clothes inside the house and the spread of DHF. This habit

allows Aedes aegypti mosquitoes to rest, increasing the likelihood of DHF cases especially in endemic areas. These results support the theory that Aedes aegypti mosquitoes tend to rest in dark, moist, and hidden places indoors, as hanging objects such as clothes, mosquito nets, or plants close to their breeding sites are indicative of being a resting pleasure for Aedes aegypti mosquitoes (23).

This difference, although not significant, still shows that hanging clothes inside the house has the potential to be a contributing factor to high dengue cases in endemic areas. This habit, which is common in both regions, makes used clothes such as school uniforms, jackets, headscarves, and mukena often found hanging in various places in the house. This result supports the theory that Aedes aegypti mosquitoes tend to rest in dark, moist, and hidden places indoors, such as hanging objects such as clothes, mosquito nets, or plants close to their breeding grounds (24).

Measures to Install Mosquito Wire Mesh

The action of installing anti-mosquito screens was significantly different between endemic and non-endemic areas with a value of $p=0.006$ ($p<0.05$), which means the difference is significant. More respondents in endemic areas have not installed mosquito screens compared to non-endemic areas, In endemic and non-endemic areas, the installation of mosquito screens is less common, especially in endemic areas, which can increase the risk of dengue transmission. Observations show that the lack of public awareness and government initiatives are the main factors for the incidence of DHF in endemic areas. In contrast, most houses in non-endemic areas have been equipped with wire mesh, although there are still those who have not installed it due to the condition of the house. Previous research by Luluk Lidya Ayun (2020)(25) supports this finding, showing that houses without wire mesh have a 4.545 times higher risk of being affected.

The use of wire mesh is one way to prevent the entry of Aedes mosquitoes into the house through ventilation holes. Open ventilation holes serve as a place for air exchange in the room, but this condition creates opportunities for Aedes aegypti mosquitoes to enter or leave the house(26) Installation of wire mesh It is better to install in all door and window vents, so that the possibility of mosquitoes entering and biting can be minimized Houses without wire mesh on vents make it easier for mosquitoes to enter, bite humans, and rest. Without wire mesh, Aedes aegypti mosquitoes are more likely to enter the house in the morning and evening (27). PSN and 3M activities added with avoiding the habit of hanging clothes in the room are activities that must be done to control the population of Aedes aegypti mosquitoes, so that dengue transmission can be prevented and reduced (28).

Motivation

The level of community motivation to prevent dengue hemorrhagic fever showed no significant difference between endemic and non-endemic areas. Although motivation in non-endemic areas was slightly higher than in endemic areas, the Mann-Whitney test showed a $p=0.347$ ($p>0.05$). This means that both endemic and non-endemic areas have relatively

the same level of motivation in preventing DHF. Research by Noradian (2017) (29), stated that 53% of the community showed high motivation to prevent DHF.

This is because although motivation is good, if it is not followed by real attitudes and actions to prevent DHF, such as cleaning the environment, draining water reservoirs, and installing mosquito screens, then the prevention efforts will be ineffective. This study concludes that an area is endemic not because of a lack of community motivation, but because of a lack of consistent and effective implementation of preventive measures. Motivation plays an important role in disease prevention, including DHF, as a strong internal drive can encourage individuals to take appropriate preventive measures(30).

Based on Abraham Maslow's theory of motivation, the need for security is the need to feel safe and protected from danger(31). Although individual motivation to prevent dengue fever is high, this does not necessarily have a significant effect on the incidence of dengue fever. Based on the Theory of Planned Behavior and Health Belief Model, preventive actions are influenced by various factors such as perceived behavioral control and structural barriers (32).

CONCLUSIONS

This study showed that there were differences between endemic and non-endemic areas in terms of larval density, mosquito breeding sites, larval free rate, attitude, action of hanging clothes, action of installing anti-mosquito screens. However, there were no differences in the level of motivation and knowledge of the community between the two areas. In endemic areas, the habit of hanging clothes inside the house and the lack of mosquito screens are the main concerns in DHF prevention efforts. Therefore, stronger interventions and continuous education are needed to improve preventive measures in endemic areas to reduce the risk of DHF spread.

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CONFLICT OF INTEREST

We have no competing interests.

REFERENCES

1. Dwicahya B, Arsin AA, Ishak H, Hamid F, Mallongi A. Aedes Sp. Mosquito Resistance and the Effectiveness of Biolarvicides on Dengue Vector Mortality. Pharmacogn J. 2023 Aug 15;15(4):541-6. Available from: https://phcogj.com/article/2075
2. Natsir N, Arsin AA, Ishak H, Alimuddin I, Masni M, Massi MN, et al. Transmission of Four Serotypes of Dengue Virus in Several Asian Countries Literature Review.

Pharmacogn J. 2023;15(6):1244-9.
3. Mohamed MA, Hassan NY, Osman MM, Gedi S, Maalin BAA, Sultan KM, et al. Epidemiological investigation of dengue fever outbreak and its socioeconomic determinants in Banadir region, Somalia. BMC Infect Dis. 2024;24(393).
4. Huang CH, Lin CY, Yang CY, Chan TC, Chiang PH, Chen YH. Relationship between the Incidence of Dengue Virus Transmission in Traditional Market and Climatic Conditions in Kaohsiung City. Can J Infect Dis Med Microbiol [Internet]. 2021;2021:9916642.
5. WHO. World Health Organization. 2022. Dengue and severe dengue.
6. Arsin AA, Elisafitri, Ainun SN, Rezki I, Nurdin MA, Sirajuddin S, et al. Correlational study of climate factors, mobility and the incidence of Dengue Hemorrhagic Fever in Kendari, Indonesia. Enfermería Clínica. 2020;30(6):280-4.
7. Indonesian Ministry of Health. Opening a New Leaf (Annual report on dengue fever). Jakarta: Ministry of Health of the Republic of Indonesia; 2022. 37 p.
8. Makassar City Health Office. Makassar City Health Office Profile. Makassar: Makassar City Health Office; 2022.
9. Maros district health office. Dengue fever data from Maros District Health Office. 2023.
10. Arsin A. Epidemiology of Dengue Fever. 1st ed. Masagena Pres, editor. Makassar; 2013. 155 p.
11. Arsin, A. Arsunan, Monintja, Tyrsa C.N, Amiruddin R, Syafar M. Analysis of temperature and humidity on dengue hemorrhagic fever in Manado Municipality. Gac Sanit. 2021;35:S330-3. Available from: https://doi.org/10.1016/j.gaceta.2021.07.020
12. Columbia University Mailman. Epidemic, Endemic, Pandemic: What are the Differences Columbia University Mailman School of Public Health [Internet]. Columbia: Columbia University Mailman School of Public Health; 2021. Available from: https://www.publichealth.columbia.edu/news/epidemic-endemic-pandemic-what-are-differences
13. Elaagip A, Alsedig K, Altahir O, Ageep T, Ahmed A, Siam HA, et al. Seroprevalence and associated risk factors of Dengue fever in Kassala state, eastern Sudan. PLoS Negl Trop. 2020 Dec;14(12):e0008918. Available from: http://www.ncbi.nlm.nih.gov/pubmed/33296362
14. Arsin AA, Amiruddin R, Marzuki DS, Elisafitri R, Basir, Mallongi A, et al. Community Empowerment with Independent Larva Monitor in Reducing the Dengue Hemorrhagic Fever Incidence, in Sidrap Regency. Pharmacogn J. 2023;15(4):622-5.
15. Kurniawan A, Widjaja J, Udin Y. Density of Aedes aegypti larvae and potential breeding sites in Tolitoli. J Health Masy. 2020;89-96. Available from: https://ojs.unm.ac.id/semnasbio/article/viewFile/15299/8955
16. Kurniawan A, Widjaja J, Ningsi, Udin Y. Density of larvae and potential breeding sites of Aedes aegypti larvae in Tolitoli. The density of larvae and potential breeding sites of Aedes aegypti larvae in Tolitoli. Pro Semin Nas Biol FMIPA UNM. 2020;89-96. Available from: https://www.academia.edu/download/102075271/15299-37954-1-PB.pdf
17. Mehmood A, Khalid Khan F, Chaudhry A, Hussain Z, Laghari MA, Shah I, et al. Risk Factors Associated with a Dengue Fever Outbreak in Islamabad, Pakistan: A Case-Control Study. JMIR Public Heal Surveill. 2021 Dec 30;7(12):e27266. Available from: http://www.ncbi.nlm.nih.gov/pubmed/34967753

18. Singh RK. Prevalence of Aedes Mosquitoes During the Dengue Transmission Season in Haridwar City of Uttarakhand State, India. Res Squqre. 2024;1:1-19.
19. Wati F, Yasnani Y, Irma I. The Relationship between Knowledge, Attitudes, and Actions with the Incidence of Dengue Fever (Dbd) in the Working Area of the Wua-Wua Health Center, Kendari City in 2023. Endem J. 2023;4(3):37-44.
20. Widiyana DA, Deniati K, S B, Dedu S. Relationship Between The Level Of Public Knowledge About Dengue Fever And Dengue Prevention Efforts In Lemah Duhur Village, Karawang. J Medicare. 2024;3(2):16.
21. Nurcahya A, Asmarudin MS, Rizkiah F. Factors Associated with the Incidence of DHF in the Working Area of Puskesmas Simpang Teritip, West Bangka Regency. J Tambusai Educ. 2024;8(1):15072-83.
22. Mawaddah F, Pramadita S, Triharja AA. Relationship between Environmental Sanitation Condition and Family Behavior with Dengue Fever Incidence in Pontianak City. J Teknol Lingkung Lahan Wetland. 2022;10(2):215.
23. Purba IE, Nababan D, Adiansyah, Kaban ES. Risk Factors of Dengue Hemorrhagic Fever. J Penelit Pendidik IPA. 2023;9(10):8131-9.
24. Fadrina S, Marsaulina I, Nurmaini N. The Relationship of Hanging Clothes and Installing Wire Gauze with the Incidence of Dengue Fever in Langkat Regency. J Heal Sains. 2021;2(3):402-9.
25. Lidya Ayun L, Tunggul Pawenang E. Relationship between Physical Environment and Behavioral Factors with the Incidence of Dengue Fever (DHF) in the Working Area of Puskesmas Sekaran, Gunungpati District, Semarang City. Public Heal Perspect J. 2020;2(1):97-104.
26. Rahmani T, Novianti S, Yogaswara D. Behavioral Factors Associated with the Incidence of Dengue Hemorrhagic Fever (DHF) at Kahuripan Health Center, Tasikmalaya City. J Community Health Indonesia. 2024;20(1):5-24.
27. Jumaina J, Gani A. Determinants of The Incidence of Dengue Hemorrhagic Fever in The Work Area of Kunciran Health Center, Tangerang, Banten. In: Strengthening Hospital Competitiveness to Improve Patient Satisfaction and Better Health Outcomes [Internet]. Masters Program in Public Health, Sebelas Maret University; 2019. p. 59-67. Available from: http://theicph.com/id_ID/2020/01/19/management-of-medical-waste-in-developing-countries-a-systematic-review-2/8-jumaina_r1/
28. Octaviani. Community Behavior in Dengue Fever Prevention Efforts. Pros Semin Nas and Call Pap KESMAS UMS. 2022;2(1):69-76.
29. Noradina. Motivation and participation of residents in preventing dbd incidence in neighborhood xi of kelurahan terjun, medan marelan sub-district in 2016. 2017;3(1):172-90.
30. Rahmah A, Sary L, Perdana AA, Riyanti R. Prevention Behavior of Dengue Hemorrhagic Fever in Community Leaders in the Work Area of the Hajimena Health Center, South Lampung Regency. J Penelit Pendidik IPA. 2023;9(7):5346-52.
31. Kurniawati RD, Sutriyawan A, Rahmawati SR, FI Health, Kencana UB, Bandung K, et al. The Relationship Of Knowledge And Motivation With The Implementation Of 3m Plus Psn In Efforts To Prevent Dengue Fever. J Kesehat Masy. 2022;9(2).
32. Montaño, Kasprzyk. Theory of Reasoned Action, Theory of Planned Behavior, and the Integrated Behavioral Model. n Heal Behav Theory, Res Pract. 2015;