Buletin Kedokteran & Kesehatan Prima
Vol.4 No.2 (2025)
DOI: 10.34012/bkkp.v4i2.7350

ORIGINAL ARTICLE

Demographic characteristics and mortality of dengue fever in Medan City (2021-2024)

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ABSTRACT

Dengue Hemorrhagic Fever (DHF) is a significant public health challenge in Indonesia, including the city of Medan. This study aimed to determine the prevalence, demographic distribution (by sex and age group), and mortality rates of DHF in Medan from 2021 to 2024. This study used secondary data from reports provided by the Medan City Health Office, which compiled information from all public health centers (Puskesmas) in the region. Analysis of the data revealed that the pediatric age group (5–14 years) was the most affected population. The distribution of cases showed a relatively balanced proportion between males and females. DHF mortality rates fluctuated annually, with a notable downward trend observed in 2024. These findings underscore the critical need to strengthen DHF prevention and control programs, with a specific focus on vulnerable age groups and high-incidence areas. This study is expected to serve as a foundational resource for public health policy planning and to enhance the capacity of primary healthcare services to effectively manage DHF cases.

Keywords: dengue hemorrhagic fever, vulnerable age groups, mortality rate

Introduction

According to the World Health Organization (WHO), an estimated 100 to 400 million dengue infections occur annually in tropical and subtropical regions. Of these, 96 million are symptomatic cases across 128 countries at risk of dengue virus infection, with approximately 500,000 cases progressing to severe forms such as Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS).[1] Indonesia, with its tropical climate and distinct wet and dry seasons, experiences a significant increase in the transmission of infectious diseases, including dengue. This is primarily due to environmental conditions during the rainy season that are highly conducive to the proliferation of the mosquito vector.[2]

Based on data from the 2023 North Sumatra Provincial Health Profile, a total of 4,705 dengue cases were reported across all districts and cities within the province. Medan City recorded the highest number of cases at 965, resulting in 24 deaths. This marks a decrease from 2022, when 8,541 cases and 60 deaths were reported.[3] Dengue represents a major public health challenge in Medan City, often causing significant public anxiety. The disease progresses rapidly and carries a high risk of fatality, potentially leading to outbreaks

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(Extraordinary Events). As an endemic area, Medan City reported 73,518 dengue cases and 705 deaths in 2021.[4]

A hallmark of dengue infection is plasma leakage, which can be detected by an increase in hematocrit or the accumulation of fluid in body cavities. This condition is triggered by the bite of an *Aedes aegypti* mosquito that has become infected with the dengue virus after feeding on a symptomatic individual.[4] Dengue can affect individuals of all ages and both sexes. Although historically more prevalent in children, recent years have shown a notable increase in cases among the adult population.[5] Patients typically experience a biphasic fever lasting 5 to 7 days. Other symptoms include muscle, joint, and back pain, as well as a rash on the face, neck, and chest. In severe cases, spontaneous bleeding may manifest as petechiae on the skin. Critical stages can involve bleeding from the gums, nose, and gastrointestinal tract, potentially progressing to severe hemorrhage and death.[2]

Dengue control strategies in Medan City involve several measures, including community education and public awareness campaigns targeting the general population, students, and local communities regarding dengue prevention. Mosquito nest eradication efforts, known as PSN (Pemberantasan Sarang Nyamuk), are implemented through the 3M approach—Menguras (draining), Menutup (covering), and Mendaur ulang (recycling) waste items. Routine larval inspections are conducted to monitor potential disease spread. Furthermore, epidemiological surveys and investigations are carried out at transmission sites, complemented by selective larviciding and targeted fogging in areas with reported cases. The government also fosters cross-sector collaboration, holds regular meetings with community health center (Puskesmas) heads, and advocates with relevant stakeholders to ensure the sustainability of dengue control programs.[4] The primary objective of this study is to determine the distribution of dengue cases based on age groups, gender, and mortality rates in the sub-districts of Medan City during the 2021–2024 period. This research also aims to analyze the year-on-year mortality trend attributed to the disease.

Method

This study is a quantitative descriptive study aimed at examining the distribution of Dengue Hemorrhagic Fever (DHF) cases based on age group, gender, and mortality in the working area of Medan City Community Health Centers from 2021 to 2024. The population for this research consists of all documented DHF cases within the sub-district of Medan City during the 2021-2024 period. Given the descriptive nature of the study, all available case data were utilized as the sample (total sampling). The data used were secondary data obtained from reports from the Medan City Health Office, which were compiled from all Community Health Centers in the Medan City working area.

Results

Table 1 shows the distribution of 4,726 dengue hemorrhagic fever (DHF) cases across 21 districts in Medan City from 2021 to 2024. The highest number of cases was in Medan Johor, which accounted for 472 cases (9.99%) of the total. This was followed by Medan Selayang with 458 cases (9.69%) and Medan Tuntungan with 433 cases (9.16%). These three districts were the most dominant contributors to the total case count.

Conversely, the lowest number of cases was found in Medan Belawan, with only 37 cases (0.78%), followed by Medan Maimun with 65 cases (1.38%). Medan Petisah and Medan Polonia also had low case numbers, at 2.10% and 2.56%, respectively. Regarding the annual trend, the highest number of cases occurred in 2022, with 2,262 cases (49.03%). This was significantly higher than the numbers for previous and subsequent years: 651 cases (14.11%) in 2021, 862 cases (18.68%) in 2023, and 839 cases (18.18%) in 2024. This trend indicates that 2022 was the peak year for DHF cases in Medan City.

Table 2 presents the distribution of 4,598 DHF cases by gender and age group from 2021 to 2024. The total number of cases fluctuated annually, starting with 643 cases in 2021. The highest number of cases was observed in 2022 with a substantial surge to 2,229 cases. The case count then declined sharply in 2023 to 862 before slightly increasing to 864 in 2024. By age group, the 15–44 years age group was the most affected, with 1,708 cases, followed by the 5–9 years group with 933 cases, and the 10–14 years group with 928 cases. The >44 years age group recorded 515 cases, while the <1 year age group had the lowest case count, at 68. The distribution of cases by gender was relatively balanced, with a slight male predominance. Males accounted for 2,319 cases, while females accounted for 2,273 of the total.

Table 1 Distribution of dengue fever cases by subdistrict

Health Center (Puskesmas)	2021		2022		2023		2024		Total	
	n	%	n	%	n	%	n	%	n	%
Medan Tuntungan	39	6,72	206	9,11	88	8,68	93	9,18	433	9,16
Medan Johor	52	8,97	224	9,91	113	11,78	67	6,62	472	9,99
Medan Amplas	26	4,48	112	4,95	51	5,39	55	5,43	252	5,33
Medan Denai	58	10,00	172	7,61	58	6,12	54	5,33	351	7,43
Medan Area	26	4,48	69	3,05	33	3,20	31	3,06	161	3,41
Medan Kota	26	4,48	104	4,60	32	3,29	32	3,16	198	4,19
Medan Maimun	11	1,90	31	1,37	13	1,37	10	0,99	65	1,38
Medan Polonia	18	3,10	35	1,55	22	2,19	22	2,17	121	2,56
Medan Selayang	15	2,59	24	1,06	90	8,95	79	7,80	458	9,69
Medan Sunggal	9	1,55	32	1,41	64	6,48	59	5,82	350	7,41
Medan Helvetia	57	9,83	173	7,65	32	2,92	38	3,75	300	6,35
Medan Petisah	9	1,55	67	2,96	7	0,73	15	1,48	99	2,10
Medan Barat	14	2,41	73	3,23	21	2,19	24	2,37	135	2,86
Medan Timur	15	2,59	71	3,14	47	4,75	36	3,55	174	3,68
Medan Perjuangan	25	4,31	62	2,74	20	1,83	29	2,86	136	2,88
Medan Tembung	43	7,41	70	3,10	32	3,47	38	3,75	189	4,00
Medan Deli	42	7,24	137	6,06	45	4,75	71	7,01	302	6.39
Medan Labuhan	65	11,21	96	4,24	60	6,21	34	3,36	263	5,57
Medan Marelan	9	1,55	75	3,32	10	1,19	30	2,96	126	2,67
Medan Belawan	6	1,03	7	0,31	11	1,10	7	0,69	37	0,78
Medan Baru	15	2,59	50	2,21	13	1,55	14	2,96	112	2,37
Total	651	100	2262	100	862	100	839	100	4726	100

Table 2. Distribution of dengue fever cases by gender and age group

Year	Age Group							Gender				Total
								Male		Female		
	<1	1-4	5-9	10-14	15-44	>44	Total	n	%	n	%	
2021	12	49	105	130	279	68	643	323	50,7	320	49,3	643
2022	25	249	474	451	811	219	2.229	1.143	52,0	1.086	48,0	2.229
2023	19	119	176	165	288	95	862	426	50,2	436	49,8	862
2024	11	109	157	166	305	116	864	427	49,4	437	50,6	864
Total	68	536	933	928	1708	515	4.598	2.319		2.273		4.598

Table 3 shows the distribution of DHF mortality from 2021 to 2024. A total of 14 deaths were recorded during this period. In 2021, there were 2 deaths, representing 14.3% of the total. This number increased sharply in 2022 to 10 deaths, accounting for 71.4% of the total DHF deaths over the four-year period. In 2023, the number of deaths decreased again to 2 (14.3%), and in 2024, there were no reported deaths from DHF.

Table 3. Distribution of dengue hemorrhagic fever cases based on mortality

Year Deaths (Year)	n	%
2021	2	14,3
2022	10	71,4
2023	2	14,3
2024	0	0
Total	14	100

Discussion

The distribution of DHF cases shows a clear tendency for adolescents and young adults to represent the highest proportion of patients. The high incidence in this productive age group suggests that environmental risk factors and daily activities contribute significantly to the disease's prevalence. The significant number of cases among children and adolescents also reflects their increased exposure in educational and social settings. This finding aligns with previous research. A study by Pasaribu et al.[6] found that the majority of DHF patients were adolescents. This is further supported by Tule[7] who highlighted that children and adolescents are the age groups most affected by the disease.

The vulnerability of adolescents to DHF is influenced by various factors. Tule[7] suggests that adolescents are more likely to engage in outdoor activities without personal protective measures, such as using mosquito repellent or wearing long-sleeved clothing, which increases their risk of mosquito bites. Furthermore, a lack of awareness regarding preventive measures contributes to this risk. Sutriyawan[8] revealed that children and adolescents generally have lower awareness of preventive actions. Additionally, an immature immune system, particularly in children, can influence the severity of the infection, as their bodies may not produce an adequate antibody response.

The distribution of DHF cases is relatively balanced between males and females, with no significant difference in the number of cases. This indicates that DHF infection does not show a clear sex-based pattern. The minor differences observed are likely influenced by non-biological factors, such as behavior, social roles, and the level of exposure to high-risk environments. Tule[7] noted that the risk of infection is similar for both males and females, as *Aedes aegypti*, the primary vector, does not discriminate based on the sex of its host. Lifestyle is a crucial factor; males often engage in outdoor activities during the morning and afternoon when mosquitoes are most active. Conversely, biologically, females may possess a stronger immune system. Ernyasih[2] stated that females can produce more cytokines, which makes them more resilient to infections, including DHF.

Sevdo[9] found that while a majority of the study's respondents were female (65%), compared to 35% male, the authors concluded that DHF transmission is not sex-dependent. They suggested that both males and females have similar susceptibility and that the higher number of female respondents might be due to their greater involvement in domestic activities and the surrounding environment. This is supported by Supangat et al.[10] who stated that *Aedes aegypti* mosquitoes tend to breed in household environments, such as water tanks, dispensers, vases, and plant pots. Since females are more frequently active within the home, they may have increased exposure to these breeding sites, elevating their risk of infection. However, this contrasts with a study by Sholihah[11] which found that females had a 0.443 times lower risk of contracting DHF compared to males, suggesting that females may have a protective factor against the infection.

The trend in DHF mortality shows sharp fluctuations, with a notable spike in 2022. This fluctuation may reflect changes in the effectiveness of early detection and case management. A study by Taufik[12] indicated that DHF-related deaths were more frequent among females, with 120 deaths in 2021, increasing to 137 in 2022, and decreasing to 74 in 2023. While DHF can affect anyone, some studies suggest that females have a greater potential for exposure to the dengue virus. Among the elderly, particularly those aged 75 and above, DHF mortality rates are higher. This is likely due to a weakened immune system and the presence of comorbidities. Previous research cited by Khaw[13] revealed a significant association between increased age and the incidence of severe DHF and a higher risk of mortality. Additionally, males have been recorded to have a slightly higher DHF mortality rate compared to females.

Conclusion

The distribution of dengue hemorrhagic fever (DHF) cases by age group reveals that the 15-44 year-old cohort recorded the highest number of cases, with 1,679. This was followed by the 5-9 year-old and 10-14 year-old age groups, with 933 and 928 cases, respectively. This data indicates that not only children but also young adults are highly susceptible to DHF. By gender, the distribution of DHF cases was relatively balanced between males (2,412 cases) and females (2,320 cases), with a slight male predominance. This suggests that DHF risk can affect both genders, influenced by environmental and lifestyle factors. Regarding mortality, there was a significant increase in deaths in 2022, with 10 reported cases. However, this number declined, reaching zero cases by 2024. This trend reflects the success of recent DHF control and management efforts in the region. Prevention and control measures should be focused on the most vulnerable groups: those aged 5-14 and 15-44 years. This can be achieved through health education initiatives in schools, communities, and workplaces. Strengthening surveillance systems and rapid response protocols is also critical in high-incidence areas like Medan Johor and Medan Selayang. Furthermore, active community participation in mosquito breeding site eradication, particularly through the "3M Plus" initiative, should be enhanced by engaging health cadres and community leaders. The capacity of primary healthcare centers (Puskesmas) as the frontline of care must be improved in terms of human resources, logistics, and training. This will ensure optimal case management and contribute to a reduction in DHF morbidity and mortality rates.

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