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Spatial and Demographic Distribution of Dengue Hemorrhagic Fever in Mangasa Health Center Area, 2021–2024

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ABSTRACT

Dengue hemorrhagic fever remains an important public health concern because of its potential to cause outbreaks and mortality. This study aimed to describe the spatial and demographic distribution of recorded dengue hemorrhagic fever cases in the Mangasa Community Health Center catchment area, Makassar City, from 2021 to 2024. The catchment area comprises Mangasa, Gunung Sari, and Mannuruki Urban Villages. This retrospective descriptive epidemiological study used secondary surveillance data. All recorded cases during the study period were included through total sampling, yielding 188 cases. Data were analyzed descriptively using frequencies, proportions, and cross-tabulations according to age group, sex, urban village, month, and year of occurrence. Monthly case distribution was presented using a line chart, while annual, demographic, and spatial distributions were summarized in tables. Spatial distribution across the three urban villages was visualized using Quantum GIS. The largest annual number of cases was recorded in 2021, with 87 cases, accounting for 46.3% of all cases. Females represented 54.3% of cases, while males represented 45.7%. The 6–17-year age group accounted for the largest proportion of cases at 41.5%. Gunung Sari and Mangasa Urban Villages each recorded 64 cases, while Mannuruki recorded 60 cases. Monthly case numbers fluctuated, with May contributing the largest overall proportion, although the peak month differed across years. Spatial distribution also varied annually, indicating that the urban village with the highest recorded number of cases was not consistent throughout the study period. These findings describe variations in recorded case distribution and should not be interpreted as differences in incidence or population risk because population denominators and non-case data were unavailable. The findings may support local surveillance and geographically targeted dengue prevention activities within the Mangasa Community Health Center catchment area.

***Keywords** : Demographic characteristics; Dengue hemorrhagic fever; Disease surveillance; Spatial distribution*

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INTRODUCTION

Dengue cases have increased dramatically worldwide in recent decades (1). With an estimated 390 million infections occurring annually, dengue virus infection has become one of the major causes of acute febrile illness, morbidity, and mortality in more than 100 countries (2). A substantial global increase in reported dengue cases occurred in 2023, affecting more than 80 countries across all World Health Organization regions. Continued transmission and unexpected increases subsequently resulted in more than 6.5 million reported cases and over 7,300 dengue related deaths (3).

Most dengue related morbidity and mortality during the past three decades have been concentrated in Southeast Asia and South Asia (4). Indonesia, as part of Southeast Asia, continues to report a considerable number of cases. Data from the Indonesian Ministry of Health showed that 53,131 dengue hemorrhagic fever cases and 404 deaths had been reported by March 2024. In the following week, the number increased to 60,296 cases and 455 deaths (5). According to the 2023 Indonesian Health Survey, South Sulawesi ranked seventh among provinces with the highest reported burden of dengue hemorrhagic fever, with a prevalence of 0.78% (6).

Dengue hemorrhagic fever is a clinical manifestation of dengue virus infection transmitted primarily through the bites of *Aedes aegypti* mosquitoes. Dengue is one of the most rapidly expanding mosquito transmitted viral diseases worldwide (7). Tropical and subtropical countries, including Indonesia, remain highly vulnerable to dengue transmission. Previous studies have indicated that temperature changes, rainfall patterns, and seasonal transitions may influence mosquito development, vector abundance, and dengue virus transmission (7).

Aedes aegypti, the principal dengue vector, is well adapted to warm urban environments (8). Urban conditions may provide numerous water holding containers that support mosquito breeding, including discarded waste, flowerpots, water storage containers, and household equipment (9). Data from the South Sulawesi Health Office showed that 2,027 dengue hemorrhagic fever cases had been reported by April 2025, including 347 cases in Makassar City, 239 cases in Maros Regency, and 195 cases in Bulukumba Regency (10).

Dengue is also recognised as an important cause of hospitalisation among patients with acute febrile illness in Indonesia. Previous serological evidence indicates that a substantial proportion of Indonesian children have been exposed to dengue virus before adolescence. This condition highlights the need for improved epidemiological surveillance, early case detection, and locally appropriate dengue prevention and control strategies (11).

The geographical and temporal distribution of dengue vectors may be influenced by rainfall, temperature, land cover, socioeconomic conditions, urban development, and ecological characteristics. These conditions can affect the availability of mosquito breeding sites, vector survival, and opportunities for human vector contact (12). Geographic information system technology can support the visualisation of reported cases and assist health authorities in identifying changes in geographical distribution over time. However, descriptive mapping should be distinguished from statistical spatial analysis because visual differences in case counts do not necessarily indicate differences in population risk or statistically significant clustering. Understanding demographic characteristics may also assist surveillance programmes in recognising population groups that account for larger proportions of recorded cases (13).

Research conducted by Rahayu in 2025 indicated that vulnerability to dengue hemorrhagic fever in Tamalate District was predominantly classified as moderate (14). The Mangasa Community Health Center catchment area includes urban villages located within Tamalate and Rappocini Districts. Nevertheless, local information concerning the geographical, demographic, and temporal distribution of recorded dengue hemorrhagic fever cases remains limited. Based on this background, this study aimed to describe the

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geographical distribution and demographic characteristics of dengue hemorrhagic fever cases recorded in the Mangasa Community Health Center catchment area, Makassar City, from 2021 to 2024, according to age group, sex, urban village, month, and year of occurrence.

METHODS

This study used a retrospective descriptive epidemiological design based on secondary data. The study population consisted of all dengue hemorrhagic fever cases recorded at the Mangasa Community Health Center, Makassar City, from 2021 to 2024. A total sampling technique was applied, resulting in 188 eligible cases. The variables examined included age group, sex, sub-district of residence, month of occurrence, and year of occurrence. Data were analyzed descriptively using frequencies, proportions, and cross-tabulations to describe the distribution of cases according to person, place, and time. Monthly and annual case distributions were presented using line and bar charts. Geographic mapping was conducted using Quantum GIS to visualize the distribution of recorded cases across the sub-districts during the study period. No inferential analysis of risk factors was performed because the dataset included only dengue hemorrhagic fever cases and did not contain a non-case comparison group or population denominators.

RESULTS

Table 1 presents the annual distribution of dengue hemorrhagic fever cases recorded at the Mangasa Community Health Center from 2021 to 2024. Of the 188 cases included in the study, the largest number was recorded in 2021, with 87 cases accounting for 46.3% of the total. The number of recorded cases decreased to 49 cases in 2022 and 22 cases in 2023, representing 26.1% and 11.7% of all cases, respectively. In 2024, the number of recorded cases increased to 30 cases, accounting for 16.0% of the total. These findings indicate annual

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fluctuations in the number of recorded dengue hemorrhagic fever cases, with a decline from 2021 to 2023 followed by an increase in 2024.

Table 1. Annual Distribution of Recorded Dengue Hemorrhagic Fever Cases, 2021–2024

Variable	Number of Cases (n)	Percentage (%)
2021	87	46.3
2022	49	26.1
2023	22	11.7
2024	30	16.0
Total	**188**	**100**

Source: Secondary Data from Mangasa Community Health Center, 2025

Table 2 presents the demographic characteristics of dengue hemorrhagic fever cases recorded at the Mangasa Community Health Center from 2021 to 2024. Of the 188 recorded cases, 102 cases occurred among females, accounting for 54.3% of the total, while 86 cases occurred among males, representing 45.7%. Based on age group, the largest proportion of cases was recorded among individuals aged 6–17 years, with 78 cases or 41.5% of the total. This was followed by the 18–30-year age group, with 51 cases or 27.1%. A total of 34 cases, representing 18.1%, occurred among individuals aged 31 years or older, while the 0–5-year age group accounted for the smallest proportion, with 25 cases or 13.3%. These findings indicate that recorded dengue hemorrhagic fever cases occurred across both sexes and all age groups, with a slightly larger proportion among females and the largest proportion among individuals aged 6–17 years.

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Table 2. Demographic Characteristics of Recorded Dengue Hemorrhagic Fever Cases

Variable	Number of Cases (n)	Percentage (%)
Sex		
Male	86	45.7
Female	102	54.3
Age		
0-5 Years	25	13.3
6-17 Years	78	41.5
18-30 Years	51	27.1
≥ 31 Years	34	18.1
Total	**188**	**100**

Source: Secondary Data from Mangasa Community Health Center, 2025

Table 3 and Figure 1 present the geographical distribution of recorded dengue hemorrhagic fever cases across Gunung Sari, Mangasa, and Mannuruki Urban Villages from 2021 to 2024. Of the 188 cases recorded during the study period, Gunung Sari and Mangasa each accounted for 64 cases, representing 34.0% of the total, while Mannuruki accounted for 60 cases or 31.9%. In 2021, Gunung Sari recorded the largest number of cases, with 39 cases or 34.5% of all cases reported that year. In 2022, Gunung Sari and Mangasa each recorded 21 cases, accounting for 42.9%, whereas Mannuruki recorded seven cases or 14.3%. The geographical distribution changed in 2023, when Mannuruki recorded the largest number of cases, with 12 cases or 54.5%, while Gunung Sari and Mangasa each recorded five cases. A similar pattern was observed in 2024, when Mannuruki recorded 13 cases or 43.3%, followed by Mangasa with nine cases or 30.0% and Gunung Sari with eight cases or 26.7%. The maps visually demonstrate year-to-year variation in the absolute number and geographical distribution of recorded cases across the three urban villages. The

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color categories represent case counts and should not be interpreted as incidence rates, population risk levels, or statistically significant hotspots.

Table 3. Distribution of Recorded Dengue Hemorrhagic Fever Cases By Sub-district and Year

Subdistrict	Year								Total	
	2021		2022		2023		2024			
	n	%	n	%	n	%	n	%	n	%
Gunung Sari	39	34.5	21	42.9	5	22.7	8	26.7	64	34.0
Mangasa	29	33.3	21	42.9	5	22.7	9	30	64	34.0
Mannuruki	28	32.2	7	14.3	12	54.5	13	43.3	60	32.0
Total	**87**	**100**	**49**	**100**	**22**	**100**	**30**	**100**	**188**	**100**

Source: Secondary Data from Mangasa Community Health Center, 2025

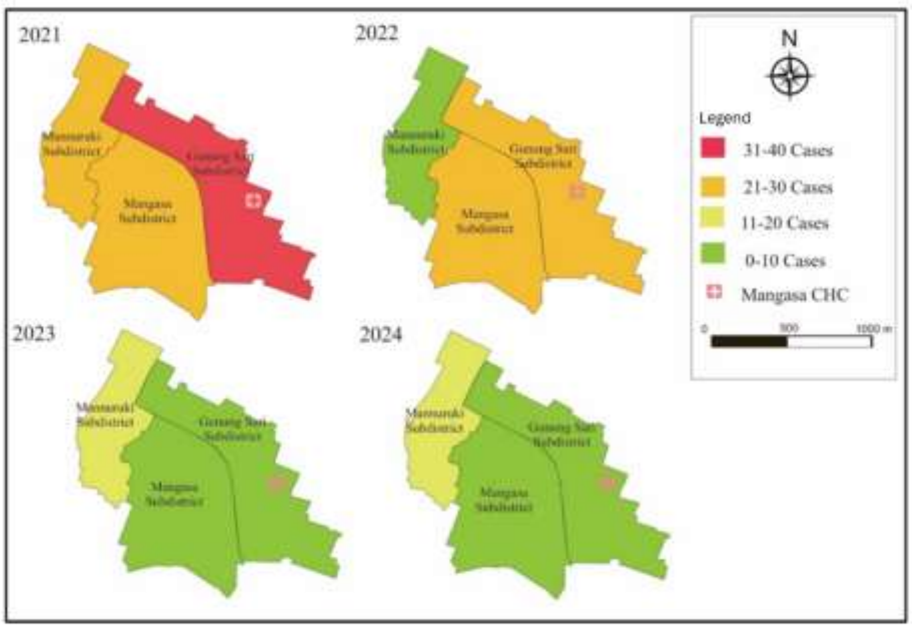

Figure 1. Geographical Distribution of Recorded Dengue Hemorrhagic Fever Cases by Urban Village in the Mangasa Community Health Center Catchment Area, Makassar City, 2021–2024

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Table 4 and Figure 2 present the monthly distribution of recorded dengue hemorrhagic fever cases at the Mangasa Community Health Center from 2021 to 2024. Of the 188 cases recorded during the study period, May accounted for the largest number, with 41 cases or 21.8% of the total. This was followed by June with 27 cases or 14.4%, April with 25 cases or 13.3%, and March with 24 cases or 12.8%. September recorded the smallest number of cases, with three cases or 1.6% of the total. The month with the largest number of cases differed across years. In 2021, the highest number was recorded in May, with 29 cases or 33.3% of cases reported that year. The line graph shows a sharp increase from April to May 2021, followed by a gradual decline from June to September and a slight increase toward the end of the year. In 2022, the highest number occurred in March, with 11 cases or 22.4%, followed by a gradual decrease during the subsequent months. In 2023, monthly case numbers remained relatively low and fluctuated slightly, with the highest number recorded in February. In 2024, cases increased from January to March, reaching a peak of 10 cases or 33.3%, before declining during the following months. Overall, the graph demonstrates substantial year-to-year variation in the timing and magnitude of monthly case peaks. These fluctuations describe the temporal distribution of recorded cases and should not be interpreted as evidence of a statistically confirmed seasonal pattern.

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Table 4. Monthly Distribution of Recorded Dengue Hemorrhagic Fever Cases at the Mangasa Community Health Center, 2021–2024

Month	Year								Total	
	2021		2022		2023		2024			
	n	%	n	%	n	%	n	%	n	%
January	0	0	9	18.3	1	4.5	2	6.7	12	6.4
February	0	0	5	10.2	4	18.1	4	13.3	13	6.9
March	0	0	11	22.4	3	13.6	10	33.3	24	12.7
April	10	11.5	9	18.3	3	13.6	3	10.0	25	13.3
May	29	33.3	6	12.2	3	13.6	3	10.0	41	21.8
June	17	19.5	4	8.2	3	13.6	3	10.0	27	14.4
July	8	9.2	1	2.0	0	0	1	3.3	10	5.3
August	6	6.9	0	0	3	13.6	2	6.6	11	5.8
September	1	1.1	1	2.0	1	4.5	0	0	3	1.6
October	2	2.3	0	0	1	4.5	1	3.3	4	2.1
November	6	6.9	2	4.0	0	0	0	0	8	4.2
December	8	9.2	1	2.0	0	0	1	3.3	10	5.3
Total	**87**	**100**	**49**	**100**	**22**	**100**	**30**	**100**	**188**	**100**

Source: Secondary Data from Mangasa Community Health Center, 2025

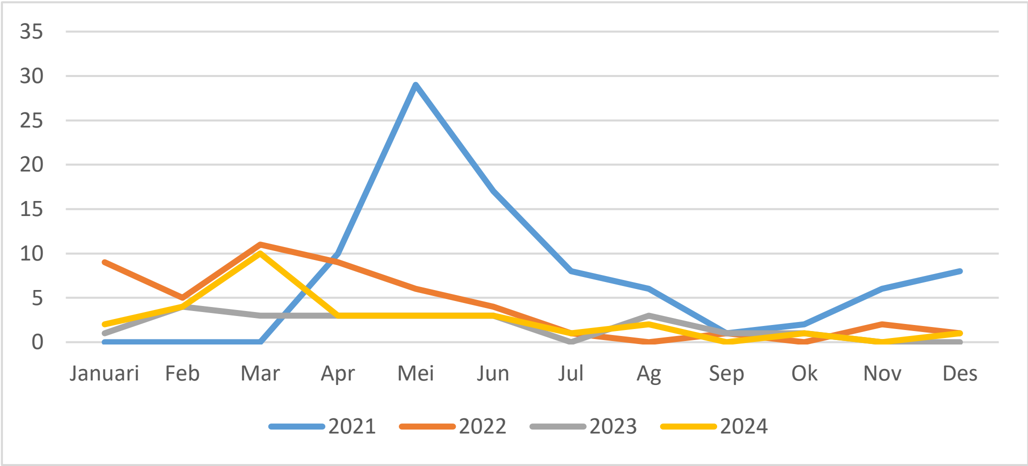

Figure 2. Monthly Distribution of Recorded Dengue Hemorrhagic Fever Cases at the Mangasa Community Health Center, 2021–2024

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DISCUSSION

The present study described 188 recorded dengue hemorrhagic fever cases in the Mangasa Community Health Center catchment area between 2021 and 2024. The largest number of cases was recorded in 2021, followed by a decline in 2022 and 2023 and a subsequent increase in 2024. This pattern demonstrates variation in the number of reported cases between years rather than a statistically confirmed change in dengue incidence. Temporal variability in dengue case notifications has also been documented in other settings, including Delhi and Bandung, where reported case numbers and their geographical distribution changed across observation periods (15), (16). Nevertheless, the annual fluctuations identified in the present study cannot be attributed to changes in transmission intensity, population susceptibility, surveillance performance, or control activities because these factors were not measured.

Females accounted for a slightly larger proportion of recorded cases than males, comprising 54.3% and 45.7% of cases, respectively. This finding is consistent with a descriptive study conducted at a community health center in Malang, which reported that females constituted 63.4% of recorded dengue cases (17). However, contrasting findings have been reported elsewhere. A large retrospective study in Pakistan identified a greater proportion of dengue cases among males, while a study of hospitalized patients in Bandung similarly found that reported cases were more frequently observed among males and children (16), (18). These differences indicate that the sex composition of recorded dengue cases is not uniform across locations. The slightly higher proportion among females in the present study should therefore not be interpreted as evidence that females had a higher risk of dengue infection. Differences in exposure, healthcare seeking, case detection, and reporting could theoretically influence the observed distribution, but none of these mechanisms was examined in this study.

Cases were recorded across all age groups, although individuals aged 6 to 17 years constituted the largest proportion, accounting for 41.5% of the total. This finding is broadly consistent with the study by Putri, which found that individuals younger than 15 years represented 73.2% of dengue cases recorded at a community health center in Malang (17). Research in Bandung also identified a prominent concentration of reported dengue cases among children (16). These convergent findings reinforce the epidemiological relevance of monitoring dengue case distributions among school age populations. However, the larger number of cases in the 6 to 17 year age group does not demonstrate that this group had the highest incidence or individual risk because the number of residents in each age group was unavailable.

The interpretation of age distributions requires particular caution because reported case composition reflects more than biological susceptibility. It may also be shaped by historical exposure, population immunity, healthcare use, clinical recognition, and reporting practices. Kada et al. demonstrated that age stratified surveillance data can provide valuable information regarding dengue transmission and accumulated population exposure when combined with population denominators and appropriate mathematical models (19). In the present study, these additional data and modelling procedures were unavailable. Consequently, the age findings should be understood as a description of the composition of recorded cases rather than an estimate of age specific transmission intensity. This distinction is methodologically important because raw case counts can appear to identify vulnerable groups even when differences in population size remain unknown.

The geographical distribution of recorded cases also varied between the three urban villages. Gunung Sari and Mangasa each accounted for 64 cases during the full study period, while Mannuruki accounted for 60 cases. Despite the relatively similar cumulative totals, the geographical distribution changed between years. Gunung Sari recorded the largest number of cases in 2021, Gunung Sari and Mangasa recorded equal numbers in 2022, and Mannuruki recorded the largest number in 2023 and 2024. These changes suggest that the concentration of recorded cases was not consistently confined to one urban village. Nevertheless, the maps display absolute case counts and cannot establish whether one area had a greater population adjusted burden than another.

The use of Quantum GIS strengthened the descriptive value of the surveillance data by making changes in case distribution more readily observable. However, the present mapping differs from statistical spatial analysis. Previous studies have used geocoded cases, kernel density estimation, spatial autocorrelation, cluster detection, population density, and climatic variables to estimate spatial risk or identify statistically supported clusters (15), (16), (20). For example, the Bandung study incorporated population density and climatic indicators into correlation and regression analyses, whereas the Delhi and hospitalized Bandung studies applied more extensive spatial techniques (15), (16), (20). Because the present study included only three urban villages and did not perform spatial autocorrelation or hotspot testing, the mapped categories must not be described as risk levels or statistically significant hotspots.

The monthly distribution showed that May contributed the largest number of recorded cases, accounting for 21.8% of the total, followed by June, April, and March. However, the timing of the highest monthly count differed between years. The peak occurred in May in 2021, March in 2022, February in 2023, and March in 2024. This variation indicates that the temporal pattern was not identical throughout the four year period. Accordingly, the findings support the interpretation of monthly fluctuation but do not provide sufficient evidence of a stable or statistically confirmed seasonal pattern.

Other studies have identified relationships between dengue transmission and climatic conditions. Idris and Aulya reported an increase in dengue cases during the earlier months of the year in Kendari and found a correlation between rainfall and dengue occurrence (21).

Lowe et al. also demonstrated that rainfall and other hydrometeorological conditions can have nonlinear and delayed effects on dengue risk, with the magnitude of these effects varying according to the level of urbanisation (22). These studies provide useful epidemiological context, but their findings cannot be used as direct explanations for the temporal distribution observed in Mangasa. The present study did not include rainfall, temperature, humidity, wind speed, mosquito density, or breeding site data. Therefore, attributing the higher case counts between March and June to climatic conditions would exceed the empirical scope of the study.

The findings have practical relevance for local surveillance despite these analytical limitations. Monthly case graphs can assist health personnel in recognising periods when recorded case numbers begin to increase, while geographical maps can show urban villages that require closer operational attention in a particular year. These tools may support the scheduling of health promotion, epidemiological investigation, larval monitoring, and vector control activities. However, interventions should not be directed solely on the basis of absolute case counts. Further assessment should incorporate population size, entomological indicators, environmental conditions, and historical surveillance data so that resource allocation reflects epidemiological burden rather than reporting volume alone. Studies using age stratified surveillance and more detailed GIS methods demonstrate that routine data become substantially more informative when linked with population and spatial information (16), (19).

Several limitations should be considered when interpreting these findings. First, the study relied on secondary data from one community health center, and therefore did not include dengue cases treated in other health facilities, cases that were not reported, or asymptomatic infections. Second, population denominators according to year, sex, age group, and urban village were unavailable. Incidence rates, attack rates, relative risks, and comparisons of population risk could therefore not be calculated. Third, the study did not include a noncase group, making it inappropriate to evaluate demographic or geographical factors associated with dengue occurrence. Fourth, the geographical analysis was limited to descriptive mapping across three urban villages and could not identify statistically significant clusters. Finally, climatic, environmental, entomological, behavioural, and mobility variables were not measured. These limitations mean that the study describes the distribution of recorded cases according to person, place, and time, but does not explain the causal mechanisms underlying that distribution.

Overall, this study provides a local epidemiological profile of dengue hemorrhagic fever cases recorded between 2021 and 2024. Its principal contribution lies in integrating demographic description, monthly case trends, and geographical visualisation within a single surveillance framework. The findings identify variations that are operationally relevant without treating them as evidence of risk or causality. Such methodological restraint strengthens the credibility of the results and establishes a descriptive baseline for subsequent studies using population denominators, environmental measurements, entomological surveillance, and more detailed spatial units.

CONCLUSIONS AND RECOMMENDATIONS

This study described the distribution of 188 recorded dengue hemorrhagic fever cases in the Mangasa Community Health Center catchment area from 2021 to 2024. Recorded cases varied by year, month, age group, sex, and urban village. Females represented a slightly larger proportion of cases, while the 6–17-year age group accounted for the largest proportion. The geographical distribution also changed between years, and monthly case peaks were not consistent throughout the study period. These findings describe recorded case distributions and do not indicate differences in incidence, risk, or statistically confirmed seasonality. Routine review of monthly trends and geographical maps may support local surveillance and dengue-control planning. Future research should incorporate population denominators, non-case comparison groups, and environmental, climatic, entomological, behavioral, and spatial variables.

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