

The Association Between Comorbidities and Severity of Dengue Among Adults in Lombok

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Abstract: Dengue remains a major public health concern in Indonesia, particularly in Lombok, West Nusa Tenggara, where evidence on the association between comorbidities and dengue severity is limited. This study aimed to assess the relationship between comorbidities and dengue severity among adults in Lombok. A retrospective cross-sectional study was conducted using medical records of adult dengue patients treated at West Nusa Tenggara Province General Hospital between 2023 and 2024. Fisher's exact test was used for statistical analysis. A total of 154 patients were included, comprising 66 patients with comorbidities and 88 without comorbidities. Gastrointestinal and hepatobiliary diseases were the predominant organ-system comorbidity category, while pneumonia and type 2 diabetes mellitus were the most common individual comorbidities. No significant association was found between comorbidities and dengue severity ($p > 0.05$). However, the findings should be interpreted cautiously due to unequal distribution of severity categories and limited number of dengue shock syndrome cases. In conclusion, no significant association was observed between comorbidities and dengue severity among adult patients in Lombok. Future multicenter studies with larger and more balanced samples are needed to investigate determinants of dengue severity. Additional clinical, immunological, and virological factors should be evaluated to improve risk stratification and patient management.

Keywords: Adult; Dengue; Comorbidity; Disease Severity; Lombok.

Introduction

Dengue remains a global health problem (Wang et al., 2020). According to the World Health Organization, the global incidence of dengue has increased substantially over the past two decades (WHO, 2023), with an estimated 100–400 million infections occurring annually worldwide (WHO, 2025). Indonesia is recognized as a highly dengue-endemic country, with cases reported continuously year around (WHO, 2023). As of October 2024, Indonesia reported 210,644 dengue cases and 1,239 deaths across 32 provinces, highlighting the persistent and widespread burden of dengue nationwide (Ministry of Health of the Republic of Indonesia,

2024). In West Nusa Tenggara (NTB), dengue remains endemic across both Lombok and Sumbawa islands, with persistent transmission reported in several districts (Health Office of West Nusa Tenggara, 2024). The increasing incidence of dengue in Lombok indicates that the disease continues to pose a substantial public health burden in the region (Health Office of West Nusa Tenggara, 2024). Hence, this highlights the need to identify factors associated with disease severity, particularly among adult patients who now represent an increasing proportion of dengue cases globally (Huang et al., 2023).

Recent studies have highlighted the potential role of comorbidities in influencing

dengue progression and clinical outcomes. Chronic conditions such as hypertension, diabetes mellitus, cardiovascular disease, and renal disease have been associated with an increased risk of severe dengue (Ng *et al.*, 2022; Sangkaew *et al.*, 2021; Tsheten *et al.*, 2021; Lee *et al.*, 2020), although the exact underlying pathophysiological mechanisms remain incompletely understood (Huang *et al.*, 2023). This issue is particularly relevant in NTB, where the epidemiological transition has resulted in a dual burden of communicable and non-communicable diseases (Health Office of West Nusa Tenggara Province, 2023). As the adult population with underlying medical conditions continues to increase, understanding the interaction between comorbidities and dengue severity becomes increasingly important for clinical risk stratification and patient management (Lien *et al.*, 2021; Lee *et al.*, 2020).

However, evidence regarding the association between comorbidities and dengue severity remains inconsistent across studies. Several investigations have reported that hypertension, diabetes mellitus, and allergic diseases are associated with an increased risk of severe dengue or dengue hemorrhagic fever (Teixeira *et al.*, 2015; Ng *et al.*, 2022; Lee *et al.*, 2020). In contrast, other studies have found no significant association between comorbidities and dengue severity (Latt *et al.*, 2020; Nabila *et al.*, 2024; Pullock *et al.*, 2025). These discrepancies may be influenced by differences in study population, geographic setting, age distribution, healthcare access, dengue endemicity, and the types of comorbidities evaluated (Pullock *et al.*, 2025; Nabila *et al.*, 2024; Ng *et al.*, 2022). Importantly, studies specifically focusing on adult dengue patients in eastern Indonesia remain limited, despite the region's increasing burden of both dengue and non-communicable diseases.

Therefore, this study aimed to examine the association between comorbidities and dengue severity among adult patients in Lombok, NTB. In addition, this study descriptively analyzed patient demographic and clinical characteristics, including age, sex, area of residence, occupation, duration of hospitalization, timing of hospital admission, and the distribution of comorbidities. By providing regional evidence from Lombok,

this study is expected to contribute to the understanding of dengue severity determinants among adults and support more targeted clinical assessment, risk stratification, and public health strategies in dengue-endemic settings.

Materials and Method

Study Site and Period of Study

This study was conducted at West Nusa Tenggara Province General Hospital (RSUD Provinsi NTB), Lombok, Indonesia. Data collection was performed between July and August 2025 using secondary data retrieved from both electronic and paper-based medical records. The study included all adult patients hospitalized with dengue from January 1st, 2023 to December 31st, 2024.

Study Design

This was an analytical observational study with a cross-sectional design using retrospective secondary data obtained from medical records.

Population and Sampling

The study population consisted of medical record from adult dengue patients hospitalized at West Nusa Tenggara Province General Hospital during the study period. The minimum sample size was calculated for an unmatched categorical analytic study using a two-sided hypothesis test, with a significance level of 5% and a statistical power of 90%. Based on the calculation, the minimum required sample size was 128 subjects. Adult patients aged ≥ 18 years with a diagnosis of dengue based on the 2011 World Health Organization (WHO) criteria were included in the study, while pregnant women were excluded. All medical records that fulfilled the eligibility criteria were enrolled until the minimum required sample size was achieved.

Data extracted from the medical records included demographic characteristics (age, sex, residence, and occupation), clinical characteristics (month of hospital admission, length of hospital stay, and dengue severity), and the presence of comorbidities. Comorbidities were defined as pre-existing diseases occurring concurrently with dengue infection and were categorized into cardiovascular, endocrine and metabolic, respiratory, dermatological, neurological and psychiatric, renal and urinary

tract, musculoskeletal and autoimmune, gastroentero-hepatology, oncology, and other conditions. Each comorbidity category was recorded as a dichotomous variable based on documented diagnoses in the medical records.

Study Procedure

All medical records of adult patients (≥ 18 years) diagnosed with dengue during the study period were identified and screened according to the predefined eligibility criteria. Dengue diagnosis was established based on clinical and laboratory evaluation documented in the medical records according to hospital diagnostic protocols and the 2011 World Health Organization (WHO) dengue guidelines. Pregnant women and medical records with incomplete key variables were excluded from the analysis. All eligible records were consecutively enrolled until the minimum required sample size was achieved. Data extraction was performed using a standardized data collection form by trained investigators to ensure consistency and accuracy of data retrieval.

The collected variables included demographic characteristics (age, sex, residence, and occupation), clinical characteristics (month of hospital admission and length of hospital stay), comorbidities, and dengue severity. Dengue data was then classified according to its severity based on the WHO Guidelines 2011: Dengue Fever (DF), Dengue Hemorrhagic Fever (DHF), and Dengue Shock Syndrome (DSS). DF was defined as fever accompanied by at least two clinical manifestations, such as headache, retro-orbital pain, arthralgia or bone pain, skin rash, or bleeding manifestations without evidence of plasma leakage. DHF was defined as fever with bleeding manifestations, thrombocytopenia (platelet count $\leq 100,000/\text{mm}^3$), and evidence of plasma leakage indicated by hematocrit increase $\geq 20\%$ and/or pleural effusion, ascites, or hypoalbuminemia.

DSS represented the most severe form of dengue and included DHF Grades III and IV, characterized by circulatory failure and severe shock with undetectable blood pressure and pulse. After data extraction, all data were checked for completeness, coded, and entered into the statistical database for analysis. Descriptive analysis was performed to summarize demographic and clinical

characteristics of the study population. Ethical approval for this study was granted by the Health Research Ethics Committee of RSUD Provinsi NTB (EC Number: 00.9.1/12/KEP/2025).

Data Analysis

Data were analyzed using IBM SPSS Statistics version 25. Continuous variables were presented as median and interquartile range (IQR), while categorical variables were presented as frequencies and percentages. Fisher's exact test was used to assess the association between comorbidities and dengue severity because the assumptions for the Chi-square test were not met. A p-value of < 0.05 was considered statistically significant.

Result and Discussion

Characteristics of Adult Dengue Patients

A total of 154 patients were included in this study. The median age was 35 years (interquartile range [IQR], 25–50), with most patients aged 18–65 years (97.4%). Males accounted for 56.5% ($n = 87$) of the study population. The majority of patients resided in Mataram City (37.0%) and West Lombok Regency (36.4%), followed by Central Lombok (16.9%), East Lombok (5.8%), and North Lombok (3.9%). Regarding occupation, private employees/entrepreneurs represented the largest group (20.8%), followed by students (12.3%) (Table 1).

In this study, dengue infection predominantly affected adults aged 18–65 years, indicating that the productive age group is the most impacted population. This finding is consistent with previous studies reporting a similar age distribution, where dengue primarily occurs among young to middle-aged adults (Yang *et al.*, 2021; Chang *et al.*, 2018; Pham *et al.*, 2025). The predominance of adult cases is likely driven by increased exposure related to urbanization, human mobility, and climate changes that facilitate dengue transmission and expansion (Yang *et al.*, 2021). From a public health perspective, this pattern has important implications, as infection in the productive age group may result in substantial socioeconomic burden due to reduced workforce productivity and increased healthcare utilization.

The present study demonstrates a male

predominance among adult dengue patients in Lombok. This pattern suggests that infection is more strongly influenced by behavioral exposure than biological susceptibility, as males are more likely to engage in outdoor activities and occupational mobility that increase contact with *Aedes aegypti*, which is active during daytime (Chang *et al.*, 2018; Ruggieri *et al.*, 2016). Overall, the results highlight the importance of behavioral and environmental factors in shaping gender distribution of dengue, with implications for targeted prevention strategies focusing on high-exposure male-dominated populations in endemic areas.

Dengue cases in this study were more frequently reported in urban areas and among occupations with higher daily mobility. Cases were mainly found in Mataram City (37.0%) and West Lombok Regency (36.4%), with private employees/entrepreneurs (20.8%) and students (12.3%) as the largest occupational groups. This pattern suggests a potential influence of urban environmental conditions, such as high population density and inadequate water management, which may facilitate *Aedes aegypti* breeding and increase human–vector contact (Ha *et al.*, 2021; Ipa *et al.*, 2025). In addition, dengue risk appears to be related to daily mobility and exposure patterns, as transmission is linked to daytime outdoor activity (Renard *et al.*, 2023). Overall, these findings indicate that dengue distribution in Lombok may be associated with

both residential setting and human mobility, highlighting the importance of urban-focused control measures and targeted prevention for highly mobile populations.

Table 1. Characteristics of Subject

Variables	n	%
Age Group		
18–65 years	150	97,4%
>65 years	4	2,6%
Gender		
Male	67	43,5%
Female	87	56,5%
Residence		
Mataram City	57	37,0%
West Lombok Regency	56	36,4%
Central Lombok Regency	26	16,9%
East Lombok Regency	9	5,8%
North Lombok Regency	6	3,9%
Occupation		
Student	19	12,3%
Private Employee/Entrepreneur	32	20,8%
Civil Servant (PNS)	14	9,1%
Entrepreneur	9	5,8%
Laborer	4	2,6%
Military/Police (TNI/POLRI)	1	0,6%
State-Owned Enterprise	2	1,3%
Employee (BUMN)	5	3,2%
Unemployed/Not Working	2	1,3%
Retired	60	39,0%
Others	6	3,9%
Not Recorded in Medical Records		

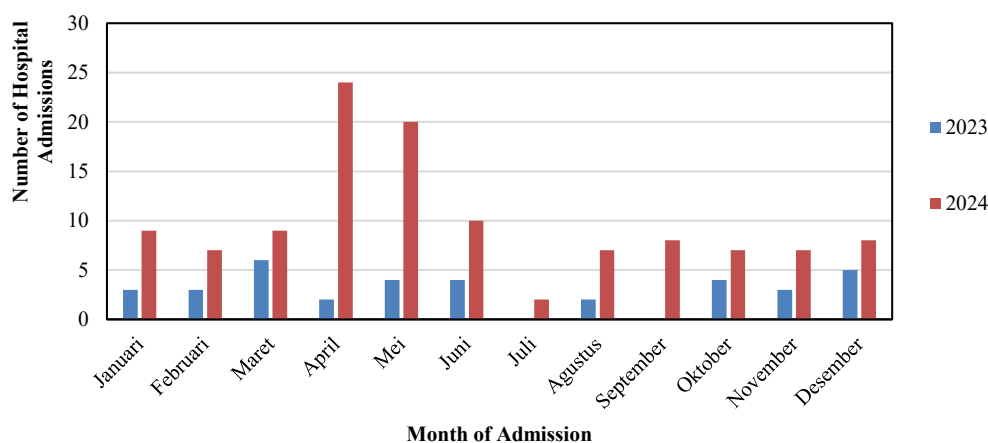


Figure 1. Distribution of Hospital Admission According to Month

Distribution of Dengue Cases Based on Hospital Admission

Monthly variation in hospital admissions

showed fluctuating patterns of dengue cases over the study period. In 2023, the highest proportion of admissions occurred in March (16.67%),

while no cases were recorded in July and September. In 2024, admissions peaked in April (20.3%) and reached the lowest proportion in July (1.7%). The present study demonstrates temporal fluctuations in dengue hospital admissions, with peaks in March 2023 and April 2024, suggesting a possible seasonal pattern in Lombok. These increases may be associated with the transition between rainy and dry seasons, when stagnant water favors *Aedes aegypti* breeding and enhances transmission. This is consistent with epidemiological evidence linking dengue incidence to rainfall, temperature, and humidity, which influence vector dynamics and viral replication, and aligns with Wibawa *et al.* (2024), who reported higher dengue incidence during the rainy season in Indonesia. However, the April 2024 peak suggests a potential shift from the expected seasonal pattern, possibly due to local climatic variability or differences in healthcare utilization and reporting. Overall, the findings indicate seasonal variability in dengue admissions beyond a single peak period, emphasizing the influence of local environmental factors and the need for continuous surveillance and vector control throughout transitional months (Wibawa *et al.*, 2024; Islam *et al.*, 2021).

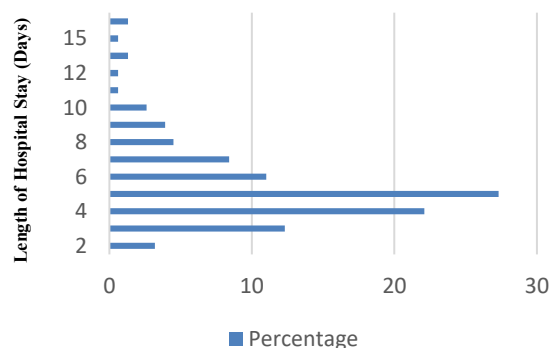


Figure 2. Distribution of Subjects Based on Length of Hospital Stay

Distribution of Dengue Cases Based on Length of Stay

This study further evaluated the duration of hospitalization among 154 dengue patients (Figure 2). The distribution of hospital length of stay demonstrated a predominance of short-duration admissions, with most patients hospitalized for 3–5 days. The highest proportion of admissions was observed among patients with

a 5-day hospital stay (27,3 %), followed by 4 days (22,1%) and 3 days (12,3 %), indicating that the majority of dengue cases were managed within less than one week. The frequency of hospitalization gradually declined with increasing duration of stay, while only a small proportion of patients required hospitalization for more than 10 days.

Regarding the length of hospital stay, most patients in this study were hospitalized for less than one week, particularly for 3–5 days, with the highest proportions observed among patients with 5-day and 4-day admissions. Similar hospitalization durations have also been reported by Shahid *et al.* (2021) and Wiratmadja *et al.* (2018). In contrast, Lien *et al.* (2021) reported a slightly longer average hospital stay of 6 days. In the present study, prolonged hospitalization (>10 days) was uncommon and mainly observed in patients with comorbid conditions, supporting previous evidence that underlying diseases may worsen dengue outcomes and delay recovery (Lien *et al.*, (2021). The length of stay of dengue patient in this study highlights the importance of early supportive management in reducing hospitalization duration and healthcare burden.

Distribution of Dengue Cases Based on Comorbidities and Disease Severity

Among the 154 dengue patients included in this study, 66 patients (42.9%) had at least one comorbidity, while 88 patients (57.1%) had no comorbid conditions. Patients with four or more comorbidities were uncommon, each accounting for less than 5% of cases (Figure 3), indicating that multiple chronic conditions were relatively rare in this population.

Table 4. Distribution of Subjects Based on Disease Severity

Dengue Severity	n	%
Dengue Fever	7	4,5
Dengue Hemorrhagic Fever	139	90,3
Dengue Syok Syndrome	8	5,2

Based on disease severity, dengue hemorrhagic fever (DHF) was the predominant clinical presentation, accounting for 90.3% of cases, while dengue fever (DF) and dengue shock syndrome (DSS) represented only a small proportion of patients (4.5% and 5.2%, respectively) (Table 4). This finding suggests

that most hospitalized patients had progressed beyond uncomplicated dengue infection but had not developed severe shock manifestations.

Regarding comorbidities, gastroentero-hepatology disorders represented the largest comorbidity category in this study (22.05%), followed by respiratory diseases (16.54%) and cardiovascular diseases (13.39%). These categories were classified according to the affected organ system. However, when comorbidities were analyzed as specific disease, pneumonia emerged as the most frequently identified condition, followed by type 2 diabetes mellitus and anemia. The relatively high occurrence of diabetes mellitus in the present

study is consistent with previous evidence indicating that metabolic disorders are common among dengue patients and may contribute towards clinical outcomes (Tseheten *et al.*, 2021). Previous studies and systematic reviews have consistently identified diabetes mellitus, hypertension, and cardiovascular diseases as major comorbidities associated with severe dengue progression (Ng *et al.*, 2022; Lee *et al.*, 2020; Toledo *et al.*, 2016). These findings are also reflected in the WHO dengue guidelines, which recognize diabetes mellitus and hypertension as important risk factors for severe dengue (WHO, 2009; WHO, 2011).

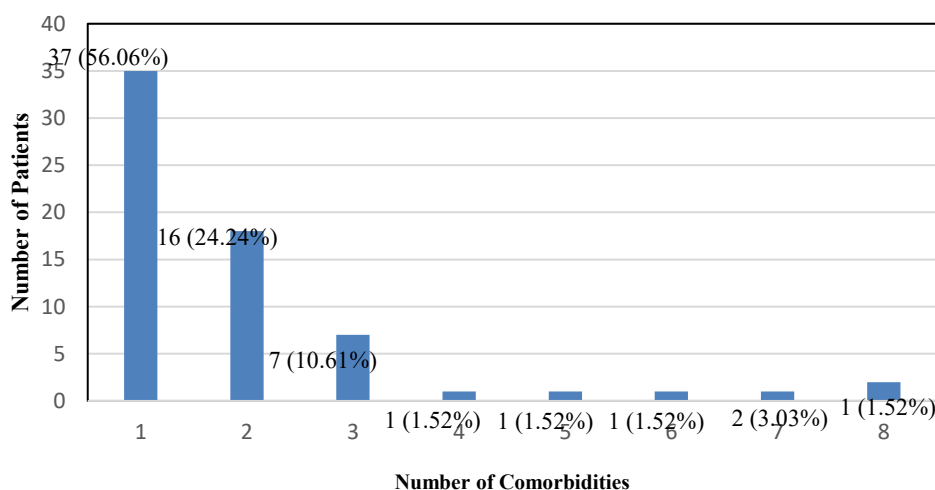


Figure 3. Distribution of Subjects Based on Number of Comorbidities

Table 3. Category of comorbidity

Comorbid	Type	Dengue Severity						Total	
		DF		DHF		DSS		N	%
		n	%	n	%	n	%		
Cardiovascular	Hypertension			7	6,93			7	5,51
	Congestive heart failure			3	2,97			3	2,36
	Atrial fibrillation and flutter			2	1,98			2	1,57
	Heart disease			1	0,99			1	0,79
	Coronary artery disease			1	0,99			1	0,79
	Angina pectoris			1	0,99			1	0,79
	Unstable angina			1	0,99			1	0,79
	Sick sinus syndrome	1	14,29					1	0,79
	Total							17	13,39
Endocrine and Metabolic	Type 2 Diabetes Mellitus	1	14,29	10	9,90	1	5,26	12	9,45
	Hyperuricemia			1	0,99			1	0,79
	Total							13	10,24
Respiratory	Pneumonia	1	14,29	11	10,89	3	15,79	15	11,81

Comorbid	Type	Dengue Severity								
		DF		DHF		DSS		Total		
		n	%	n	%	n	%	N	%	
	COPD (Chronic Obstructive Pulmonary Disease)	1	14,29	1	0,99			2	1,57	
	Pulmonary edema			1	0,99	1	5,26	2	1,57	
	Bronchopneumonia					1	5,26	1	0,79	
	Chronic nasopharyngitis			1	0,99			1	0,79	
	Total							21	16,54	
Dermatological	Candidiasis					1	5,26	1	0,79	
	Oral candidiasis			1	0,99			1	0,79	
	Pemphigoid Bullosa			1	0,99			1	0,79	
	Tinea corporis					1	5,26	1	0,79	
	Psoriasis			1	0,99			1	0,79	
	Total								5	3,94
Neurology and Psychiatry	Depression					1	5,26	1	0,79	
	Generalized anxiety disorder					1	5,26	1	0,79	
	Tension type headache			1	0,99			1	0,79	
	Migraine			1	0,99			1	0,79	
	Peripheral vertigo	1	14,29					1	0,79	
	Non-organic insomnia			1	0,99			1	0,79	
	Total								6	4,72
Renal and urinary tract	Nephrolithiasis			3	2,97	1	5,26	4	3,15	
	Chronic kidney disease stage 5			3	2,97			3	2,36	
	Glomerulonephritis			2	1,98			2	1,57	
	Hydronephrosis			1	0,99			1	0,79	
	Complicated urinary tract infection			1	0,99			1	0,79	
	Total								11	8,66
	Musculoskeletal and autoimmune	Systemic Lupus Erythematosus			2	1,98			2	1,57
Multiple fractures of vertebrae cervical				1	0,99			1	0,79	
Total									3	2,36
Gastroentero-hepatology	Dyspepsia			8	7,92			8	6,30	
	Typhoid fever			6	5,94	1	5,26	7	5,51	
	Gastroenteritis	1	14,29	4	3,69			5	3,94	
	Cholecystitis			3	2,97			3	2,36	
	GERD			2	1,98			2	1,57	
	Liver abscess			1	0,99			1	0,79	
	Cholelithiasis with cholecystitis			1	0,99			1	0,79	
	Acute pancreatitis			1	0,99			1	0,79	
	Total								28	22,05
Oncology	Breast cancer					1	5,26	1	0,79	
	Multiple myeloma			1	0,99			1	0,79	
	Total								2	1,57
Others	Anemia	1	14,29	8	7,92	3	15,79	12	9,45	
	Aplastic anemia			1	0,99			1	0,79	
	Malaria					1	5,26	1	0,79	
	HIV					1	5,26	1	0,79	
	Bacterial infection			2	1,98			2	1,57	
	Total									

Comorbid	Type	Dengue Severity						Total	
		DF		DHF		DSS		N	%
		n	%	n	%	n	%		
	Secondary infection			1	0,99			1	0,79
	Pulpitis			1	0,99			1	0,79
	Sepsis					1	5,26	1	0,79
	Acute mastoiditis			1	0,99			1	0,79
	Total							21	16,54

Although the exact mechanism linking diabetes to severe dengue is not fully understood, several studies suggest that the pro-inflammatory state and chronic endothelial dysfunction in diabetic patients may increase vulnerability to more severe disease progression. These conditions trigger pro-inflammatory cytokine activation and increased vascular permeability, which are key processes in the pathogenesis of severe dengue (Marois *et al.*, 2021; Lee *et al.*, 2020; Huang *et al.*, 2018).

Within the cardiovascular disease, hypertension was the most frequently observed (5.38%). While the exact mechanism between hypertension and severe dengue is not fully understood, hypertension is associated with a pro-inflammatory state characterized by elevated interleukin-6 (IL-6) and C-reactive protein (CRP) levels. This condition can lead to vascular endothelial dysfunction and increase the risk of severe clinical manifestations of dengue (Ng *et al.*, 2022).

Meanwhile, the high prevalence of gastroentero-hepatology conditions in this study indicates a distinct clinical complexity. Descriptive analysis showed that this category was dominated by common conditions such as

dyspepsia (6.30%) and significantly by typhoid fever (5.51%). These findings should be interpreted cautiously, as it could not be confirmed whether typhoid fever cases were pre existing comorbidities or co-infections occurring concurrently with dengue. This is consistent with Mahato *et al.*, (2022) who reported that dengue and typhoid co-infections are quite common in endemic areas, with a prevalence of 18.95% among patients diagnosed with dengue. On the other hand, there is limited literature explaining dyspepsia in dengue patients, and it is unclear whether this complaint represents a comorbidity, clinical manifestation, or complication.

Bivariate Analysis

The bivariate analysis showed no statistically significant association between the presence of comorbidities and dengue severity ($p = 0.289$). Nevertheless, comorbidities were more frequently observed among patients with dengue shock syndrome (DSS) (62.5%) compared with those without comorbidities (37.5%). In contrast, among patients with DF/DHF, the majority did not have comorbidities (58.2%), while 41.8% had at least one comorbid condition (Table 5).

Table 5. Bivariate Analysis

Comorbidity	Dengue Severity				Total		p-value
	DD/DBD		SSD		n	%	
	n	%	n	%			
With Comorbidities	61	41,8	5	62,5	66	42,9	0,289
Without Comorbidities	85	58,2	3	37,5	88	57,1	
Total					154	100	

The findings of the present study are generally consistent with several previous studies reporting no statistically significant association between comorbidities and dengue severity (Pulock *et al.*, 2025; Nabila *et al.*, 2024; Latt *et al.*, 2020). Ahmad *et al.*, (2018) also conducted a cross-sectional study in Malaysia with 700

dengue patients. The study found no statistically significant association between diabetes mellitus ($p = 0.674$) and hypertension ($p = 0.868$) with severe dengue. The similarity in study design and large sample size strengthens the findings of this study that comorbidities are not the main determinant of dengue severity. This suggests

that factors influencing dengue severity are multifactorial and may be affected by individual immune status, viral virulence, and patients' socioeconomic conditions (Nabila *et al.*, 2024).

In contrast, several other studies have demonstrated a significant relationship between comorbidities and dengue severity. Hypertension, diabetes mellitus, and other chronic conditions have been reported as independent risk factors for severe dengue outcomes (Ng *et al.*, 2022; Lee *et al.*, 2020; Teixeira *et al.*, 2015). The differences in findings between this study and previous studies may be due to several factors, including variations in study design, sample size, and disease classification systems. Unlike many previous studies that used case-control designs and the WHO 2009 dengue classification, this study applied a cross-sectional design and categorized patients according to the 2011 WHO dengue guidelines into DF, DHF, and DSS groups. This affects sampling, control of variables, and the ability to assess causal relationships between comorbidities and dengue severity.

Limitation of Study

This study has several limitations. First, as a single-center study, the findings may not be generalized to all dengue patients in Lombok or other endemic settings. Second, the cross-sectional design does not allow causal inference between comorbidities and dengue severity. Third, as this was a retrospective study, the quality of the findings depended on the quality of the available and routinely collected data in medical records. In addition, the analysis was limited to bivariate analysis, and therefore potential confounding factors, including sociodemographic characteristics, immune status, and dengue virus serotype, could not be adjusted for. Another important limitation was the disproportional distribution of dengue severity categories, as most hospitalized patients in this tertiary referral hospital presented with dengue hemorrhagic fever (DHF), while the number of severe dengue shock syndrome (DSS) cases was relatively small. This imbalance may have reduced the statistical power to detect significant associations between comorbidities and severe dengue outcomes. Finally, as the study population consisted predominantly of adults, the findings may not be applicable to

pediatrics patients, who may exhibit different immunological responses and clinical presentations of dengue infection.

Future studies should involve larger multicenter populations, including primary healthcare facilities and outpatient settings, to better represent the full clinical spectrum of dengue infection. Prospective cohort studies using standardized protocols and multivariable analysis are also recommended to clarify the independent role of comorbidities in dengue severity while controlling for potential confounding factors.

Conclusion

This study found no statistically significant association between the presence of comorbidities and dengue severity in the study population. However, these findings should be interpreted cautiously, as dengue severity is influenced by multiple interacting factors, including host characteristics, immune response, viral factors, and clinical management. The findings may also have been affected by selection bias, unequal severity distribution, and the limited number of DSS cases. Therefore, the absence of a significant association in this study does not necessarily indicate that comorbidities have no role in the clinical progression of dengue. Importantly, patients with underlying comorbidities still require careful clinical attention, including close monitoring, early detection of warning signs, and timely management, to reduce the risk of complications and optimize patient outcomes.

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