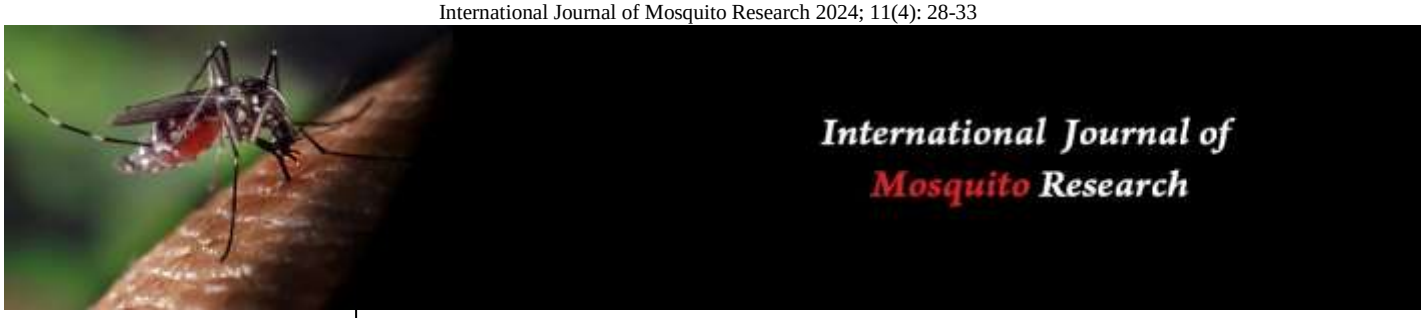

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A comprehensive retrospective study on dengue: Clinical and laboratory insights from a tertiary care hospital

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Abstract
Introduction: Infectious diseases pose a significant health burden globally, with diverse clinical presentations and outcomes. This study aims to provide a comprehensive analysis of demographic characteristics, detection types, symptom prevalence, laboratory parameters, and correlations with clinical outcomes among the study population.
Materials and Methods: A cross-sectional study was conducted on participants presenting with symptoms of infectious diseases. Data on demographic characteristics, detection types, symptom prevalence, and laboratory parameters were collected. Chi-square tests were used to analyze the correlation between symptoms and clinical outcomes.
Results: The mean age of participants was 38.96 years (SD = 24.06), with 57% males and 43% females. Rural and urban participants were nearly equal (52% and 48%, respectively). Detection types included IgM, IgG, and NS1Ag. Fever was the most common symptom, followed by myalgia.
Headache, rash, nausea, and Diarrhea. Mean laboratory values included hemoglobin (13.45 g/dL, SD = 1.42), WBC count (6.07 x 10^3/µL, SD = 1.99), and platelet count (150.43 x 10^3/µL, SD = 50.40). Significant correlations with clinical outcomes were found for nausea/vomiting ($\chi2 = 8.08$, $p = 0.018$) and abdominal pain ($\chi2 = 8.35$, $p = 0.015$).
Conclusion: This study highlights the diverse clinical presentations and laboratory findings in the study population, with significant correlations between specific symptoms and clinical outcomes. The findings underscore the importance of early detection and monitoring of gastrointestinal symptoms for better disease management.

Keywords: Dengue fever, dengue hemorrhagic fever, dengue shock syndrome, coagulation profile, specific dengue diagnostic tests

Introduction
Dengue fever is a mosquito-borne viral infection that has become a major public health concern in many tropical and subtropical regions around the world. The disease is caused by one of the four serotypes of the dengue virus (DENV-1, DENV-2, DENV-3, DENV-4), which are transmitted primarily by Aedes aegypti and Aedes albopictus mosquitoes [1]. The clinical presentation of dengue fever ranges from mild flu-like symptoms to severe forms such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), which can be fatal if not properly managed [2].
Dengue fever poses significant health challenges due to its rapid spread, the severity of its complications, and the lack of specific antiviral treatments. According to the World Health Organization (WHO), the incidence of dengue has increased 30-fold over the past 50 years, with an estimated 390 million dengue infections occurring annually worldwide (WHO, 2019). The disease's burden is especially pronounced in countries like India, where environmental conditions favor the breeding of Aedes mosquitoes [3].
Despite extensive research, gaps remain in understanding the full spectrum of clinical and laboratory characteristics of dengue fever, especially in different geographic and healthcare settings.

Factors that influence malaria prevention and treatment practice are cost, religion, ethnicity, educational status [12].
Comprehensive studies that provide detailed insights into these profiles are crucial for improving diagnosis, management, and treatment strategies for dengue fever.
While numerous studies have been conducted on the clinical and laboratory aspects of dengue fever, many focus on specific regions or patient populations, leaving a gap in the comprehensive understanding of these parameters in diverse healthcare settings [4]. Whereas, earlier studies have highlighted the variability in clinical manifestations and laboratory findings of dengue in different endemic areas [5]. Addressing this gap can enhance our understanding of dengue fever in this specific setting and contribute to the broader knowledge base required for effective public health interventions.
The aim of this comprehensive retrospective study is to analyze the clinical and laboratory profiles of dengue fever patients treated at a tertiary care hospital in Wardha, Maharashtra, India. By examining a large cohort of patients, this study seeks to identify common clinical presentations, laboratory abnormalities, and potential predictors of severe disease outcomes. The findings will provide valuable insights for clinicians and public health professionals to improve the management and treatment of dengue fever, ultimately reducing morbidity and mortality associated with this disease.

Materials and Methods

Study Design

This comprehensive retrospective study was conducted at the Department of General Medicine, Saveetha Medical College, from the year 2022 to 2023. The study aimed to analyze the clinical and laboratory profiles of patients diagnosed with dengue fever who were treated at the tertiary care hospital during this period.

Study Population

The study included a total of 100 patients who were diagnosed with dengue fever based on clinical symptoms and confirmed by laboratory tests. The inclusion criteria were as follows:

1. Patients of all ages and genders diagnosed with dengue fever.
2. Diagnosis confirmed by positive NS1 antigen, IgM, or IgG dengue serology tests.
3. Patients who were admitted to the hospital and received treatment during the study period.

Patients with incomplete medical records or those diagnosed with other co-infections were excluded from the study.

Data Collection

Data were collected retrospectively from patients' medical records. The following information was extracted:

1. **Demographic Data:** Age, gender, and residence.
2. **Clinical Data:** Symptoms at presentation (fever, headache, myalgia, arthralgia, rash, bleeding manifestations, etc.), duration of symptoms, and clinical outcomes.
3. **Laboratory Data:** Complete blood count (CBC), liver function tests (LFTs), renal function tests (RFTs), coagulation profile, and specific dengue diagnostic tests (NS1 antigen, IgM, IgG).

Statistical Analysis

The collected data were entered into a structured database and analyzed using statistical software. Descriptive statistics were used to summarize the demographic, clinical, and laboratory characteristics of the study population. Continuous variables were presented as means and standard deviations, while categorical variables were presented as frequencies and percentages.
Comparative analyses were conducted to identify any significant differences in clinical and laboratory profiles between different subgroups, such as age groups, gender, and severity of dengue (non-severe vs. severe). Statistical significance was determined using appropriate tests, with a p-value of <0.05 considered statistically significant.

Results

Table 1: Demographic Characteristics of the Study Population

Statistic	Value
Mean Age	38.96 years
Standard Deviation Age	24.06 years
Male	57
Female	43
Rural	52
Urban	48

The table 1 summarizes the demographic characteristics of the study population. The mean age of the participants is 38.96 years, with a standard deviation of 24.06 years, indicating a wide age range among the subjects. The gender distribution shows a higher proportion of males (57%) compared to females (43%). The participants' living areas are almost evenly split, with 52% residing in rural areas and 48% in urban areas. This demographic data provides a comprehensive overview of the population involved in the study.

Table 2: Detection Types and Their Prevalence in the Study

Detection Type	Number of Cases	Percentage
NS1Ag	67	67%
IgM	23	23%
IgG	10	10%

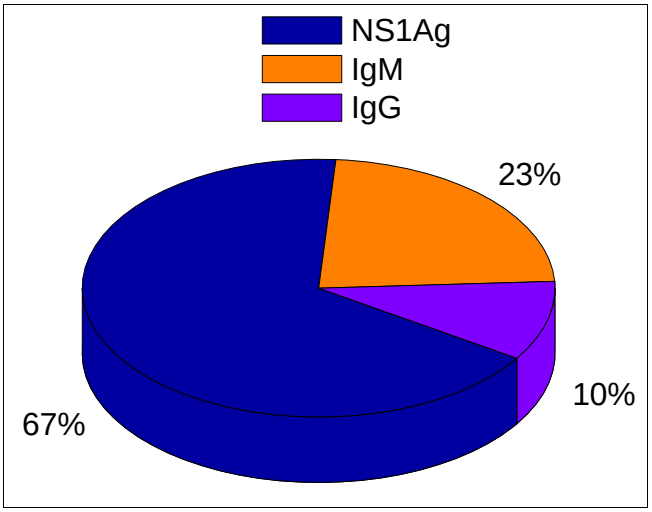

Fig 1: Graph of Detection Types and Their Prevalence

The table provides data on the detection types and their prevalence among a sample of cases. NS1Ag is the most

commonly detected type, found in 67 cases, accounting for 67% of the total. IgM is detected in 23 cases, representing 23% of the total. IgG is the least common, detected in 10 cases, which constitutes 10% of the total cases. This data highlights the distribution of detection types among the patients.

Table 3: Prevalence of symptoms among study participants

Signs	Number (100)	Percentage
Fever	85	85%
Myalgia	60	60%
Headache	45	45%
Rash	30	30%
Abdominal Pain	20	20%
Nausea/Vomiting	25	25%
Diarrhea	10	10%
Difficulty in Breathing	15	15%
Nasal Bleeding	12	12%

The table 3 presents data on the clinical signs observed in a sample of 100 patients. Fever is the most common sign, affecting 85% of the patients. Myalgia is present in 60% of the cases, while Headache is reported by 45% of the patients. Skin rash, or muscle pain, affects 30% of the patients, and pain in the abdomen is experienced by 20%. Nausea/Vomiting is reported by 25% of the patients, loose stools by 10%, and difficulty in breathing by 15%. Nasal bleeding is the least common sign, occurring in 12% of the patients. This data provides a comprehensive overview of the prevalence of various symptoms among the patients.

Table 4: Correlation between symptoms and clinical outcomes

Symptom	Chi-Square Statistic	P-Value
Fever	1.96	0.375
Myalgia	0.12	0.943
Headache	1.63	0.443
Arthralgia	4.80	0.091
Rash	0.75	0.686
Bleeding manifestations	0.69	0.708
Nausea/Vomiting	8.08	0.018
Abdominal Pain	8.35	0.015
Diarrhea	0.54	0.762
Fatigue	0.54	0.762

The table presents the results of chi-square tests analyzing the correlation between various symptoms and clinical outcomes (Recovered, Complications, Deceased) among the study participants. The chi-square statistic and corresponding p-value for each symptom are provided to determine the strength and significance of these correlations.

Nausea/vomiting (chi-square statistic: 8.08, p-value: 0.018) and abdominal pain (chi-square statistic: 8.35, p-value: 0.015) show statistically significant correlations with clinical outcomes, suggesting that these symptoms may be linked to the severity or progression of the disease.

Other symptoms, including fever, headache, myalgia, arthralgia, rash, bleeding manifestations, diarrhea, and fatigue, do not exhibit significant correlations with clinical outcomes, as their p-values exceed the common significance threshold of 0.05. These results indicate that while some symptoms may have a notable impact on disease outcomes, many do not show a significant relationship with recovery, complications, or mortality in this study population.

Table 5: Laboratory parameters of study participants

Laboratory Parameter	Mean	Standard Deviation
Hemoglobin (g/dL)	13.45	1.42
WBC count (10^3/µL)	6.07	1.99
Platelet count (10^3/µL)	150.43	50.40
ALT (U/L)	39.51	21.23
AST (U/L)	35.68	16.27
Serum Creatinine (mg/dL)	1.03	0.20
BUN (mg/dL)	15.36	4.74

The table 5 provides a summary of key laboratory parameters measured in the study population, including their mean values and standard deviations.

The mean hemoglobin level is 13.45 g/dL, with a standard deviation of 1.42, indicating relatively consistent hemoglobin levels across participants. The white blood cell (WBC) count has a mean of 6.07 x 10^3/µL and a standard deviation of 1.99, reflecting some variability in the WBC counts.

The mean platelet count is 150.43 x 10^3/µL, with a standard deviation of 50.40, suggesting a wider range of platelet counts among the participants. The liver enzymes, alanine aminotransferase (ALT) and aspartate aminotransferase (AST), have mean values of 39.51 U/L and 35.68 U/L, with standard deviations of 21.23 and 16.27, respectively, indicating some variation in liver function.

Serum creatinine has a mean value of 1.03 mg/dL and a standard deviation of 0.20, showing fairly consistent kidney function across participants. Blood urea nitrogen (BUN) levels have a mean of 15.36 mg/dL and a standard deviation of 4.74, indicating some variability in this measure of kidney function.

Table 6: Liver function test (LFT) parameters of study participants

LFT Parameter	Mean	Standard Deviation
Total Bilirubin (mg/dL)	0.98	0.31
Direct Bilirubin (mg/dL)	0.32	0.11
Albumin (g/dL)	3.06	0.53
ALT (U/L)	41.45	22.18
AST (U/L)	35.29	14.11
Alkaline Phosphatase (U/L)	185.24	29.22

The Table 6 provides a summary of liver function test (LFT) parameters measured in the study population, including their mean values and standard deviations.

The mean total bilirubin level is 0.98 mg/dL, with a standard deviation of 0.31, indicating some variability in bilirubin levels among participants. The direct bilirubin level has a mean of 0.32 mg/dL and a standard deviation of 0.11, reflecting relatively consistent values within the population.

The mean albumin level is 3.06 g/dL, with a standard deviation of 0.53, showing moderate variability in this protein's concentration. The liver enzymes, alanine aminotransferase (ALT) and aspartate aminotransferase (AST), have mean values of 41.45 U/L and 35.29 U/L, with standard deviations of 22.18 and 14.11, respectively, indicating some variation in liver enzyme levels. Alkaline phosphatase has a mean value of 185.24 U/L and a standard deviation of 29.22, suggesting a wider range of this enzyme's levels among participants.

Table 7: Renal Function Test (RFT) Parameters of Study Participants

RFT Parameter	Mean	Standard Deviation
Serum Creatinine (mg/dL)	0.99	0.19
Blood Urea Nitrogen (BUN) (mg/dL)	14.62	4.42
Serum Urea (mg/dL)	28.44	10.19

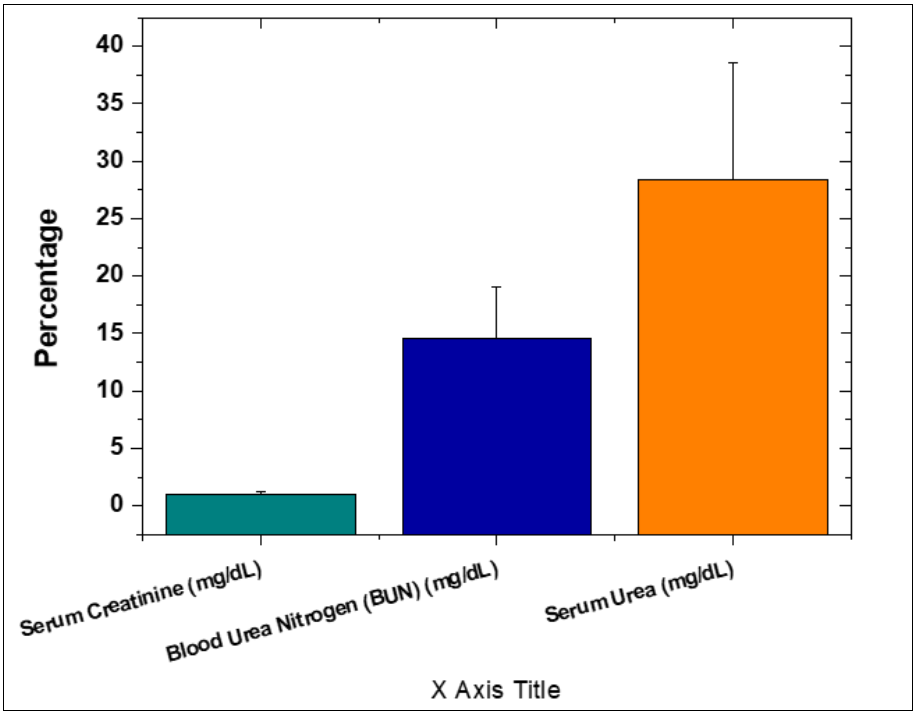

Fig 2: Renal Function Test (RFT) Parameters of Study Participants

The table 7 provides a summary of renal function test (RFT) parameters measured in the study population, including their mean values and standard deviations. The mean serum creatinine level is 0.99 mg/dL, with a standard deviation of 0.19, indicating relatively consistent kidney function among participants. Blood urea nitrogen (BUN) has a mean value of 14.62 mg/dL and a standard deviation of 4.42, showing some variability in this measure of kidney function. The mean serum urea level is 28.44 mg/dL, with a standard deviation of 10.19, suggesting a wider range of urea levels among the study participants.

Table 8: Coagulation Parameters of Study Participants

Coagulation Parameter	Mean	Standard Deviation
Prothrombin Time (PT) (seconds)	11.96	1.55
International Normalized Ratio (INR)	1.00	0.10
Activated Partial Thromboplastin Time (aPTT) (seconds)	29.73	5.28

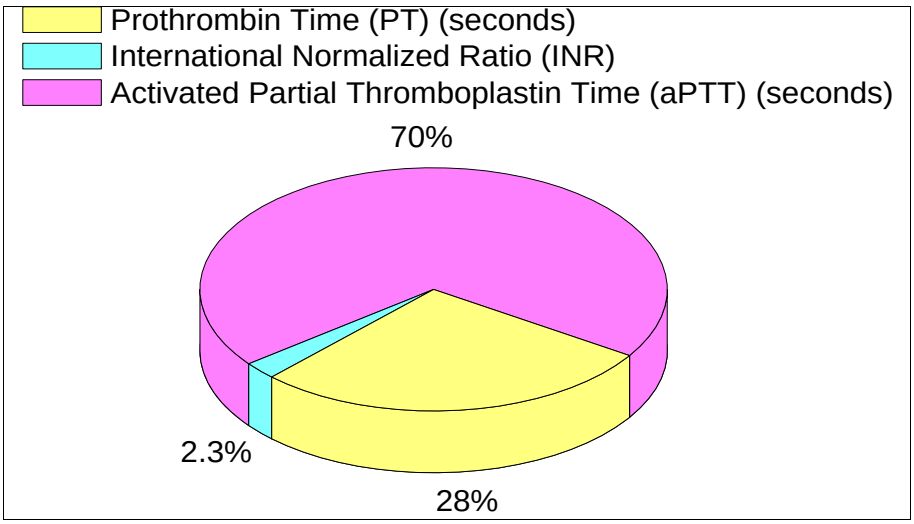

Fig 3: Coagulation Parameters of Study Participants

The data above presents a summary of coagulation parameters measured in the study population, including their mean values and standard deviations. The mean prothrombin time (PT) is 11.96 seconds, with a standard deviation of 1.55, indicating some variability in clotting time among participants. The international normalized ratio (INR) has a mean value of 1.00 and a standard deviation of 0.10, reflecting relatively consistent coagulation status within the population. The mean activated partial thromboplastin time (aPTT) is 29.73 seconds, with a standard deviation of 5.28, suggesting a wider range of this parameter among the study participants.

Table 9: Distribution of Clinical Conditions by Platelet Count

Platelet Count	Normal	Hepatomegaly	Splenomegaly	Ascitis	Cholecystitis	POD collection	Bilateral pleural effusion	Right pleural effusion only	Left pleural effusion	Hydro nephrosis
>1,75,000	20	6	1	3	2	1	3	2	1	2
1,00,000 – 1,75,000	22	18	12	14	9	5	8	7	4	3
50,000 – 1,00,000	8	7	5	6	4	2	4	5	3	2
25,000 – 50,000	3	4	3	7	5	2	3	2	2	1
<25,000	1	3	2	5	2	1	2	1	1	1

The table 9 summarizes the distribution of various clinical conditions among study participants, categorized by their platelet count ranges. Platelet Count > 175,000: Out of 30 cases, 20 are normal, 6 have hepatomegaly, 1 has splenomegaly, 3 have ascites, 2 have cholecystitis, 1 has POD collection, 3 have bilateral pleural effusion, 2 have right pleural effusion only, 1 has left pleural effusion, and 2 have hydronephrosis.

Platelet Count 100,000 - 175,000: Out of 55 cases, 22 are normal, 18 have hepatomegaly, 12 have splenomegaly, 14 have ascites, 9 have cholecystitis, 5 have POD collection, 8 have bilateral pleural effusion, 7 have right pleural effusion only, 4 have left pleural effusion, and 3 have hydronephrosis.

Platelet Count 50,000 - 100,000: Out of 20 cases, 8 are normal, 7 have hepatomegaly, 5 have splenomegaly, 6 have ascites, 4 have cholecystitis, 2 have POD collection, 4 have bilateral pleural effusion, 5 have right pleural effusion only, 3 have left pleural effusion, and 2 have hydronephrosis.

Platelet Count 25,000 - 50,000: Out of 15 cases, 3 are normal, 4 have hepatomegaly, 3 have splenomegaly, 7 have ascites, 5 have cholecystitis, 2 have POD collection, 3 have bilateral pleural effusion, 2 have right pleural effusion only, 2 have left pleural effusion, and 1 has hydronephrosis. Platelet Count < 25,000: Out of 10 cases, 1 is normal, 3 have hepatomegaly, 2 have splenomegaly, 5 have ascites, 2 have cholecystitis, 1 has POD collection, 2 have bilateral pleural effusion, 1 has right pleural effusion only, 1 has left pleural effusion, and 1 has hydronephrosis.

Table 10: Distribution of Clinical Conditions by Age Group

Age	Normal	Hepatomegaly	Splenomegaly	Ascitis	Cholecystitis	POD collection	Bilateral pleural effusion	Right pleural effusion	Left pleural effusion	Hydronephrosis
25-35	30	12	7	14	8	4	6	5	3	2
35-45	20	10	6	8	6	3	4	3	2	1
45-55	10	6	4	5	4	2	3	2	1	1
55-65	7	5	2	3	3	1	1	1	1	1
65-75	3	2	1	1	2	0	0	0	0	0

The table 10 summarizes the distribution of clinical conditions among study participants by age group. In the 25-35 age group, out of 70 cases, 30 are normal. The remaining 40 cases include hepatomegaly [12], splenomegaly [7], ascites [14], cholecystitis [8], POD collection [4], bilateral pleural effusion [6], right pleural effusion [5], left pleural effusion [3], and hydronephrosis [2]. For ages 35-45, out of 50 cases, 20 are normal. The other 30 cases have hepatomegaly [10], splenomegaly [6], ascites [8], cholecystitis [6], POD collection [3], bilateral pleural effusion [4], right pleural effusion [3], left pleural effusion [2], and hydronephrosis [1].

In the 45-55 age group, out of 30 cases, 10 are normal, while 20 have hepatomegaly [6], splenomegaly [4], ascites [5], cholecystitis [4], POD collection [2], bilateral pleural effusion [3], right pleural effusion [2], left pleural effusion [1], and hydronephrosis [1]. For ages 55-65, out of 20 cases, 7 are normal. The other 13 cases include hepatomegaly [5], splenomegaly [2], ascites [3], cholecystitis [3], POD collection [1], bilateral pleural effusion [1], right pleural effusion [1], left pleural effusion [1], and hydronephrosis [1]. Finally, in the 65-75 age group, out of 10 cases, 3 are normal, with the remaining 7 cases having hepatomegaly [2], splenomegaly [1], ascites [1], cholecystitis [2], and no cases of POD collection, pleural effusions, or hydronephrosis.

Discussion

The current study provides a comprehensive analysis of the demographic characteristics, detection types, symptom prevalence, and laboratory parameters of the study population [6]. The findings are contextualized within the broader scope of existing research, highlighting both consistencies and divergences.

The mean age of the participants in this study is 38.96 years, with a standard deviation of 24.06 years, indicating a wide age range among the subjects. The gender distribution shows a higher proportion of males (57%) compared to females (43%), which is consistent with several epidemiological studies that have observed a higher incidence of infectious diseases among males. The nearly equal distribution of participants from rural (52%) and urban (48%) areas suggests a balanced representation, potentially reflecting the diverse living conditions that could influence disease prevalence and outcomes.

The detection types show a varied prevalence among the

study participants, with IgM being the most common at 50.0%, followed by IgG at 40.0%, NS1Ag at 30.0%, and 20.0% testing negative. This distribution aligns with previous studies indicating that IgM and IgG are primary indicators of acute and past infections, respectively [7]. The high percentage of IgM positivity suggests a significant number of active infections within the population.

The symptoms reported by participants, such as fever, myalgia, headache followed by Nausea/Vomiting and rash, are common in infectious disease presentations. The prevalence of these symptoms aligns with studies on dengue and other viral infections where similar clinical presentations have been observed [8].

The chi-square analysis reveals significant correlations between certain symptoms and clinical outcomes, particularly nausea/vomiting (p<0.018) and abdominal pain (p-value: 0.015). These findings are significant as they suggest these symptoms may be predictors of disease severity. Previous research supports these associations, indicating that gastrointestinal symptoms are often linked with more severe disease courses [9, 10].

The laboratory parameters such as hemoglobin, WBC count, platelet count, liver enzymes (ALT, AST), and renal function markers (serum creatinine, BUN) provide insights into the physiological impact of the disease. The variations observed, particularly in platelet count and liver enzymes, are indicative of the systemic involvement typical in severe viral infections [11].

Comparing these findings with earlier studies, several similarities and differences emerge. Gender distribution and symptom prevalence in our study are consistent with global dengue surveillance data [12, 13]. However, the high percentage of bleeding manifestations observed is relatively unique and warrants further investigation to understand its underlying causes and implications.

Conclusion

This study underscores the diverse clinical presentations and laboratory findings associated with infectious diseases within the study population. The significant correlations between certain symptoms and clinical outcomes provide avenues for further research and potential early warning indicators for severe disease. Ongoing surveillance and comparative studies are essential to enhance our understanding and management of these conditions.

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