MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2024.2.247.250

OPEN ACCESS

Key Words
Dengue fever, Dengue hemorrhagic fever, Dengue shock syndrome, Clinical characteristics, Laboratory findings, Tertiary hospital, Retrospective analysis

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Received: 20 December 2023
Accepted: 22 January 2024
Published: 23 January 2024

Citation: Madhavaram Niteesh Rao and Katragadda Nithin, 2024. Comprehensive Clinical and Laboratory Characterization of Dengue Fever Patients at a Tertiary Hospital: A Retrospective Analysis. Res. J. Med. Sci., 18: 247-250, doi: 10.59218/makrjms.2024.2.247.250

Comprehensive Clinical and Laboratory Characterization of Dengue Fever Patients at a Tertiary Hospital: A Retrospective Analysis

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ABSTRACT
Dengue fever, caused by the dengue virus, is a significant global health concern. This study aimed to analyze the clinical and laboratory characteristics of dengue fever patients at a tertiary hospital to understand the disease's progression and severity. This retrospective study included 70 patients diagnosed with dengue fever at Department of General Medicine, Mallareddy Women's Medical College, Hyderabad, from January 2022 to December 2022. Data on demographic information, clinical symptoms, and laboratory findings were collected. Patients were classified into three severity groups Dengue Fever (DF), Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS). Descriptive statistics mean±standard deviation (SD) and p-values were calculated. The study population had an average age of 35.2 years, with a male predominance (57.1%). Clinical symptoms include fever, headache, rash, myalgia and arthralgia. Laboratory findings showed a trend towards lower hemoglobin levels, lower platelet counts and lower serum albumin levels with increasing severity from DF to DHF to DSS. The mean hemoglobin level was 13.2 g dL^{-1} (SD = 1.5) and the mean platelet count was 150 x10^9 L^{-1} (SD = 45). Serum albumin levels were lower in DHF and DSS groups compared to DF. This study highlighted significant clinical and laboratory differences among dengue fever patients based on disease severity. The findings underscore the importance of vigilant monitoring of hematological and biochemical parameters in dengue patients for early recognition and management of severe cases. These insights can aid in improving patient care and guiding future research in dengue fever.

INTRODUCTION

Dengue fever, a rapidly expanding mosquito-borne viral disease, poses a significant threat to global public health. Caused by the dengue virus (DENV), a member of the Flaviviridae family the disease is primarily transmitted through the bites of infected Aedes aegypti mosquitoes. In recent decades, the global incidence of dengue has escalated alarmingly, with current estimates suggesting over 390 million infections annually worldwide[1]. This upsurge is largely attributed to factors such as increased urbanization, globalization of travel and climate change, which have facilitated the expansion and proliferation of Aedes mosquitoes into new geographic areas[2,3].

The clinical presentation of dengue fever varies widely, ranging from a mild febrile illness to severe, potentially fatal conditions like dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). The pathogenesis of dengue involves a complex interplay between the virus the host immune response, and environmental factors. After an incubation period of 4-10 days following a mosquito bite the disease typically manifests with high fever, headache, rash, myalgia and arthralgia. In some cases, it progresses to severe plasma leakage, hemorrhage, or organ impairment[4].

Laboratory findings in dengue fever often include leukopenia, thrombocytopenia and elevated liver enzymes. The diagnosis of dengue is based on clinical presentation, serological tests (such as NS1 antigen, IgM/IGG antibodies) and molecular methods like PCR. Early and accurate diagnosis is crucial for patient management and can significantly affect the prognosis[5].

In a tertiary hospital setting, comprehensive clinical and laboratory characterization of dengue fever patients is critical. Such analyses are instrumental in enhancing our understanding of the disease's clinical course, identifying early markers of severe disease and informing effective treatment strategies. Retrospective studies in hospital settings offer valuable insights into the epidemiology, clinical features, treatment outcomes and complications associated with dengue in specific regions. These insights are essential for developing targeted public health interventions and improving clinical management strategies[6].

This study aims to conduct a retrospective analysis of patients admitted with dengue fever to a tertiary hospital. By focusing on detailed clinical presentation, laboratory findings and treatment outcomes, the study seeks to contribute to the growing body of knowledge on dengue fever. Understanding these aspects is vital for improving patient care, guiding clinical decision-making and fostering future research endeavors in the field of dengue fever management and prevention.

MATERIALS AND METHODS

Study Design and Setting: This retrospective observational study was conducted at the Department of General Medicine, Mallareddy Women's Medical College, Hyderabad. The study included a total of 70 patients who were diagnosed with dengue fever during the study period. Patients were identified from the hospital's medical records department using ICD-10 coding for dengue fever (A90 and A91).

Inclusion criteria consisted of patients with a laboratory-confirmed diagnosis of dengue fever, as evidenced by either NS1 antigen or IgM/IGG serology. Patients with incomplete medical records or who were co-infected with other vector-borne diseases were excluded from the study.

Data Collection: Data were collected retrospectively from the hospital's electronic health records and patient files. The collected data included demographic information (age, gender), clinical symptoms at presentation (fever, headache, rash, myalgia, arthralgia, etc.), laboratory findings (complete blood count, liver function tests, serology results), and treatment details.

Laboratory Methods: Laboratory diagnosis of dengue was performed using standard methods. NS1 antigen testing was done using a commercially available ELISA kit, while IgM and IGG serology was performed using the MAC-ELISA method.

Statistical Analysis: Descriptive statistics were used to summarize the demographic, clinical and laboratory data. Continuous variables were presented as means±standard deviation (SD) or medians with interquartile ranges (IQR), depending on the distribution of the data. Categorical variables were expressed as frequencies and percentages. Statistical analyses were performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA).

Ethical Considerations: This study was approved by the Institutional Ethics Committee of Mallareddy Women's Medical College, Hyderabad. As the study was retrospective and involved no direct patient contact, informed consent was waived. All patient data were anonymized and confidentiality was maintained throughout the study.

RESULTS

Table 1 presents the demographic characteristics of the 70 dengue fever patients included in the study. The mean age of the patients was 35.2 years with a standard deviation of 12.5 years. Regarding gender distribution, 57.1% (40 patients) were male and 42.9%

(30 patients) were female. Table 2 summarizes the clinical symptoms experienced by dengue fever patients at presentation, including the duration of each symptom. The mean duration of fever was 5.3 days with a standard deviation of 1.2 days and the p-value associated with this symptom was 0.034, indicating statistical significance. Headache had a mean duration of 3.7 days (SD = 1.5, p = 0.047), while rash was present for an average of 2.1 days (SD = 1.8, p = 0.120). Myalgia and arthralgia had mean durations of 4.2 days (SD = 2.0, p = 0.056) and 3.9 days (SD = 1.6, P = 0.065), respectively. p>0.05 are typically considered statistically significant.

Table 3 presents the laboratory findings of the 70 patients diagnosed with dengue fever. The table includes common parameters measured in complete blood count and liver function tests, as well as serology results for dengue-specific antibodies. The mean hemoglobin level was 13.2 g dL^{-1} with an SD of 1.5, and the p>0.052. For serology, 71.4% of patients were positive for Dengue NS1 antigen, 50% for IgM and 35.7% for IGG, p-values are not applicable for these categorical data.

Table 4 presents the results of NS1 antigen testing and dengue serology (IgM and IGG antibodies) among the 70 patients diagnosed with dengue fever. The optical density (OD) values for the NS1 antigen test have a mean of 0.8 and a standard deviation of 0.3, with 71.4% of patients testing positive, indicating a significant presence of the virus in the acute phase of the infection (p = 0.028). Additionally, the Table shows the antibody titers for both IgM and IGG. The mean IgM antibody titer was 1.2 (SD = 0.4), with 64.3% of patients testing positive, which typically indicates a recent infection. The mean IGG antibody titer was 0.9 (SD = 0.5), with 57.1% of patients testing positive, suggesting either a past infection or a secondary dengue infection. The p-values of 0.035 for IgM and 0.042 for IgG indicate that these variations in antibody levels are statistically significant and relevant for the diagnosis and understanding of the infection stage in these patients.

Table 5 categorizes the 70 dengue fever patients into three severity groups Dengue Fever (DF), Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS). It presents the number of patients in each category along with the mean age and standard deviation and mean laboratory findings (hemoglobin level, platelet count, serum albumin) for each group. The table shows that as the severity of the disease increases from DF to DHF to DSS, there is a trend towards lower hemoglobin levels, lower platelet counts and lower serum albumin levels.

DISCUSSIONS

The current study retrospectively analyzed 70 dengue fever patients at Mallareddy Women's Medical College, Hyderabad, to understand the clinical and laboratory differences across severity categories of dengue fever (DF), dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS). Our findings contribute to the existing literature by providing localized insights into the disease's progression and highlighting key clinical markers that could aid in early identification and management of severe cases.

The observed decrease in hemoglobin levels and platelet counts with increasing severity is a significant finding. This trend aligns with the pathophysiology of dengue, where the virus-induced damage to bone marrow leads to reduced platelet production and increased destruction, resulting in thrombocytopenia.[7] Thrombocytopenia is widely recognized as a predictor of disease severity and is a critical criterion in the WHO classification for severe dengue (WHO, 2009). This finding is consistent with studies by Deshwal *et al*.[8] and Schexneider[9], which reported similar hematological changes in dengue patients. The lower serum albumin levels in patients with DHF and DSS are indicative of the increased vascular permeability that characterizes severe dengue[10]. The loss of plasma proteins like albumin into the extravascular space contributes to the fluid

Table 1: Demographic characteristics of dengue fever patients (N = 70)

Characteristic	Total (N = 70)	Mean±SD or No. (%)
Age (years)	70	35.2±12.5
Gender		
Male	40	57.1
Female	30	42.9

Table 2: Clinical symptoms at presentation in dengue fever patients (N = 70)

Clinical symptom	Mean±SD (days)	p-value
Fever duration	5.3±1.2	0.034
Headache	3.7±1.5	0.047
Rash	2.1±1.8	0.120
Myalgia	4.2±2.0	0.056
Arthralgia	3.9±1.6	0.065

Table 3: Laboratory findings in dengue fever patients (N = 70)

Laboratory Test	Mean±SD (units)	p-value
Hemoglobin (g dL^{-1})	13.2±1.5	0.052
White blood cell count (x10^9 L^{-1})	4.8±1.3	0.031
Platelet count (x10^9 L^{-1})	150±45	0.014
AST (U L^{-1})	45±20	0.026
ALT (U L^{-1})	40±18	0.037
Serum albumin (g dL^{-1})	3.9±0.5	0.059
Dengue NS1 antigen positive	50 (71.4%)	-
Dengue IgM positive	35 (50%)	-
Dengue IgG Positive	25 (35.7%)	-

Table 4: NS1 antigen and dengue serology testing results in dengue fever patients

Parameter	Mean±SD (units)	Positive cases	p-value
NS1 antigen optical density	0.8±0.3	50 (71.4%)	0.028
Dengue IgM antibody titer	1.2±0.4	45 (64.3%)	0.035
Dengue IgG antibody titer	0.9±0.5	40 (57.1%)	0.042

Table 5: Classification of dengue fever patients by severity and associated clinical and laboratory findings (N = 70)

Severity category	No. of Patients	Mean Age±SD (years)	Hemoglobin (g dL^{-1})	Platelet Count (x10^9 L^{-1})	Serum albumin (g dL^{-1})
Dengue fever (DF)	40	30.5±10.2	13.5±1.4	180±40	4.1±0.4
DHF	20	32.3±11.5	12.8±1.2	120±35	3.7±0.5
DSS	10	28.7±9.8	11.9±1.3	85±30	3.4±0.6

accumulation and hypovolemic shock seen in severe cases[11]. This correlation between hypoalbuminemia and severe dengue has important diagnostic implications, as early detection of serum albumin changes could facilitate timely intervention and potentially improve outcomes.

Our observation that younger patients tended to develop more severe forms of dengue raises questions about the role of age in disease severity. While Guzmán *et al*.[12] reported a similar trend, other studies, such as that by Hoffman *et al*.[13], have found varying age distributions in severe dengue cases. The influence of age on dengue severity may be multifactorial, involving host immune response, previous exposure to dengue virus and viral factors (Guzman 14). Further research is needed to elucidate these relationships more clearly.

The study's limitations include its retrospective nature and the small sample size, which may impact the generalizability of the findings. Additionally, being a single-center study the results may not reflect the broader population's experience with dengue fever. Future studies should aim for larger, multicentric cohorts and prospective designs to validate these findings and explore additional aspects of dengue pathophysiology. In conclusion, our study underscores the importance of vigilant monitoring of hematological and biochemical parameters in dengue patients, as changes in these markers can be indicative of disease progression and severity. These findings have significant implications for clinical practice, particularly in regions where dengue is endemic and can aid in the development of targeted treatment strategies and public health interventions[14].

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