Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/vbt94a79

COMPARATIVE EVALUATION OF CLINICO HEMATOLOGICAL PROFILE IN NS-1 ANTIGEN CONFIRMED DENGUE CASES

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ABSTRACT

Background: Dengue Fever is a self - limiting illness which is spread by the bite of *Aedes aegypti* mosquito. WHO estimates about 50 to 100 million dengue cases every year. Nearly 300,000 cases of dengue hemorrhagic fever are reported with 24,000 deaths every year. In India dengue fever has become more frequent in the recent years. Diagnosis mainly depends on NS-1 antigen detection and IgM antibody detection.

Aims and Objective: This study aims to assess the correlation between clinical manifestations and haematological profile in the confirmed of dengue. Settings and design: One year hospital based observational study.

Materials and Methods: A total of 220 NS-1 dengue positive cases admitted were analysed and correlated with clinical features, haematological and biochemical findings. Statistical analysis used: Chi-square test or Fisher's exact test and Spearman's correlation coefficient were used. A probability value i.e, 'p' value of equal to or less than 0.05 was considered as significant statistically.

Results: Out of 220 dengue patients, 194 were with dengue fever and 26 with dengue haemorrhagic fever. Common clinical features were fever, arthralgia, myalgia, itching, abdominal pain and rash. The main laboratory findings were thrombocytopenia, raised hematocrit, leucopenia, raised SGPT, SGOT and serum alkaline phosphatase.

Conclusion: Dengue fever continues to be a significant health problem. It is important to correlate clinical examination with laboratory profile in dengue patients to minimize the morbidity and mortality arising out of serious complications of dengue fever.

Keywords: Dengue fever, Dengue haemorrhagic fever, NS-1 antigen and Thrombocytopenia.

INTRODUCTION

Dengue is a mosquito-borne illness attributed to Arbovirus, which is transmitted to humans through the bite of the female Aedes aegypti mosquito.[1] DENGUE VIRUS (DV) refers to an enveloped, single-stranded RNA virus belonging to the Flaviviridae family, characterized by four serotypes: DV-I, DV-II, DV-III, and DV-IV. All four serotypes may result in a spectrum of illnesses, from the self-limiting dengue fever (DF) to the severe and potentially fatal dengue hemorrhagic fever or

dengue shock syndrome (DHF/DSS).[2]
Approximately 50 million cases of dengue fever are reported each year.[2] In India, the prevalence of epidemics is escalating as a result of accelerated urbanization and inadequate water resource management, compounded by suboptimal water storage practices.[3,4] Prompt identification of dengue fever is crucial for effective subsequent management.[5] Serological assays are extensively employed; however, their accuracy is contingent upon the timing of sample collection. A contemporary method for the early detection of dengue fever involves the identification of the NS1 antigen. These diagnostic immunochromatographic strip kits can facilitate the early identification of dengue and decrease the turnaround time.[6] The early manifestations of dengue are characterized by a lack of specificity. This study seeks to establish a correlation between clinical assessment and laboratory findings in individuals with dengue, with the objective of reducing morbidity and mortality resulting from severe complications associated with dengue fever.

AIM AND OBJECTIVES

To evaluate clinical and hematological profile of NS-1 antigen confirmed dengue cases

MATERIAL AND METHODS

This investigation constitutes a two-year hospital-based observational study, conducted in the department of Pathology at Prasad Institute of Medical Sciences, Lucknow, U.P., India. Any male or female patient hospitalized from January 2023 to December 2025 with a diagnosis of dengue fever and laboratory confirmation (NS). Individuals with a positive result from a rapid antigen test were included in the study.
The study enrolled a total of 220 participants. Individuals with co-infections that may confound the interpretation of laboratory diagnostics, as well as immunocompromised patients and those unwilling to participate, were excluded from the study.
Written consent was obtained from all individuals who tested positive for dengue. A comprehensive clinical history was obtained, accompanied by thorough hematological, electrolyte, and serological evaluations. The patients were assessed for clinical characteristics according to symptoms including fever, arthralgia, myalgia, hemorrhagic disorders, abdominal and retro orbital pain, pruritus, and skin rash.
The blood count was executed utilizing a fully automated hematology analyzer (Beckman Coulter). The peripheral smears were subsequently stained with Wright's stain.
The biochemical analyses were conducted using an automated Clinical Biochemistry analyzer.

Ethical approval

Acquired from the Institutional Ethical Committee. Informed written consent was procured from all study participants, and only those individuals consenting to sign the informed consent were incorporated into the research.

Statistics

The collected data were encoded and subsequently inputted into Microsoft Excel. The association among variables was ascertained through the application of the chi-square test or Fisher's exact test, along with Spearman's correlation coefficient. A probability value, specifically a "p" value, of 0.05 or less was deemed statistically significant.

RESULT

Among the 220 individuals diagnosed with dengue, 194 were identified as having Dengue Fever (DF), while 26 were diagnosed with Dengue Hemorrhagic Fever (DHF).

Demographic distribution

In the current investigation, 73.6% (n=162) of the patients were identified as male, while 26.4% (n=58) were classified as female. The ratio of male to female individuals was 2.8:1, with the largest

proportion of patients (60.9%) falling within the age range of 14 to 50 years.

Table 1: Distribution according to age

Age groups	Number of patients	Percentage
1 – 13 years	49	22.3%
14 – 50 years	134	60.9%
>50 years	37	16.8%
Total	220	100%

Clinical Profile

Fever was the predominant clinical manifestation, observed in all patients upon initial presentation. The presentation of fever lacked a distinct pattern and was predominantly characterized by its high grade. Additional prevalent characteristics included arthralgia, myalgia, abdominal discomfort, retro-orbital pain, and pruritus. Skin rash and hemorrhage from the gums and nose were predominantly observed as petechiae and purpura. observed in instances of dengue hemorrhagic fever. No mortality was documented.

Table 2: Haemoglobin levels in dengue patients

Parameters	DF (n-154)	DHF (n-66)
Fever	154 (100%)	66 (100%)
Arthralgia	116 (75.3%)	41 (62.1%)
Myalgia	114 (74.0%)	54 (81.8%)
Itching	89 (57.8%)	21 (31.8%)
Abdominal pain	76 (49.3%)	52 (78.8%)
Rash	65 (42.2%)	56 (84.8%)
Retro orbital pain	79 (51.3%)	16 (24.2%)
Bleeding disorder	19 (12.3%)	66 (100%)

Laboratory profile

The most prevalent hematological abnormalities included thrombocytopenia, elevated hematocrit, and leucopenia. Leukocytosis was noted in the majority of patients at admission during the initial days of the illness, subsequently transitioning to leukopenia from the fourth day onwards. DHF cases were observed to have low MPV.

Biochemical profile

Significantly elevated serum bilirubin, SGOT, SGPT, and alkaline phosphatase levels were noted in both dengue fever (DF) and dengue hemorrhagic fever (DHF) cases.

Renal function tests, including serum urea, creatinine, and uric acid levels, were found to be within the normal reference ranges.

Electrolyte levels indicated normal serum potassium and chloride concentrations; however, the majority of cases presented with hyponatraemia.

Table 3: Distribution of patients according to PCV levels

Investigations	DF (n-154)	DHF (n- 66)
Normal Hb	64 (41.5%)	34 (51.5%)
Raised Haematocrit	78 (50.6%)	32 (48.5%)
Leucopenia	71 (46.1%)	20 (30.3%)
Thrombocytopenia	154 (100%)	66 (100%)
Low MPV	29 (18.8%)	43 (65.2%)
Raised SGOT	113 (73.4%)	53 (84.8%)
Raised SGPT	115 (74.7%)	49 (74.2%)
Raised ALP	104 (67.5%)	56 (84.8%)

Raised Bilirubin	57 (37.0%)	34 (51.5%)
Hyponatraemia	36 (23.4%)	42 (63.6%)

Platelet count was further divided depending upon severity.

Table 4: Distribution of patients according to MPV levels

Platelet	**Number of patients**	**Percentage**
<20,000	42	19.1%
20,000 – 49,999	48	21.8%
50,000 – 99,999	99	45.0%
1,00,000 – 1,49,999	24	10.9%
>1,50,000	7	3.2%
Total	220	100%

Maximum cases had moderate thrombocytopenia with a platelet count between 50,000-99,999 lacs/cumm.

Table 5: Distribution of patients according to total leucocyte count

Clinical features		**HB**	**PCV**	**MPV**	**TLC**	**Platelet**
Fever	r	NA	NA	NA	NA	NA
	p	NA	NA	NA	NA	NA
	n	220	220	220	220	220
Rash	r	-.097	-.168	.201	-.053	.408
	p	.286	.065	.028*	.555	.0001*
	n	220	220	220	220	220
Myalgia	r	.132	.161	.082	.084	.131
	p	.149	.081	.371	.354	.183
	n	220	220	220	220	220
Arthralgia	r	-.173	-.058	.079	.043	-.194
	p	.061	.538	.399	.647	.044*
	n	220	220	220	220	220
Itching	r	.000	.167	.103	.024	.078
	p	.997	.068	.262	.801	.428
	n	220	220	220	220	220
Abdominal pain	r	.097	-.048	.324	.074	.091
	p	.298	.598	.0001*	.418	.357
	n	220	220	220	220	220
Retro orbital pain	r	-.021	.005	-.011	-.008	.098
	p	.831	.968	.914	.941	.309
	n	220	220	220	220	220
Bleeding disorder	r	-.118	-.013	.206	-.132	-.542
	p	.196	.896	.023*	.154	.0001*
	n	220	220	220	220	220

r=Correlation Coefficient, p = p value (probability value), n = number of study participants
* = Statistically significant

Interpretation: All the clinical features were correlated using “Spearman’s correlation”.

The correlation coefficient (r) ranged from -1 to +1, with a negative value denoting a negative correlation and a positive value signifying a positive correlation. The p-value A p-value of less than 0.05 was deemed statistically significant.

A value of 'r' below 0.3 indicated a weak correlation, while a value above 0.7 suggested a strong correlation between two variables. Fever was observed in all participants of the study, consequently, it was not possible to calculate the correlation coefficient with respect to the hematological results. Individuals exhibiting rash demonstrated significant positive correlations with mean platelet volume (MPV) and platelet counts, which were determined to be statistically significant.

Arthralgia demonstrated a modest hematological correlation; however, the association with platelet levels was determined to be statistically significant, despite displaying a slight negative correlation coefficient. Abdominal pain exhibited a moderate positive correlation (r = 0.32) with mean platelet volume (MPV), which was determined to be statistically significant. Individuals with bleeding disorders exhibited a weak positive statistically significant correlation with Mean Platelet Volume (MPV), while a moderate negative and highly statistically significant correlation was observed with platelet counts.

Table 6 illustrates the relationship between platelet count and clinical observations through the utilization of Spearman's correlation coefficient. It was noted that the nature of fever, arthralgia and bleeding disorders exhibited a negative correlation with platelet counts, as indicated by correlation coefficients (r) of -0.737, -0.192, and - 0.542, respectively. Within the entirety of these observations, a notable correlation was identified between platelet count and the specific type of fever experienced by the patient, as well as the presence of bleeding disorders. These findings were determined to be highly statistically significant (p = 0.0001).

Table 6: Correlation between clinical and haematological findings using Spearman's correlation coefficient

Correlation coefficients	Fever	Type of fever	Rash	Arthralgia	Myalgia	Itching	Abdominal pain	Retro- orbital pain	Bleeding disorder
R	NA	-.737	.408	-.192	.131	.076	.091	.098	-.542
P	NA	.0001	.0001*	.044*	.183	.426	.354	.307	.0001*
N	120	220	220	220	220	220	220	220	220

All other clinical findings i.e., Rash, Myalgia, Itching, Abdominal pain and Retro orbital pain were positively correlated and all of them were found to be statistically significant. ($P<0.05$).

DISCUSSION

The prompt diagnosis of dengue presents a challenge due to its initial manifestation of nonspecific symptoms, such as fever, arthralgia, and myalgia, which resemble those associated with viral infections, malaria, and other conditions. typhoid fever, a disease that is endemic in the nation. Serological assays identify viruses at a later stage of the disease progression. Hematological analyses facilitate the prompt and early identification of dengue, while also predicting the emergence of severe dengue. These inquiries prove to be highly beneficial in rural environments characterized by resource constraints.

The predominant age range in this study was 14-50 years (60.9%). This demographic represents the working-age population, and consequently, these individuals are More vulnerable to mosquito bites due to occupational exposure.[7-9] Males constituted 73.6% and females 26.4%, resulting in a male to female ratio of 2.8:1. A predominance of males was observed. observed a relationship that aligned with findings from other research. [10,11]

In this investigation, 70.0% of cases were identified as Dengue Fever (DF), while 30,0% were diagnosed with Dengue Hemorrhagic Fever (DHF), with no cases exhibiting signs and symptoms indicative of Dengue Shock Syndrome (DSS). Hospitals equipped with a well-trained workforce and adequate resources have documented a decreased prevalence of Dengue shock syndrome. [11, 12]

In this research, all 120 participants (100%) exhibited fever as the primary symptom, accompanied by myalgia in 80% and arthralgia in 74.2% of the subjects. Less frequently encountered symptoms included abdominal discomfort, pruritus, and cutaneous eruptions. A bleeding disorder was observed in 37 (30.8%) patients. 7,13 The primary clinical characteristic of DHF was fever accompanied by severe myalgia, intense arthralgia, hemorrhagic diathesis, retro-orbital pain, and cutaneous eruption. 14

In this investigation, a significant proportion of patients (55.0%) exhibited elevated hematocrit levels resulting from hemoconcentration associated with plasma leakage, which suggests the

presence of hypoalbuminemia. This phenomenon serves as an indicator of Severity is significantly correlated with a heightened risk of DH.15 Consequently, this parameter can serve as an early indicator of plasma leakage and a valuable diagnostic tool. prognostic indicator. Thrombocytopenia was observed in 98.3% of cases, while leucopenia was noted in 54.2% of cases, which is consistent with the results of other research. 16-20 A significant proportion of the patients (67.5%) exhibited normal Mean Platelet Volume (MPV). Thrombocytopenia can be induced by a variety of factors and may arise as a result of immune responses directed against platelet that induces the attachment of dengue antigens to platelets, subsequently leading to their immunological destruction facilitated by antibodies. Additionally, it may be a consequence of The outcome of direct dengue virus infection on megakaryocytes leads to enhanced platelet destruction. During the acute phase of the fever, thrombocytopenia is observed. attributed to the suppression of bone marrow function. 21
Leukopenia results from the inhibition of the myeloid lineage in the bone marrow by the dengue virus during the acute stage of the illness.
This research indicated elevated liver enzyme levels in individuals diagnosed with dengue fever. Similar findings were observed in previous studies. 22-24
The etiology of hepatic dysfunction is complex and can occur as a consequence of hypoxia, direct viral impact, or immune-mediated injury. Dengue virus specifically targets the Kupffer cells and hepatocytes within the liver. It interacts with receptors upon entering the cell and subsequently undergoes internalization. The cell undergoes endocytosis, resulting in cellular apoptosis. 27,30
Alkaline phosphatase (ALP) is typically elevated in hepatobiliary disorders that induce cholestasis. 23,31
All dengue patients exhibited normal serum urea and serum creatinine levels. Similar findings have been reported in additional studies as well. 32,33
Hyponatremia was observed in the majority of cases, potentially attributable to salt depletion, inadequate renal excretion, inappropriate antidiuretic hormone levels, or the introduction of The presence of sodium within cells results in the impaired functionality of the sodium-potassium pump.

CONCLUSION

The results of this investigation underscore considerable differences in the clinical characteristics of dengue fever as determined by clinical manifestations and laboratory indicators. Clinical manifestations including myalgia, arthralgia, rash, abdominal discomfort, retro-orbital pain, and pruritus, along with laboratory metrics such as platelet count, total cell count, hematocrit, and hepatic function, characterize this condition. enzymes exhibited considerable variations and merit correlation for timely diagnosis and efficacious management.

Source of fund: None

Conflict of interest: None

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