

## ORIGINAL RESEARCH

### Clinico-laboratory profile of Dengue Fever patients in a Tertiary Care Hospital in Northern India

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Received: 24May 2024

Accepted: 19 June 2024

#### ABSTRACT

**Introduction-** Dengue is a dreaded mosquito-borne viral disease with a wide spectrum of presentations ranging from subclinical disease to severe dengue. It is endemic in tropical regions. The objective of this study was to assess the clinical and laboratory profile of dengue patients in a tertiary care hospital in Northern India.

**Material and methods-** The present cross-sectional study was conducted among the confirmed cases of dengue fever for a period of three months at a tertiary care hospital in Northern India. A total of 530 confirmed cases of dengue were studied. The clinical, biochemical, and haematological profiles of the patients were analysed after their classification as per WHO guidelines into one of the three groups.

**Results-** Of the 530 cases, 71.3% were males and 28.68% were females. Most of the subjects were in the age group of 21-30 years (37.17%) while only 0.94% belonged to the age group greater than 60 years. A total of 74.2% were classified into dengue fever group, 19.1% dengue hemorrhagic fever and only 6.7% in the dengue shock group. The most common symptoms were fever (98.49%) and bodyache (89.06%) while ascites (40%) was the most common clinical finding followed by pleural effusion 24.75%. Mortality rate among the patients was 2.1% and a significant association was observed between mortality rate and pleural effusion. Mortality was highest in dengue shock group 16.8%. Leucopenia (44.1%) was the commonest laboratory finding in patients with dengue fever while elevation in liver enzymes (SGOT) was encountered in 69.4% and 75.2% patients with dengue shock syndrome and dengue hemorrhagic fever respectively.

**Conclusion-** Fever was the commonest presenting symptom of a dengue infection. Leucopenia, thrombocytopenia, anemia, and increased liver enzymes were the frequent associated laboratory findings. It is imperative to understand these clinical and laboratory characteristics for the timely diagnosis, assessment of dengue infection severity, prediction of any associated risk factors with severity and general management of the illness.

**Keywords** – Clinical, Dengue Fever, Dengue Hemorrhagic Fever, Dengue Shock, Hematological, Laboratory Profile

#### INTRODUCTION

Dengue fever is an arboviral disease spread by mosquitoes. The primary symptom of dengue is high fever, however the disease can range in severity from asymptomatic to severe shock.[1,2] The World Health Organization estimates that between 50 and 100 million cases of dengue fever occur each year in more than 100 endemic countries. [3] The World Health Organization (WHO) divided dengue into three categories: dengue fever, dengue hemorrhagic fever and dengue shock syndrome[1]

In humans, dengue fever is the most prevalent arboviral infection (virus carried by arthropods) and is caused by one of the four serotypes of a single-stranded RNA virus belonging to the genus Flavivirus, dengue virus (DENV) [4,5]. It consists of the four serotypes DENV1, DENV2, DENV3, and DENV4, which are closely related but antigenically distinct. [6] While DENV1 and DENV3 are widely distributed, all four serotypes have been isolated in India where most of the cases are seen during the monsoon season. A person can get infected with any of the four serotypes, but infection with only one serotype results in lifetime homotypic immunity to that serotype and a very short period of partial heterotypic immunity to other serotypes. The dengue virus, in our part of the world mostly spreads by the bite of Aedes aegypti mosquito and manifests in three clinical stages: febrile phase, critical phase and recovery phase.[7, 8]

Dengue infections may be asymptomatic at the outset in 50-90% cases.[9] Mostly, it can manifest either as a general febrile sickness or a complex set of symptoms typical of dengue fever. The symptoms of classic dengue fever include a sharply rising temperature, headache, retro-orbital pain, weakness, nausea, sore throat, vomiting,

altered taste perception, and centrifugal maculopapular rash. Severe dengue (DHF/DSS) can result due to plasma leakage and may get complicated with hemorrhage or organ involvement. A person infected with one serotype of dengue fever (DHF) and harboring another serotype from previous infection may occasionally experience both types of infections simultaneously.[4]

In higher altitude areas like Northern India, several factors contribute in the spread of dengue such as unplanned urbanization, an increase in average temperature, and inadequate sanitation. The clinical and laboratory profile is essential for diagnosis and patient management of dengue as it affects nearly every system of the body. However, there are not many studies on the clinical and laboratory characteristics of dengue patients from our part of the country. The purpose of this study is to assess the clinical and laboratory characteristics of confirmed dengue patients so that early diagnosis and proper management helps in reducing the mortality.

## **MATERIAL & METHODS**

The present cross-sectional study was conducted among confirmed cases of dengue fever for a period of three months at a tertiary care hospital in Northern India. Ethical clearance was obtained from ethical review board before commencement of study. A written informed consent after explaining about the study procedure was taken from all the participants.

A total of 530 confirmed cases of dengue fever were taken for the study. Patients with positive test results in the form of either Dengue IgM or NS1 antigen, or both, were considered to have positive dengue serology and were included in the study. Patients with negative dengue serology and the co-existence of other infectious diseases were excluded from the study.

The patient's history and physical examination, as well as the hematological, biochemical, microbiological, and serological findings recorded during admission together with duration of hospitalization were assessed and analyzed. Based on the clinicopathological parameters patients were divided into three groups: dengue fever (DF), dengue shock syndrome (DSS) and dengue hemorrhagic fever (DHF).

All patients presenting with febrile illness were subject to battery of tests such as malaria card test, Chikungunya serology, rickettsia serology and typhidot IgM to exclude other infections.

Aspartate transaminase (AST) or alanine transaminase (ALT)  $\geq 1000$ , impaired consciousness, an increase in fluid accumulation, respiratory distress, and severe organ involvement were all associated with severe dengue. Severe plasma leakage contributes to these complications.[1,2]

A platelet count of less than  $150,000 \text{ cells/mm}^3$  was referred to as thrombocytopenia while a hemoglobin level of less than 13 gm/dl for men and less than 12 gm/dl for women was anemia. A pack-cell volume (PCV) of more than 52% for men and more than 47% for women was considered hemoconcentration and a total white blood cell count of less than  $4,500 \text{ cells/mm}^3$  was referred to as leucopenia.

The clinical, biochemical, and haematological profiles of all patients were compared and examined after the classification into one of the three groups (WHO guidelines). To enter and analyze the data, SPSS version 25.0 was used. The chi-square test and descriptive statistics were used to provide results. A p value less than 0.05 was considered as significant.

## **RESULTS**

Of 530 cases 71.3% were males and 28.68% were females. Most subjects were from the age group of 21-30 years (37.17%) while least were from the age group of greater than 60 years (0.94%). A total 74.2% were classified into dengue fever group, 6.7% dengue shock syndrome and 19.1% into dengue hemorrhagic fever group as shown in Table 1.

**Table 1: Gender and Age distribution among the Study Subjects**

Variables	N=530	%
Gender		
Male	378	71.32
Female	152	28.68
Age Group (in years)		
18-20	56	10.57
21-30	197	37.17
31-40	177	33.40
41-50	58	10.94
51-60	37	6.98
>60	5	0.94
Type of Dengue		
Dengue Fever	393	74.2
Dengue Shock Syndrome	36	6.7
Dengue Hemorrhagic Fever	101	19.1

The most common symptoms were fever (98.49%) and bodyache (89.06%) followed by headache (58.68%), loose stools (37.92%), abdominal pain (36.79%), bleeding manifestations, (22.64%), rash (21.32%), vomiting (20%) , sore throat (16.23%), shortness of breath (8.49%), hypotension (7.74%) and encephalopathy (3.02%) as shown in Table 2.

**Table 2: Clinical presentation among the Study Subjects**

Variables	N=530	%
Fever	522	98.49
Headache	311	58.68
Body ache	472	89.06
Sore Throat	86	16.23
Loose Stools	201	37.92
Abdominal Pain	195	36.79
Vomiting	106	20.00
Shortness of breath	45	8.49
Hypotension	41	7.74
Encephalopathy	16	3.02
Rash	113	21.32
Bleeding Manifestation	120	22.64

The mean±SD value of various laboratory parameters were : TLC (5439.20±4344.24), ALC (1737.02±972.51), HB (12.60±12.419), Platelet (61475±38194), HCT (38.879±7.3137), ALP (89.85±44.476), SGOT (106.11±214.119), SGPT(106.11±214.119), Urea (27.82±7.89) and Creatinine (0.87±0.68) as shown in Table 3.

**Table 3: Laboratory profile among the study subjects**

Variables	Maximum	Mean	SD
TLC	19000	5439.20	4344.24
ALC	7000	1737.02	972.51
HB	21	12.601	2.419
Platelet	240000	61475	38194
HCT	60	38.879	7.3137
ALP	335	89.85	44.476
SGOT	14979	166.17	926.977
SGPT	2713	106.11	214.119
Urea	150	27.82	7.89
Creatinine	3.4	0.87	0.68

The clinical and radiological examination confirmed pleural effusion in 24.72%, ascites in 40% and mural edema in 37.55% of the study group. Mortality due to dengue was seen in 2.1% cases as shown in Table 4.

**Table 4: Pleural effusion, Ascites, Mural edema and Mortality among the study subjects**

Variables	N=530	%
Pleural effusion	131	24.72
Ascites	212	40.00
Mural Edema	199	37.55
Mortality	11	2.1

An association between various laboratory parameters and mortality was analysed . A significant association ( $p < 0.05$ ) was observed with certain parameters such as TLC, HB, ALP , SGOT and SGPT while no significant ( $p > 0.05$ ) association was found with respect to parameters like ALC, Platelet count and HCT as shown in Table 5.

**Table 5: Mortality and various laboratory parameters**

Deaths		TLC	ALC	HB	Platelet	HCT	ALP	SGOT	SGPT
No	Mean	5262.86	1739.58	12.65	61589.94	38.94	89.21	139.71	102.16
	SD	2300.52	957.63	2.38	38415.65	7.24	42.60	671.88	183.22
Yes	Mean	13727.27	1616.36	10.45	56090.91	35.91	120.09	1409.45	292.00
	SD	25383.46	1582.92	3.36	26394.90	10.24	97.77	4500.53	803.25
t test		44.25	0.17	8.98	2.12	1.86	5.24	20.98	8.59
p value		<0.01*	0.68	0.003*	0.19	0.17	0.023*	<0.01*	0.004*

\*: statistically significant

An interesting association between mortality rate among study group and fluid collection in various body cavities was seen. Mortality among patients with Pleural effusion was 6.87% followed by ascites 3.77% and mural edema 2.01%. However none of the associations were significant as shown in Table 6.

**Table 6: Pleural effusion, Ascites and Mural edema and Mortality among the Study Subjects**

Variables	N	Mortality		p value
		N	%	
Pleural effusion	131	9	6.87	0.17
Ascites	212	8	3.77	0.63
Mural Edema	199	4	2.01	0.78

Most common symptom encountered in all the three types of dengue was fever, sore throat and body aches while the least common symptom was encephalopathy as shown in Table 7. Rash was seen in 40% patients with DHF.

**Table 7: Common Clinical Presentations among the study subjects and Dengue Type**

Variables	N=530	Dengue Fever		Dengue Shock Syndrome		Dengue Hemorrhagic Fever		p value
		N=393	%	N=36	%	N=101	%	
Fever	522	391	99.49	34	94.4	97	96.04	0.83
Headache	311	226	57.5	30	83.3	55	54.46	0.018*
Body ache	472	346	88.04	33	91.7	93	92.08	0.86
Sore Throat	86	69	17.6	4	11.1	13	12.87	0.77
Loose Stools	201	160	40.7	11	30.6	30	29.70	0.48
Abdominal Pain	195	142	36.1	16	44.4	37	36.63	0.65
Vomiting	106	72	18.4	12	33.3	22	21.78	0.08
Breath Shortness	45	36	9.2	2	5.6	7	6.93	0.71
Hypotension	41	0	0	33	91.7	8	7.92	<0.01*
Encephalopathy	16	9	2.3	4	11.2	3	2.97	0.18
Rash	113	65	16.6	8	22.2	40	39.60	0.032*

\*: statistically significant

In the study group, 38.4% patients with dengue fever had mural edema; ascites was seen in 42.57% of patients with dengue hemorrhagic fever and 36.1% patients with dengue shock syndrome had pleural effusion. Table 8

**Table 8: Pleural effusion, Ascites and Mural edema among the Study Subjects And Dengue Type**

Variables	N=530	Dengue Fever		Dengue Shock Syndrome		Dengue Hemorrhagic Fever		p value
		N=393	%	N=36	%	N=101	%	
Pleural effusion	131	93	23.7	13	36.1	25	24.75	0.13
Ascites	212	155	39.4	14	38.9	43	42.57	0.74
Mural Edema	199	151	38.4	10	27.8	38	37.62	0.22
Mortality	11	1	0.3	6	16.8	4	3.96	0.004*

\*: statistically significant

Leucopenia was seen in 44.1% patients with dengue fever and elevation of SGOT was seen in 69.4% and 75.2% patients with dengue shock syndrome and dengue hemorrhagic fever respectively. AKI was mostly seen in DSS (16.7%). Table 9

**Table 9: Dengue type and commonest laboratory abnormality**

Variables	Dengue Fever		Dengue Shock Syndrome		Dengue Hemorrhagic Fever		p value
	N=393	%	N=36	%	N=101	%	
Leukopenia	173	44.1	10	27.8	43	42.6	0.06
Anemia	168	42.7	22	61.1	57	56.4	0.29
Hemoconcentration	38	9.7	5	13.9	15	14.9	0.72
Elevated SGOT	248	64.1	25	69.4	76	75.2	0.66
Elevated SGPT	136	34.6	13	36.1	41	40.6	0.80
AKI	24	6.1	6	16.7	6	5.9	0.07

## DISCUSSION

The present study was conducted among 530 patients having positive serology report for dengue (NS1 Ag/dengue IGM) visiting a tertiary care center of Northern India. The study was done to find out the clinical and laboratory profile of serologically confirmed dengue patients.

In the present study, 71.3% were males and 28.68% were females. Similar observations were made by Nelly B et al [10]. In their study, 93.4% were male cases who outnumbered female cases. This result was not consistent with the research conducted by Yousuf et al [11]. Males were more commonly affected in our study as males are the breadwinners of the families and spend considerable time outside in search of livelihood while females usually stay back home doing the household chores.

Most subjects were from the age group of 21-30 years (37.17%) and only 0.94% were from the age group greater than 60 years. Increased prevalence among the younger age group was also seen by Babuji A and Shreshtha B where the mean age of patients was 37.18 years and 34.44 years respectively.[12,13] Most dengue patients were adults as they are the working-age group and therefore may have greater exposure to insect bites.

In our study, 74.2% were suffering from mild form of dengue fever while 6.7% had dengue shock syndrome and 19.1% had dengue hemorrhagic fever. In a study done by Thapa et al, 76% were dengue without warning signs, 21.4% were dengue with warning signs and 2.4% were severe dengue. These results are consistent with our study[14]

The most common symptoms found in our study were fever (98.49%) and bodyache (89.06%). These results were similar to study by Deshwal et al, who observed fever in 100%, headache in 94.8%, nausea and vomiting in 5.4% cases.[4] Fever, therefore, is the most common and initial symptom. Patients living in an endemic area with fever and other suggestive symptomatology should be investigated for dengue. In our study, bleeding manifestation was present in 22.64% patients. In other studies, it was present among 24.8% and 37.3% cases.[15, 16]. This signifies the severity and progression of disease.

Anemia was present in 42.7 % patients of dengue fever, 61.1% of dengue shock syndrome and 56.4% of dengue hemorrhagic fever while in other studies, it was present in 44.1% and 11.3% of cases.[15,16] At the time of presentation, a significant proportion of patients had anemia, and the proportion tend to increase as the patient's condition deteriorated. Due to the high prevalence of anemia in DSS, even in the absence of significant correlation, it should be seriously taken into consideration as a risk factor predicting severity when treating dengue infection patients.

Leucopenia was seen in 44.1% patients of dengue fever, 27.8% of dengue shock and 42.1% of dengue hemorrhagic fever. Other studies observed leucopenia in the range of 60 to 80%. [14,17] Given the high frequency of leucopenia in dengue patients, febrile patients exhibiting leucopenia ought to be examined for possible dengue infection, particularly if they reside in an endemic area. Additionally, leucopenia at the onset and during the illness has a strong correlation with the severity of the condition and can be utilized as a risk factor for severe dengue.

Increased SGOT and SGPT level was observed in all patients suffering from different level of severity of disease. According to Yousuf Md et al., there were 28% cases of elevated SGPT and 40.66% cases of increased SGOT.[11] Pleural effusion was most common among patients of dengue shock syndrome (36.1%), ascites was common in dengue hemorrhagic fever (42.5%) and mural edema was seen in dengue fever (38.4%). Ascites is a predictor of mortality which occurs in 40% patients with ascites. The maximum mortality rate was found in dengue shock syndrome (16.8%). Higher mortality rates shown in other studies could be due to re-infection and delayed presentation to the hospital.

## CONCLUSION

Understanding clinicopathological characteristics is not only crucial in making an accurate and timely diagnosis but also helps in predicting the severity. Physicians may be made aware of the possibility of dengue virus infections by knowing the most prevalent clinical and laboratory profiles of dengue disease. The most common clinical symptoms were fever, headache and bodyache while the commonest laboratory abnormalities were anaemia, leucopenia, raised SGOT and SGPT. Thrombocytopenia did not determine outcome but leucopenia, anemia, transaminitis and serositis were identified as independent predictors of severity. Early diagnosis, careful monitoring and judicious fluid management can reduce the mortality due to complications.

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