



HEMATOLOGICAL AND BIOCHEMICAL PARAMETERS IN CLINICALLY SUSPECTED DENGUE CASES IN A TERTIARY CARE TEACHING HOSPITAL IN KARNATAKA

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ABSTRACT

Background : Dengue is an acute viral illness with sometimes fatal complications. To reduce the associated mortality and morbidity, early diagnosis and prompt management becomes essential. This study was undertaken to evaluate the commonly employed laboratory parameters and also to highlight the importance of the less commonly used investigations which might be of importance.

Methods: A cross sectional study was conducted among 200 patients suspected to have dengue infection. Clinical examination and relevant blood investigations were done.

Results: Out of 200 patients , 52 (26%) were found positive for dengue. 25.5% were positive for NS1 antigen only. Leukopenia and thrombocytopenia were seen in cases with dengue. Ferritin and liver enzymes were found to be elevated.

Conclusion: Dengue is endemic in India. No specific treatment is currently available for this disease. Early diagnosis, proper care and management can only reduce the mortality associated with this disease.

KEYWORDS : Dengue, Thrombocytopenia, Hyperferritinemia.

INTRODUCTION

Dengue is a member of flavivirus family which presents as four antigenically distinct serotypes (DENV- 1,2,3,4)¹. In the recent years and especially from the last decade there has been an increasing number of cases of this vector borne disease, and is now a major global health concern².

It is the fastest spreading vector borne viral disease and is now endemic in over 100 countries, resulting in 40% of the world's population living in an area at risk for dengue³.

The manifestations of the disease may vary from a non severe febrile illness to one with a symptom complex of dengue fever. Classical dengue fever is characterised by a rapid onset of fever, headache, retroorbital pain, diffuse body pain, weakness, vomiting, sorethroat, altered taste sensation and a centrifugal maculopapular rash⁴. Severe dengue presenting as dengue haemorrhagic fever or dengue shock syndrome is characterised by severe abdominal pain, persistent vomiting, rapid breathing, bleeding gums, fatigue, restlessness and blood in vomitus⁵. This condition may be fatal due to plasma leakage, fluid accumulation, respiratory distress, severe bleeding or organ involvement⁶.

In the absence of a proper care management, the case fatality rate can be as high as 20% in patients with severe dengue².

In the management of any disorder , diagnosis is a very vital step. Without diagnosis, specific management cannot be carried out, offering no hope for success in treatment. Since the febrile illness is difficult to diagnose clinically, laboratory tests play an essential role in identifying dengue infections . The combined determination of NSI and specific antibodies enable reliable diagnosis of dengue viral infections in all phases of the disease.

The objective of this research was to study the commonly used laboratory parameters in dengue and also to correlate other uncommonly used laboratory investigations with dengue fever.

MATERIALS AND METHODS

The study was conducted among 200 patients who presented to the teaching hospital with features suspicious of dengue after obtaining a clearance from the institutional ethical committee. The hospital caters both urban population in the vicinity and also cases referred from rural training centres. The study was conducted between September 2017 to September 2018. Systematic random sampling technique was used to select the study population. A performa was used to collect demographic information, other general information of the patient and clinical history.

Blood sample of the patients were then collected in both plain and EDTA collection tubes. Cold chain was maintained during transportation of the samples wherever required. Peripheral smear for Malaria, Total Leucocyte count, Differential counts, PCV , ESR ,Platelet counts and Mean platelet volume were done. The sample was also subjected to Dengue NS1 Antigen, Anti dengue IgM, Anti dengue IgG, CRP, ferritin, AST and ALT. Cases with positive NS1 Antigen or positive IgM antibody or both positive were diagnosed as having dengue fever.

RESULTS:

The study was done among 200 patients who presented to the out patient department of the hospital with history suggestive of dengue. 94% of the population were females and most of them (38%) belonged to the 21-40 years age group (Table 1).

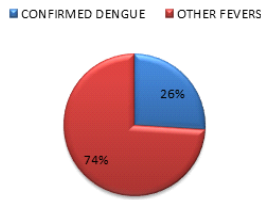
TABLE 1: AGE AND SEX DISTRIBUTION OF THE CASES

SNO.	AGE DISTRIBUTION	FREQUENCY (%)
1	≤ 20 YEARS	33 (16.5%)
2	21 – 40 YEARS	75 (37.5%)
3	41 – 60 YEARS	61 (30.5%)
4	61 – 80 YEARS	29 (14.5%)
5	> 80 YEARS	2 (1%)
SNO.	SEX DISTRIBUTION	FREQUENCY (%)
1	MALE	11 (5.5%)
2	FEMALE	189 (94.5%)

In about 26% of the population, only NS1 antigen was positive. IgM was positive in 0.5% of the population. In 4.5% of the population, both NS1 antigen and IgM were positive (Table 2). The criteria used to diagnose dengue fever in the study was a case with positive NS1 Antigen or positive IgM antibody or when both turn out to be positive .26% of the study population were thus diagnosed to be suffering from dengue infection based on the serological reports (Figure 1).

TABLE 2: SEROLOGICAL INVESTIGATIONS IN THE STUDY POPULATION

SNO.	SEROLOGICAL TESTS	FREQUENCY (%)
1	NS1 ANTIGEN ONLY	51 (25.5%)
2	IgM ONLY	1 (0.5%)
3	Ig G POSITIVE	5 (2.5%)
4	NS1 + IgM	9 (4.5%)

FIGURE 1: DISTRIBUTION OF CASES BASED ON SEROLOGICAL DIAGNOSIS

Clinical examination revealed that both systolic and diastolic blood pressures were on the lower side in cases diagnosed with dengue infection when compared to other fevers. A t test was applied to see if there was a relationship between the blood pressure measurement and the diagnosis. There was a significantly lower blood pressure in cases with dengue infection in this study revealed by a p value less than 0.05 (Table 4).

The hematological investigations showed that the mean platelet count in cases with dengue infection was 123.9×10^3 when compared to 189.39×10^3 . This lower average platelet count in case of dengue fever was also found to be statistically significant. There was also a statistically significant relationship between mean platelet volume and WBC count with the presence of dengue infection. The mean platelet volume and WBC count were found to be lower in dengue infection when compared to other fevers (Table 4).

TABLE 4: CLINICAL AND LABORATORY PARAMETERS IN THE STUDY POPULATION

S NO.	PARAMETERS	CONFIRMED DENGUE CASES	OTHER FEVER CASES	t VALUE	p VALUE
1	SYSTOLIC BLOOD PRESSURE	107.11 ± 8.10	112.54 ± 17.60	2.1438	0.0333*
2	DIASTOLIC BLOOD PRESSURE	70.15 ± 7.92	73.33 ± 9.68	2.1306	0.0344*
3	TOTAL WBC COUNT	$4.32 \times 10^3 \pm 1.86$	$7.28 \times 10^3 \pm 3.80$	5.3884	<0.0001*
4	PLATELET	$123.9 \times 10^3 \pm 52.33$	$189.39 \times 10^3 \pm 91.15$	4.9000	<0.0001*
5	PACKED CELL VOLUME	37.23 ± 4.71	36.58 ± 4.73	0.8534	0.3945
6	MEAN PLATELET VOLUME	10.29 ± 0.94	11.74 ± 0.95	9.4937	<0.0001*
7	ERYTHROCYTE SEDIMENTATION RATE	20.17 ± 14.74	38.45 ± 26.31	4.7501	<0.0001*
8	C REACTIVE PROTEIN	3.45 ± 2.28	55.2 ± 20.66	18.0474	<0.0001*
9	FERRITIN	1005.7 ± 164.51	157.73 ± 62.19	53.0212	<0.0001*
10	ASPARTATE AMINO TRANSFERASE	146.71 ± 158.41	44.02 ± 49.74	6.9919	<0.0001*
11	ALANINE AMINO TRANSFERASE	99.48 ± 81.11	38.95 ± 36.08	7.2789	<0.0001*

*pvalue less than 0.05 and indicates significance

Serum of the study population was also subjected to certain biochemical investigations like C Reactive protein, ferritin, AST and ALT. CRP was found to be much lower in dengue infection when compared to other fevers in our study. Serum ferritin values were lower in other fevers when compared to cases with dengue infection. The mean AST and ALT values were much higher in cases with dengue infection when compared to other fevers. These differences were

found to be statistically significant with a p value less than 0.05 (Table 4).

DISCUSSION:

Over the past few years there has been a rapid increase in the number of dengue cases. One of the reasons for this may be the rapid urbanization with popping up of construction sites and accompanying poor environmental sanitation leading to a rise in mosquito breeding places^{7,8,9,10}. For improved case detection of dengue, we thus require to create a good awareness among the medical fraternity regarding the outbreaks in different regions of the country and also knowledge regarding the available diagnostic modalities. This study was done among 200 cases of fever with suspected dengue. 52 (26%) were actually found positive for dengue in serology. It was intended to see for differences in the most commonly and uncommonly used investigations in dengue when compared to other fevers thus giving us an idea about the uncommonly used investigations in dengue.

There were 94.5% females and 5.5% males in the study population. This kind of a high female ratio is not consistent with other studies which usually show a male preponderance^{11, 12}. The reason usually quoted for male preponderance is the more exposure of males to the bite of the vector *Aedes Aegypti*, due to their clothing habits or outdoor activities¹³. It could be because of chance that this particular study has a high female to male ratio. Majority of the cases were in the 21 – 40 years age group. These findings were similar to studies done by Sameera Rajendra Mehta in Pune¹⁴ and Deshwal¹⁵ et al.

51 cases (25.5%) were positive for NS1 antigen only. NS1 antigen circulates in high levels in blood during the first few days of illness. Hence positive NS1 antigen indicates acute phase of illness. Dengue specific IgM was positive only in one case. Dengue specific IgM can be detected in blood only after 3 – 5 days of illness, hence its role as an early diagnostic marker is doubtful. A similar study was conducted by Kanthikar et al¹⁶ at Maharashtra were 358 serum samples were collected from suspected cases of dengue and 37.7% were positive for the disease. Among them majority (63.3%) were positive for IgM only. 33.3% were positive for NS1 antigen only. The NS1 positivity was close to our study but IgM positivity was much more compared to our study, the probable reason being the early accessibility to health care system.

Low platelet count was seen in patients with dengue fever and it was significantly lower in dengue fever when compared to other fevers in the present study. Thrombocytopenia is always considered a predictive parameter for the inpatient management of dengue fever as well as recovery parameter in DHF and DSS¹⁷. Thrombocytopenia and a rising hematocrit is usually seen by day 3 or 4 of the disease¹⁸. It is considered that the dengue virus induced bone marrow suppression is responsible for decreased platelet synthesis and an immune mechanism is responsible for platelet destruction in DHF¹⁹.

Leucopenia was observed in this study which was similar to studies done elsewhere^{20, 21}. Leucopenia is considered to occur due to bone marrow suppression by virus in acute phase and is due to mainly the decrease in polymorphs^{22,23}. Ferritin levels were also found to be significantly higher than other fevers in the present study. Similar findings were noted by Corniella A M van de Weg²⁴ et al in their study. It has been concluded in the study that ferritin can be used as a marker to discriminate between dengue and other febrile illnesses and also could serve as a marker for activity of the disease²⁴.

Liver function abnormalities, especially elevated AST and ALT levels were observed in the present study and it was statistically significant elevation when compared to other fevers. Dengue virus induced damage to the liver cells, hypoxia and shock have all been quoted as reasons for elevation in transaminases. These elevated transaminase levels are similar to studies done by Daniel et al in Kerala²⁵ and Sharma et al²⁶.

CONCLUSION

Non specific manifestations of dengue make diagnosis a challenging task for the treating physician. He needs to differentiate it from other febrile illnesses. Thrombocytopenia was observed in cases with dengue fever and this was statistically significant when compared to other fevers. The results of this study have thus highlighted the importance of proper clinical examination and laboratory findings of thrombocytopenia, raised hematocrit, hyperferritinemia and elevated liver enzymes in the early diagnosis of dengue infection thus avoiding

the waiting for dengue serology for diagnosis. Early diagnosis, proper care and management may reduce the development of DHF and DSS and thus the mortality associated with dengue fever.

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