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HAEMATOLOGICAL AND BIOCHEMICAL CHANGES SEEN IN DENGUE FEVER IN A TERTIARY CARE HOSPITAL OF NORTHERN RAJASTHAN

[1]Dr. Tarun Sharma, [2]*Dr. Garima Gupta and [3]Dr. A. R. Kalla

[1]Assistant Professor, Department of Pathology, Dr S.N Medical College, Jodhpur, Rajasthan.
[2]Senior Resident, Department of Biochemistry, AIIMS, Jodhpur, Rajasthan.
[3]Head of the Department and Senior Professor, Department of Pathology, Dr S.N Medical College, Jodhpur, Rajasthan.

***Corresponding Author: Dr. Garima Gupta**
Senior Resident, Department of Biochemistry, AIIMS, Jodhpur, Rajasthan.

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ABSTRACT

Introduction: Dengue is a viral infectious disorder, seen with high prevalence in developing countries. Despite multiple national level programmes to eradicate the disease still its incidence is not decreased as expected. Dengue presents with multiple sign and symptoms like fever, bodyache, tender hepatomegaly, rashes and many more, so it is associated with high morbidity and mortality. **Objective:** This study was conducted in Umaid hospital, Jodhpur (tertiary care hospital of child and maternal health) affiliated by Dr. S.N Medical College, Jodhpur. Main objective of the study is to evaluate the various haematological and biochemical changes seen in Dengue fever. **Material and methods:** It is a retrospective study. Haematological and biochemical datas of dengue patients were obtained from laboratory records. **Results:** In our lab we received total 4690 samples for dengue out of those 742(15.8%) were positive by rapid card test. NS1 Antigen was positive in 623(83.89%), IgG in 131(17.65%) and IgM in 14(1.86%). In hematology anemia was seen in 53% cases wile thrombocytopenia seen in 89% cases. Severe thrombocytopenia was predictor of poor prognosis. **Conclusion:** With help of haematological and biochemical changes we could assess the disease severity, prognosis of patients and recovery assessment.

KEYWORDS: Dengue, haematological, biochemical, fever.

INTRODUCTION

Dengue virus belongs to the genus Flavivirus (group B arbovirus, RNA virus) and comprises structural and non-1 structural proteins. The classic clinical presentation is characterized by the abrupt onset of headache, myalgia in addition to arthralgia, retro-orbital pain and hemorrhagic manifestations. The classical presentation differs from dengue hemorrhagic fever by fuid leakage into the interstitium.

Dengue is a vector-borne disease that is a major public health threat globally. It is caused by the dengue virus (DENV, 1–4 serotypes), which is one of the most important arboviruses in tropical and subtropical regions.[1,2] Since the mid-1990s, epidemics of dengue in India have become more frequent, especially in urban zones, and have quickly spread to new regions, such as Orissa, Arunachal Pradesh and Mizoram, where dengue was historically non-existent.[3] The epidemiology of dengue in India was first reported in Madras (now Chennai) in 1780, and the first outbreak occurred in Calcutta (now Kolkata) in 1963; subsequent outbreaks have been reported in different parts of India.[4,5] Since 1956, four serotypes (one to four) of dengue virus have been reported in various parts of the country.[6] The total number of dengue cases has significantly increased in India since 2001. In the early 2000s, dengue was endemic in a few southern (Maharashtra, Karnataka, Tamil Nadu and Pondicherry) and northern states (Delhi, Rajasthan, Haryana, Punjab and Chandigarh). It has recently spread to many states, including the union territories.[3] In addition to the increased number of cases and disease severity, there has also been a major shift in the geographical range of the disease. Dengue had been restricted to urban areas, but it has now spread to rural regions.[7] The expansion of dengue in India has been related to unplanned urbanization, changes in environmental factors, host–pathogen interactions and population immunological factors. Inadequate vector control measures have also created favorable conditions for dengue virus transmission and its mosquito vectors. Both Aedes aegypti and Aedes albopictus are the main competent vectors for dengue virus in India.[8] The number of dengue cases has increased 30-fold globally over the past five decades.[9] Dengue is endemic in more than 100 countries and causes an estimated 50 million infections annually.[10] Nearly 3.97 billion people from 128 countries are at risk of infection.[11,12] Individuals

infected with dengue exhibit a wide spectrum of clinical symptoms ranging from asymptomatic to severe clinical manifestations, such as dengue shock syndrome.[13] The WHO regions of Southeast Asia (SEA) and the western Pacific represent ~75% of the current global burden of dengue.[14,15,16]

The diagnosis of dengue fever is carried out based on clinical, epidemiological and laboratory data. Among laboratory tests, both non-specific [blood count, platelet count, tourniquet test, prothrombin time (PT), activated partial thromboplastin time (APTT), liver function tests and serum albumin concentration] and specific tests (viral isolation tests and serology for antibody examination) are used.[17,18]

Leukopenia is the most prominent hematological change, sometimes with counts of less than 2 x 10^3/µL. However, there are reports of mild leukocytosis at the onset of the disease, with neutrophilia. Lymphocytosis is a common finding, with the presence of atypical lymphocytes. The hematocrit concentration should be monitored according to the days of illness, remembering that, with the progression to DHF, there will be a 20% increase in hematocrit from the patient's baseline, associated with thrombocytopenia (< 100 x 10^9/L).[19,20]

Of biochemical variables, the most frequent changes occur in liver function tests such as in serum aspartate aminotransferase (AST), serum alanine aminotransferase (ALT), Gamma-glutamyl transpeptidase and alkaline phosphatase levels, and serum albumin concentrations.[20]

In this context, the present study aimed to assess the biochemical and hematological dynamics of patients with dengue fever in order to increase the sensitivity of the screening by healthcare professionals in the most serious cases and to try to identify laboratory markers that may indicate this evolution.

MATERIAL AND METHODS

This is a descriptive observational retrospective study of secondary data obtained from the medical records of 8192 patients aged from 2 to 70 years who had clinical suspicion of dengue were processed. Out of those 490(5.89%) sample were found to be positive for dengue.

RESULTS

Male to female ratio were found to be nearly equal. IPD OPD ratio was 3:1.NS1 antigen found to be positive in 623 patients. IgG1 was positive in 131 patients and IgM in 14 cases by rapid card test diagnoses of dengue fever in a Umaid Hospital Jodhpur(maternity and child health hospital) that is a referral centre for infectious and contagious diseases in the period from September 2016 to may2018.

In hematolgy anemia was found to be in 54% cases. Microcytic hypochromic anemias was the most the most common cause followed by haemolytic anemia and few cases of megaloblastic anemia. Heamatocrit was high in around 80% cases. Wbc count was high in 40% cases, out of which most of the cases had lymphocytosis, followed by neutrophillia. Neutropenia was noted in 20% cases while lymphocytopenia was noted in 30% cases. Low platelet count were noted in 82% cases. Severe thrombocytopenia(less than 20,000 cumm) was noted in 5% cases.

In biochemical parameters serum liver enzymes like AST and ALT were found to be high in 30% cases while Alkaline phosphatase was high in 10% cases and serum GGT(gamma glutamyl transpeptidase) was high in 5% cases. Serum albumin was low in 12% cases and it is seen mostly in those cases where platelet count was markedly reduced.

Platelet Count in Different Groups in Dengue Patients (Table No 01)

Groups of Thrombocytopenia(CUMM)	Percentage of Dengue Patients(%)
Less than 20,000 count	20%
20,000 to 50,000 count	31%
50,000 to 1lakh count	30%
>1 lakh count	19%

Hemoglobin Levels in Different Groups in Dengue Patients (Table No 02)

Hb concenteration (gm/dl)	Percentage of Dengue Patients(%)
< 3	5%
3-5	10%
5-7	5%
7-10	40%
>10	40%

DISCUSSION

Vector born diseases like dengue fever are becoming more common due to change in climate, more urbanization and poor living standards. Although, so many vector control programs are launched in endemic countries every year, yet dengue fever has become a serious problem worldwide. India being a tropical country provides appropriate weather for aedes mosquito

to grow and an increase in the disease burden has been noticed in recent years.[21] Dengue is caused by a virus belonging to the flaviviridae family (single stranded, positive, nonsegmented RNA virus). It has four distinct serotypes DEN1, DEN2, DEN3 and DEN4.[22] Infection with one serotype confers immunity to only that serotype and hence a person may be infected four times.[23] Humans are the main reservoir of dengue virus.[24] Cross reactive anti dengue antibodies from the previous infection bind to the new infecting serotype and enhance viral uptake by monocytes and macrophages. This antibody dependant mechanism produces an amplified cascade of cytokines and complement activation causing endothelial dysfunction and consumption of coagulation factors leading to plasma leakage and hemorrhagic manifestations. The severity of the disease depends on the strain and serotype of the virus, age of the patient and degree of viremia. Memory dengue T lymphocyte response after a primary infection includes both serotype-specific and serotype –cross reactive T lymphocytes.[25] NS3 protein seems to be the major target for CD4 + and CD 8+ T cells, although some Tcell epitopes have been recognized in other proteins such as envelope and capsid.[26,27] These finding support the possibility that during a secondary infection T cells become activated due to interactions with infected monocytes. Recent observations suggest a massive T-cell activation during DHF, which could partly explain the mechanism of plasma leakage through cytokine production and infected cell lysis by CD4+ and CD8+ dengue –specific T lymphocyte .Cytokines could be released directly from monocytes/macrophages as a result of infection or after interactions between infected and immune cells or both.[28,29] Cytokines that may induce plasma leakage such as interferon ɣ, interleukin (IL) 2 and tumor necrosis factor TNF – α are increased in DHF cases.[30] Interferon ɣ enhances uptake of dengue particles by target cells through increasing Fc cell receptors.[31] Other cytokines such as IL-6, IL-8 and IL-10 are also increased. A protein of 22-25 kDa responsible for increased capillary permeability has been detected in sera of DHF patients.[32] The release of high levels of platelet-activating factor may induce platelet consumption and augment adhesiveness of vascular endothelial cells resulting in thrombocytopenia.[32]

During study period we analysed 490 patients for their haematological and biochemical profiles. Results were found similar to other older studies(and Ageep AK et al 2007[19]). Most specific and constant findings were thrombocytopenia, increase haematocrit and anemia. Besides these haematological changes raised(kao c et al 2005[20]) AST, ALT levels low albumin were also similar findings comparing to prior studies.

CONCLUSION

With help of haematological and biochemical changes we could assess the disease severity, prognosis of patients and recovery assessment.

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