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Original Research Article

A study on serological and hematological parameters in dengue fever in a tertiary care hospital of North Kerala

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ABSTRACT

Dengue fever is one of the major public-health concerns in India and it has shown an increasing trend in Kerala since 2006. This study is aimed to study the serological and hematological parameters of patients with dengue fever in a tertiary referral center and teaching hospital.

Materials and Methods: A retrospective study was performed, during the period of three years, from January 2016 to December 2018. A total of 2126 serum samples from clinically probable cases of dengue were added in the study. All the samples included were tested for NS1 antigen, IgM, and IgG antibodies, using the immunochromatographic test (ICT) Dengue Day 1 Test (J.Mitra & Co. Pvt. Ltd., New Delhi). Laboratory tests of dengue positive parameters and its hematological profile was co-related.

Results: Out of 2126, 393 samples (18.48%) were positive for dengue. Among them 383 (97.45%) were grouped as primary dengue infection, 10 (2.54%) as secondary dengue infection. Higher rate of cases were in males and the age group of 21years to 30 years were chiefly affected. Maximum cases were found in monsoon and post monsoon seasons. Leucopenia and thrombocytopenia was more consistently associated with dengue infection

Conclusions: Thrombocytopenia and leucopenia are prima facie and are indicators for provisional and initial diagnosis of dengue infection. Defining primary and secondary dengue infection will be helpful to clinicians for optimal management to achieve a favorable outcome.

1. Introduction

Dengue ranks as one of the most important mosquito borne viral disease in the world.[1] About 4 billion people are estimated to be at risk for dengue infection in more than 100 countries worldwide.[1] India experienced high levels of dengue transmission, for the last three decades with epidemics every 2–3 years.[2] In Kerala there has been an increasing trend of dengue infection since 2006, inspite ofhaving an area of approximately 1.5% of the country; it contributed 9.2% of case study in 2010.[3]

Dengue virus is an RNA virus belonging to the genus Flavivirus. There are four different serotypes of Dengue virus (DENV), DENV-1, DENV -2, DENV -3 and DENV-4and newly identified fifth serotype DENV -5.[4] It is one of the most swiftly increasing mosquito-borne viral diseases with a wide clinical spectrum and a wide variety of presentations, ranging from mild febrile illness to the more severe forms for instance Dengue Shock Syndrome (DSS) and Dengue hemorrhagic fever (DHF).[5] Recovery from infection provides lifelong immunity against that serotype but confers only partial and transient protection against subsequent infection by other serotypes.[1] Secondary infection with a serotype different from that causing primary infection may lead to DHF and DSS which can be fatal.[6]Detection of NS1 antigen and dengue specific IgM/IgG has been the mainstay of diagnosis of Dengue Infection.[7] Apart from the dengue specific parameters,

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platelet count, leukocytes are the only accessory laboratory test available in the peripheral areas that can support the diagnosis of DHF or DSS.[8]

Therefore the present study is aimed to collect the data from the records of all patients who were confirmed as dengue by serological test and correlating it with hematological parameters like platelet count, leukocytes thus helping to increase the sensitivity of the screening by healthcare professionals in the most serious cases of dengue infection.

2. Materials and Methods

This is a retrospective study, performed in the department of Clinical Microbiology, MES Medical College and Hospital, Perinthalmanna, Kerala from 1st January 2016 to 31st December 2018. The study was accepted by the Institutional ethics committee (No IEC/MES/57/2018). The study included all patients diagnosed with positive serology for dengue using standard kit Dengue Day 1 Test (J.Mitra & Co. Pvt. Ltd., New Delhi).

Of 2126 serum samples from clinically probable cases of dengue, was diagnosed in 383 (18.4%) and were added in the study. Blood samples were collected in plain vacuette (Becton Dickinson). The serological assays for dengue were performed using standard kit Dengue Day 1 Test (J.Mitra & Co. Pvt. Ltd., New Delhi).

All patients with positive result for NS1Ag or IgM or IgG antibodies against dengue virus were considered dengue-positive group. All the demographic and hematological, details during the study period were considered. Based on serological test, patients were defined as primary dengue infection and secondary dengue infection. Primary dengue infection was described by an increase in dengue specific IgM and nonstructural protein 1 (NS 1) antigen, and secondary dengue infection was described by the presence of IgG antibodies initially, in the course of the disease. All around comparison of hematological results was done with primary and secondary dengue infection. All the details of the study were categorized into frequency, and are represented in figures.

3. Result

A total of 2126 serum samples from clinically probable cases, dengue was serologically confirmed in 393 (18.4%) shown in Figure 1. The sum of dengue positive cases in the year 2016, 2017 and 2018 were 47, 291 and 55 and number of cases peaked in June to August as shown in the Figure 2. The total number of males in our study was 254 (64.63%) while 139 (35.36%) were females and the maximum affected were of 21 to 30 years of age (22.39%) shown in Table 1. The total number of infection in primary dengue was 383(97.5%) and secondary dengue was 10 (2.5%) patients as shown in table 2 It was observed that 227 (59.2%) patients with primary dengue and 8 (80%) with secondary dengue cases had thrombocytopenia $<$ 1 lakh cells /cu mm. White blood cell (WBC) count $<$ 4000 was observed in 191 (48.6%) patients with primary dengue and 4 (40%) in secondary dengue infection as shown in Table 2.

Table 1: Age group and Gender wise distribution of Dengue cases

Age group	Male	female
0-10	28	18
11-20	47	25
21-30	59	29
31-40	38	28
41-50	30	16
51-60	28	12
61-70	16	5
$>$ 70	8	6

Table 2: Distribution of hematological and biochemical parameters in dengue cases

Platelet count	Primary dengue n = 383	Secondary dengue n=10	Total n=393
$<$ 20000 /mm^3	38 (9.92%)	1(10%)	39(9.92%)
20000 – 50000/mm^3	72 (18.79%)	3 (30%)	75(19.08%)
510000- 75000 mm^3	52(13.57%)	3(30%)	55(13.99 %)
76000- 100000 mm^3	65(16.97%)	1(10%)	66(16.79%)
$>$ 100000	156(40.73%)	2(20%)	158(40.20%)
Leucocyte count			
$<$4000	191(49.86%)	4(40%)	195(49.6%)
4000-11000	163(41.47%)	6(60%)	169(43%)
$>$11000	29(7.57%)	0	29(7.37%)

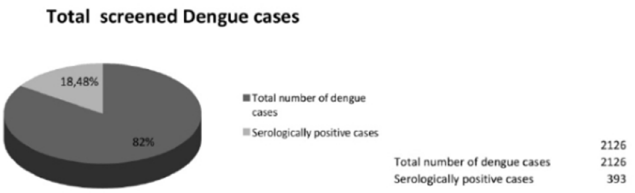

Fig. 1: Total Screened dengue cases

4. Discussion

The incidence of DENV infections has rised over the past few years in India. Kerala, which remained basically an unknown territory for dengue infection till mid-1990s, now has a widespread epidemics annually.[9] Dengue infections are mostly difficult to distinguish clinically from other acute febrile illnesses prevailing in our region. It presents with a wide variety of symptoms, ranging from flu like illness to

	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2016	0	1	6	5	4	5	4	5	4	5	4	4
2017	6	3	0	2	24	99	72	61	8	7	6	3
2018	3	3	0	1	6	21	7	5	4	3	2	0

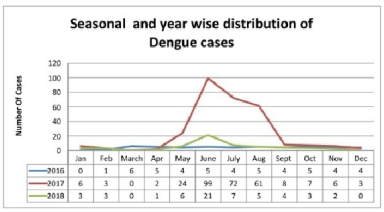

Fig. 2: Seasonal and year wise distribution of dengue

the more severe forms such as DSS or DHF. It is known that initial and correct diagnosis of DHF or DSS followed by supportive care curtail morbidity and mortality. Therefore this study was aimed to diagnose dengue infection early by correlating hematological parameters with serological markers.

Out of 2,126 blood samples screened for dengue infection serologically from 1st January 2016 to 31st December 2018, 393 (18.48%) samples were found to be positive for dengue infection. Similar prevalence 20% was found in other study also.[10] The number of dengue cases found to be reported in Kerala has been increasing from 2010. Kerala, where crops like rubber, pineapple, areca and spices are cultivated Aedes albopictus has been found to be abundant.[3] Aedes aegypti was encountered in very few places and in scanty numbers.[3] In our study there is a progressive increase in the dengue cases over the years from 2016 to 2017. The rate of infection was quite high in 2017. The reason for this increase in cases during the year 2017 could be due to high rainfall which caused abundant mosquito growth.[11]

In our study highest number of cases was found in rainy and post rainy seasons i.e. during the month of June to August. The transmission of dengue infection increases in monsoon and post monsoon season.[9] The presence of stagnating water after rainfall favors breeding of the mosquito vector resulting in an increased incidence of dengue.

Males 259 (65.90%) were effected more than females 134 (34.09%). Similar results were observed in other study.[12] Reasons behind male preponderance could be due to greater male exposures to dengue-carrying mosquitoes during daytime hours either at the workplace or during travelling to and from work.

Young people of 21 to 30 yrs age (22.39%) were affected maximum followed by 11-20 years (18.32%). There are other studies which showed the peak number of confirmed cases occurring in 21–30 year-olds followed by 11–20 year-old group.[13]

Platelet count below <1,00,000/mm3 was seen in 235 (59.79%) patients, out of which <50,000/mm3 was seen in 114 (29%) patients. Among these 114 patients, 39 (9.92%) patients had severe thrombocytopenia (<20,000/mm3) and 75 (19.08%) patients had moderate thrombocytopenia (20,000 to 50,000/mm3). The remaining 158 patients had platelet count >1,00,000/mm3. In this study, 227 (59.2%) patients with primary and 8 (80%) with secondary dengue infection had thrombocytopenia meeting the WHO criteria, i.e. < 1 lakh cells /cu mm. Other studies also showed the incidence of thrombocytopenia in 82%,[14] 96%[15] respectively. DENV directly or indirectly affect bone marrow progenitor cells by inhibiting their function to reduce the proliferative capacity of hematopoietic cells and also directly interacts with and activates platelets causing thrombocytopenia.[16]

White blood cell count < 4000 was seen in 191 (49.86%) patients with primary and 4 (40%) in secondary dengue infection. Similar results were obtained by other study were leukopenia was observed in 43%.[17] In another study leukopenia was observed in 21%[14] of cases. In our study, there was no statistically notable association between leukopenia and primary and secondary dengue infection..

5. Conclusion

We conclude that dengue cases are on increase in Kerala. Young adult males bears greater burden of disease with increased magnitude in monsoon and post-monsoon period. Thrombocytopenia and leucopenia are prima facie and are indicators for provisional and initial diagnosis of dengue virus infection. Distingushing primary and secondary dengue will be helpful to clinicians working in endemic areas for optimal management to achieve a favorable outcome.

6. Source of funding

None.

7. Conflict of interest

None.

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