Dengue infection: its prevalence with seasonal variations

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Abstract

Background: Dengue fever is emerging arbo-viral acute febrile illness, which is endemic in India. Continuous surveillance of dengue fever is important for the proper and timely institution of vector control measures. With this study we made an attempt to know seasonal variation of incidence of dengue infection and correlation between thrombocytopenia and leucopenia in dengue positive cases. Apart from dengue serological markers platelet count and leucocyte count are also important in proper management of dengue infected cases.

Methods: This study was conducted in department of Microbiology Al-ameen medical college Vijaypur from January 2014-december 2015. Serum samples were collected from patients suspected with dengue fever and dengue serology was done using immunocrhomatographic card test, along with this platelet count and total count was done by automation.

Results: Of 284 samples received 58 (20.42%) samples were positive for one or more parameters of dengue. 27(46.55%) samples were positive for only NS1, 4(6.89%) were positive for only IgM, 14(24.13%) were positive for only IgG. Remaining 13 were positive for more than one serological markers. 36.26% of dengue positive cases had thrombocytopenia whereas only 4.28% of dengue negative cases had thrombocytopenia. 55.17% of dengue positive cases had leucopenia whereas only 12.38% of dengue negative cases had leucopenia. The increase incidence of cases coincides with the mason and post monsoon season.

Conclusion: Incidence of dengue infection was higher in monsoon and post Manson period. Thrombocytopenia and leucopenia provide high suspicion of dengue infection, mainly where dengue serological tests are not available.

Keywords: Dengue fever, NS1 antigen, IgM antibody, Seasonal, Platelet count

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Introduction

Dengue virus is a flavivirus. It is an emerging viral infection causing potential danger globally. It can cause simple fever to life threatening complications. The complications such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) are usually related to cross-reactivity between one serotype to other.[1] Distribution of dengue infection is associated with the mosquito vector (*Aedes aegypti*). In tropical areas, as the vector is active throughout the year so as the disease but with maximum transmission and disease incidence in months of rainfall.[2] Rainy season or post rainy season favors the collection of water in various sites like old tires, coolers, old earthenware pots, coconut shells etc. This acts as a good site for mosquito breeding. Hence, the vector thrives and disease incidence increases.[3] During the rain fall the mosquito population is high (3-4 female mosquitoes per house) as compared to the density during the dry season (1-2 female mosquitoes per house).[4]

The disease follows a seasonal and cyclical patterns with large outbreaks occurring every two to three years according to some studies.[5,6]

Identifying Dengue Specific IgM and IgG immunoglobulins in serum samples is mainstay of diagnosis. Isolation of virus, RT-PCR is time-consuming, requiring costly laboratory methods. Hence in large number of cases identifying IgM, IgG and NS1 specific to virus remains as important diagnostic parameters.[8] Immunocrhomatographic test is used for finding NS1antigen in serum samples of patient as early as day one for presumptive diagnosis.[9] Because of ease of use, cost and stability at room temperature, we used ICT for detection of NS1 antigen as one of the method for diagnosis of dengue infection in acute stage of illness.

Presence of IgM anti- DENV antibodies associated with primary dengue. An IgM antibody takes 5-7 days to become detectable after the onset of illness and remain for 2-3 months. Secondary infection is associated with appearance of IgG antibodies in serum with a weak IgM response.[10] It is important to have a rapid and sensitive laboratory tests for the early detection of the disease.[11]

Materials and Methods

This study was conducted in department of Microbiology in Al-ameen medical college Vijaypur from January 2014-december 2015. Serum samples were obtained from cases who are admitted with clinical features simulating dengue. Test done include

NS1 antigen detection, IgM antibody detection, IgG antibody detection using immunocrhomatographic card test. This evaluation has been done keeping in view the scenario at the peripheral centers, where only ICT-based tests are available for diagnosis of dengue infection, along with this platelet count and total count was done by automation. Keeping in mind the logistic constraints of healthcare system in the peripheral areas, we tried to correlate the platelet counts and immunochromatography (ICT)-based dengue serology tests.

Results

Total of 284 samples were received in the Microbiology department for Dengue serology. Of this 58 (20.42%) samples were positive with antigen only, antibody only or combination of both antigen and antibodies specific for dengue.

Table 1: Dengue positivity with age and sex

Age group in years	Male	Female	Total (%)
0-15	22	6	28(48.27)
16-25	9	5	14(24.13)
26-50	7	3	10(17.24)
51-70	4	0	4(6.89)
>70		2	2(3.44)
Total	36	20	58(100)

Maximum dengue cases were seen in pediatric age group of 0-15 years. Dengue infection was higher in males less in females. Male and female ratio was 1.8:1.

Table 2: Sero-positivity of different serological parameters for dengue infection

Serological markers	Number of positive(%)
NS1	27(46.55)
IgM	4(6.89)
IgG	14(24.13)
NS1+IgM	4(6.89)
NS1+IgG	1(1.72)
IgM+IgG	7(12.06)
NS1+IgM+IgG	1(1.72)
Total	58(100)

Out of 58 dengue serology positive test, NS1 was positive in 27(46.55%), IgM was positive in 4(6.89), IgG was positive in 14(24.13%) only and 13 were positive with both antigen and antibody or both antibodies, combination serological parameters.

Table 3: Seasonal distribution of dengue sero-positivity

Month	2014		2015	
	Total tested	Positive(%)	Total tested	Positive(%)
January	12	03(10)	06	02(7.14)
February	03	00	06	01(3.57)
March	05	02(6.6)	07	01(3.57)
April	03	01(3.3)	09	02(7.14)
May	12	03(10)	06	00
June	09	01(3.3)	11	00
July	10	00	11	01(3.57)
August	11	05(16.66)	13	04(14.28)
September	11	03(10)	36	04(14.28)
October	18	09(30)	51	11(39.28)
November	06	01(3.3)	14	02(7.14)
December	06	02(6.6)	08	00
Total	106	30(100)	178	28(100)

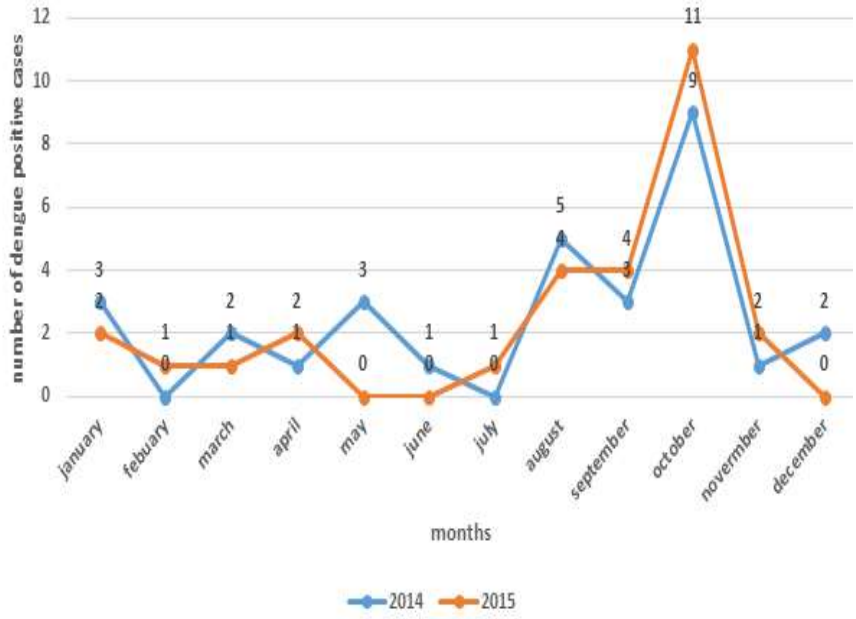

Fig. 1: Month and Year wise distribution of dengue positive case

Table 4(A): leucocyte count comparison with positive and negative cases

Dengue positive cases	Total count <4000cells/Cumm
Dengue positive (n=58)	32(55.17%)
Dengue negative(n=226)	28(12.38%)
	60

Table 4(B): Platelet count comparison in positive and negative cases

Dengue positive cases	Platelet conts <100000cells/Cumm
Dengue positive (n=58)	21(36.20%)
Dengue negative(n=226)	13(5.75%)
	34

Thrombocytopenia was exist in 36.26% and 4.28% of dengue positive, dengue negative cases respectively. This finding is statistically significant ($p<0.05$). Leucopenia was there in 55.17% of dengue positive cases and 12.38% of dengue negative cases detected with leucopenia this finding is statistically significant. ($p<0.05$).

Discussion

Total of 284 samples were included in this study out of which 58(20.42%) were positive for one or more serological parameters of dengue. Maximum numbers of patients were in the age group of 0-15 years (48.27%) (Table1). Male to female ratio was 1.8:1. It has been established before that in many Asian countries, reduced disease detection in women may be a statistical artifact may be due to lower reporting and care-seeking for women and that determining sex differences requires well-designed studies.[12]

Out of 58 dengue serology positive test, NS1 was positive in 27(46.55%), IgM was positive in 4(6.89), IgG was positive in 14(24.13%) only and 13 were positive with both antigen and antibody or both antibodies, combination serological parameters. (Table 2) same findings seen by soumya etal.[13] Complications associated with dengue fever can be avoided by using NS1 antigen assay because it can be identified in serum from day one of fever.[14] immunoglobulins begins to appear in 5-10 days of fever in primary infection and after about 4-5 days in secondary dengue virus infection.[11] In our study 46.55% of cases were positive only for NS1 antigen. We would have missed many positive cases if we had included only antibody detection in the panel of tests. Including NS1 antigen assay increases the sensitivity of results. Equal findings were seen in different studies also.[11,13,15]

A seasonal trend of dengue over two-year period was assessed. Climatic factors responsible for epidemics either alone or in combination are rainfall, variation in temperature sometimes humidity.[16]

We observed an increase in the dengue cases from month of august in 2014 and from month of July in 2015 in both the year peak was in the month of October followed by decline in cases. (Table 3, Fig. 1). Our results were consistence with other studies.[13,16,17,18]

We try to correlate leucopenia and thrombocytopenia in dengue positive and dengue negative cases. Thrombocytopenia was present in 36.26% and 4.28% of dengue positive, dengue negative cases respectively. This finding is statistically significant ($p<0.05$). Leucopenia was present in 55.17% and 12.38% of dengue positive, dengue negative cases

respectively. This finding is statistically significant. ($p<0.05$). Table 4(A) and 4(B). Our study in consistent with different studies.[13,17]

Conclusion

Dengue is more in rainy and post rainy season. There is a strong relation between thrombocytopenia as well leucopenia with dengue fever. NS1 antigen identification is best parameter for diagnosis of infection in initial phase of illness.

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