

Study of Prevalence and Serodiagnosis of Dengue Fever in Febrile Patients Attending a Tertiary Care Hospital

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ABSTRACT

BACKGROUND

Dengue is a mosquito-borne viral infection found in tropical and sub-tropical regions around the world and has emerged as a significant threat and burden to public health systems. The infection is transmitted by the bite of an infected female mosquito- *Aedes aegypti*. Dengue viral infection may be asymptomatic or may give rise to undifferentiated fever with or without other associated clinical manifestations, namely, Dengue Fever (DF), Dengue Haemorrhagic Fever (DHF) or Dengue Shock Syndrome (DSS). The present study is conducted to evaluate the prevalence and serodiagnosis of Dengue fever among patients with acute febrile illness, provide useful guidance to clinicians for early diagnosis and prevention of untoward complications of dengue

METHODS

This was a retrospective descriptive study conducted for a period of one year in a tertiary care hospital from January 2019- December 2019. Blood samples collected from 1905 clinically suspected cases of dengue fever and serum were separated and tested for detection of Dengue NS1 antigen, Dengue specific IgM antibody and IgG antibody by using Dengue Day 1 test kit (procured from J. Mitra & Co. Ltd, India). Test was performed and results were interpreted as per manufacturer manual.

RESULTS

Out of 1905 serum samples tested, 273 were positive for dengue and 1632 were negative, with seropositivity was 14.33%. Out of 273 dengue positives, 202 (73.6%) were positives for dengue specific NS1 Antigen, 50 (18.3%) were positives for dengue specific IgM and 14 (5.12%) were positives for dengue specific IgG and 8 (2.93%) were positives for both IgM and IgG. Out of 273 positives cases of dengue, 158 (57.8%) were males and 115 (42.12%) were females. Majority of the patients tested positive were in the age group of 21-30 yrs. (28.2%).

CONCLUSIONS

Dengue cases occur throughout the year with more positives in Jun-October. The incidence of dengue cases was higher in males and in children and in young adults. Early laboratory diagnosis of dengue fever among patients with acute febrile illness is essential to prevent dengue related complications.

KEY WORDS

Dengue Fever, Serodiagnosis, Dengue Day 1 Test Kit

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BACKGROUND

Dengue is a mosquito-borne viral infection found in tropical and sub-tropical regions around the world and has emerged as a significant threat and burden to public health systems.¹ It is also called as break bone fever.² The Dengue virus causes significant morbidity and mortality in many parts of the world, including India.¹ Dengue is believed to infect 50 to 100 million people worldwide a year with half a million life-threatening infections requiring hospitalization, resulting in approximately 2.5% deaths.¹ The infection is transmitted by the bite of an infected female mosquito- *Aedes aegypti*.³ Dengue virus belongs to Genus Flavivirus & has 4 antigenically distinct serotypes that can cause human infections namely DENV-1, DENV-2, DENV-3 and DENV-4.³ Dengue viral infection may be asymptomatic or may give rise to undifferentiated fever with or without other associated clinical manifestations, namely, Dengue fever (DF), Dengue haemorrhagic fever (DHF), or Dengue shock syndrome (DSS).⁴

Incidence of dengue has increased dramatically over the past five decades with 50–100 million infections occurring annually.⁵ Compared to the global burden of disease (GBD) 2013 estimates, GBD 2015 reported an increase in the number of dengue deaths by 48.7% resulting in 18,400 deaths.⁵ The National Vector Borne Disease Control Program, Government of India has reported more than 100,000 cases during 2015–2017.⁶ The case fatality rate in patients with dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) can be as high as 44%.⁷ Hence early and rapid laboratory diagnosis of dengue is crucial. Appropriate clinical management can save the lives of DHF and DSS patients and mortality can be reduced to less than 1%.⁸

The present study is conducted to determine the prevalence and serodiagnosis of Dengue fever among patients with acute febrile illness and providing useful guidance to clinicians in early diagnosis and preventing the untoward complications of dengue.

METHODS

This was a retrospective descriptive study conducted for a period of one year in a tertiary care hospital from January 2019- December 2019. Patients with acute onset of illness, high grade fever, severe headache, backache, musculoskeletal pain or retro-bulbar pain with or without rashes were considered as clinically suspected case of dengue virus infection.⁹

Blood samples collected from 1905 clinically suspected cases of dengue fever were included in the study. 3 ml of blood collected with aseptic precautions from the patients who are clinically suspected as dengue fever. Serum was separated and tested for detection of Dengue NS1 antigen, Dengue specific IgM antibody and Ig G antibody by using Dengue Day 1 test kit (procured from J. Mitra & Co. PVT. Ltd., India). Test was performed and results were interpreted as per manufacturer manual.¹⁰

Dengue Day 1 Test is a rapid immuno-chromatographic test detects Dengue NS1 Antigen and also IgM and IgG antibodies to Dengue virus in Human serum/plasma.¹⁰

Dengue Day 1 test kit consists of two devices: one device for detection of Dengue NS1 antigen and second device for the differential detection of Dengue IgM/IgG antibodies in Human serum/plasma.¹⁰

Dengue NS1 Antigen device contains two lines; 'C' (control line) & "T" (Dengue NS1 antigen test line). Test line is coated with anti-dengue NS1 Ag. When a sample is added to the device, Dengue NS1 antigen if present in the sample will bind to the anti-dengue NS1 gold colloidal conjugate making antigen antibodies complex. This complex migrates along the membrane to the test region and forms the visible pink line at "T" as antibody-antigen-antibody gold colloid forms.¹⁰ Sensitivity of Dengue NS1 Ag was found to be 96% and Specificity was found to be 98%.¹⁰

Dengue IgM/IgG test device has three lines; "C" (control line), "M" (IgM test line) & "G" (IgG test line). IgM test line is coated with anti-human IgM and IgG test line with anti-human IgG. The sample is added to the device, if IgG and IgM antibodies are present in the sample which react with anti-human IgM or IgG antibodies coated on the membrane respectively. The Colloidal gold complexes containing dengue 1-4 antigens is captured by the bound anti-dengue IgM or IgG on respective test bands in the test window causing a red band to form at the IgG or IgM region of the test device window. The intensity of test bands in the respective device will be depends on the amount of antigen/antibody present in the sample. The appearance of red colour in a specific test region is considered as positive for that particular antigen and antibody type (IgG or IgM). A red control line must develop in the test device window indicating the test has been done properly.¹⁰ Dengue IgM/ IgG antibody sensitivity was found to be 95% & Specificity was 97%.¹⁰

RESULTS

In the present study, 1905 serum samples were collected from the patients suspected to have dengue fever and all the serum samples were tested for dengue NS1 Antigen, dengue specific IgM and IgG antibodies.

Out of 1905 cases, 1301 (54.12%) were males and 874 (45.87%) were females. Age distribution of the patients includes, 4 (0.2%) were in the age group < 1 yr., 190 (9.97%) of 1-10 yrs., 259 (13.59%) of 11-20 yrs., 443 (23.25%) of 21-30 yrs., 313 (16.45%) of 31-40 yrs., 276 (14.48%) of 41-50 yrs., 259 (13.59%) of 51-60 yrs., 111 (5.82%) of 61-70 yrs. and 39 (2%) of 71-80 yrs., majority of the patients were in the age group of 21-30 yrs.

In this study, out of 1905 serum samples tested, 273 were positive for dengue and 1632 were negative, with overall seropositivity was 14.33%. [Table 1]

Out of 273 dengue positives, 202 (73.6%) were positives for dengue specific NS1 Antigen, 50 (18.3%) were positives for dengue specific IgM and 14 (5.12%) were positives for dengue specific Ig G and 8 (2.93%) were positives for both IgM and IgG. [table 2] Dengue NS1 Antigen and Ig M seropositivity (primary dengue infection) was more when compared to IgG/both IgM and IgG seropositivity (secondary dengue infection)

Out of 273 positives cases of dengue, 158 (57.8%) were males and 115 (42.12%) were females [Table 3]. Majority of the

patients tested positive were in the age group of 21-30 yrs. (n=77, 28.2%), followed by age group of 11-20 yrs. (n=71, 26%). [figure 1]

In the present study, it was observed that a gradual increase in dengue positive cases from June (n=34), July (n=38) with maximum positives in August (n=61), followed by gradual decrease by December and the study shows occurrence of dengue cases during monsoon, post monsoon and dry seasons [figure 2]

Results	Number of Samples	Percentage
Dengue positive	273	14.33%
Dengue negative	1632	85.66%
Total	1905	100%

Table 1. Seropositivity for Dengue

Results	Number of Samples Positive	%
Dengue specific NS1 Antigen	202	73.6%
Dengue specific IgM	50	18.3%
Dengue specific Ig G	14	5.12%
Dengue specific IgM and IgG (both).	8	2.93%
Total	273	100%

Table 2. Study Results of Dengue

Sex	No. of Positives	Percentage
Male	158	57.8%
Female	115	42.12%
Total	273	100%

Table 3. Sex Distribution of Positive Cases of Dengue

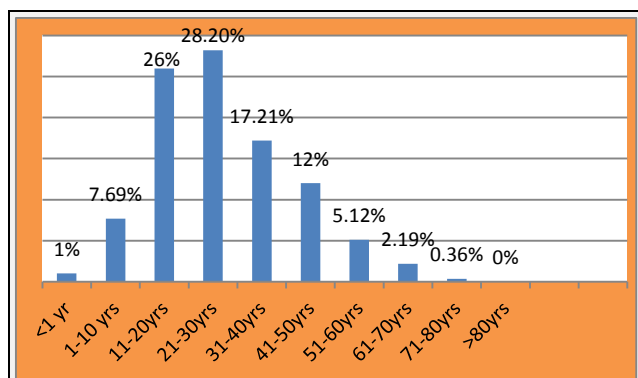


Figure 1. Age-Wise Distribution of Positive Cases of Dengue

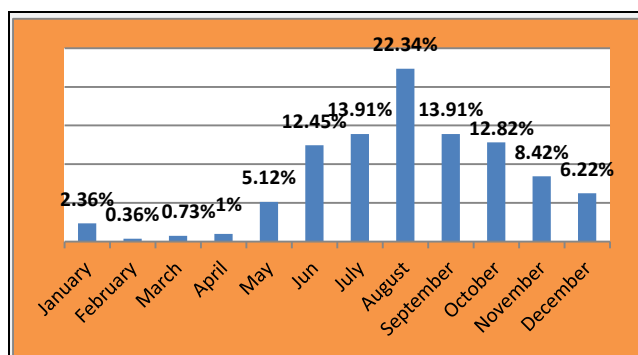


Figure 2. Month- Wise Distribution of Positive Cases of Dengue

DISCUSSION

Dengue is an important and life threatening arboviral infection in tropical countries with an estimated 390 million infection and 96 million symptomatic infections occurring

annually.¹¹ The early diagnosis of Dengue is of great importance to arrest the progression of Dengue related complications. In the present study, overall seropositivity was 14.33%, this finding is in correlation with other studies conducted by Goswami et al,¹² Garg A et al,¹³ Paramasivan Ret al¹⁴ and Manisha Patankaret al.¹⁵ Out of 273 dengue positives, 57.8% were males and 42.12% were females, with males being affected more than females which is in concordance with other studies conducted by Manisha Patankar et al,¹⁵ Garg A et al,¹³ Gupta et al,¹⁶ Mistry et al,¹⁷ Shanmugan et al¹⁸ and Jhansi Charles et al.¹⁹ Higher prevalence among males might be due to their more outdoor activities resulting in exposure to day-time biting mosquitoes compared to females.

In the present study, majority of the positive cases were in the age group of 21-30 yrs (28.2%) followed by age group of 11-20 yrs (26%). These findings are similar to other Indian studies conducted by S. Dhivya Lakshmi et al,²⁰ Madanetal²¹ and Sujatha et al.²² The high incidence of seropositivity in the age group of 11-30 years shows that the children and young adults were exposed to mosquito bites more due to their habits of involving in brisk outdoor activities.²¹

To know the seasonal variation of the dengue, data was analysed on monthly basis. In the present study, there was gradual increase in dengue positive cases from June with maximum positives in August followed by gradual decrease by December. Similar findings have been reported by Madhulika Mistry et al¹⁷ and Nissi Mathew et al.²³ The Present study shows occurrence of dengue cases during monsoon, post monsoon and even dry seasons. As the monsoon season favours breeding of Aedes mosquitoes, an effective preventive and control measures to be taken prior to and the beginning of monsoon to reduce the occurrence of dengue in the community.¹⁷

CONCLUSIONS

Dengue is endemic in many parts of India and epidemics are frequently reported from various parts of India and abroad.^{24,25} The case fatality rate in patients with dengue haemorrhagic fever (DHF) and Dengue Shock Syndrome (DSS) can be as high as 44%. Hence early laboratory diagnosis of dengue is crucial.

The present study provides information on the prevalence of dengue with prevalence being 14.33%. The study shows prevalence rate to be significantly higher in males and in the age group of children & young adults and also occurrence of dengue cases during monsoon season, post monsoon season and even dry seasons, which shows the year-round transmission of Dengue. So, it is necessary to take precautionary measures to control mosquitoes throughout the year.

Early laboratory diagnosis of dengue fever among patients with acute febrile illness is essential to prevent dengue related complications. Creating awareness among the public regarding mosquitoes causing dengue fever and its control measures and personal protective measures is essential for preventing epidemics of dengue and related mortality.

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