



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

International Journal of Current Research  
Vol. 11, Issue, 11, pp.8186-8188, November, 2019

DOI: <https://doi.org/10.24941/ijcr.37174.11.2019>

INTERNATIONAL JOURNAL  
OF CURRENT RESEARCH

## RESEARCH ARTICLE

### EPIDEMIOLOGY AND TRENDS OF DENGUE FEVER CASES- A 4 YEAR STUDY IN A TERTIARY CARE CENTRE OF NORTH DELHI

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#### ARTICLE INFO

##### Article History:

Received 14<sup>th</sup> August, 2019  
Received in revised form  
08<sup>th</sup> September, 2019  
Accepted 25<sup>th</sup> October, 2019  
Published online 26<sup>th</sup> November, 2019

##### Key Words:

Dengue,  
NS1 Antigen.

#### ABSTRACT

**Background:** Dengue an important emerging mosquito-borne disease worldwide, is transmitted primarily by the bite of *Aedes aegypti* mosquito. In recent times, there has been a surge in number of dengue cases creating a burden on the already stressed health infrastructure. **Objectives:** This study was done to assess & analyze the trend of the disease progression over the years along with the epidemiological features in patients admitted to Hindu Rao hospital situated in North Delhi. **Method:** Blood samples from patients suspected of having dengue infection, attending medicine, pediatrics, fever clinics of Hindu Rao hospital were collected and tested for dengue specific IgM antibodies and NS1 antigen positivity. **Results:** In this study, conducted over a period of 4 yrs (2015-2018), a total of 17,499 samples were tested from suspected dengue infection cases. Out of 9968 samples tested for dengue specific IgM antibody, 1711 (17.17%) were positive and out of 7531 samples tested for NS1 antigen, 580 (7.70%) were positive. **Conclusion:** An increase in detection of dengue cases was observed in 2017 & 2018 in comparison to 2015 & 2016. The increase in case detection may be attributed to active health campaigns generating awareness among general public and availability of prompt diagnostic facilities. The increase may also be indicative of infection by a possible new serotype.

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Citation: Dr. Sanjay Jain and Dr. Nadeem Ahmad. 2019. "Epidemiology and trends of dengue fever cases- A 4 year study in a tertiary care centre of North Delhi.", *International Journal of Current Research*, 11, (11), 8186-8188.

#### INTRODUCTION

Dengue is a very important emerging mosquito-borne disease worldwide, transmitted primarily by the bite of *Aedes aegypti* mosquito. In recent times, there has been a surge in epidemics of dengue which earlier used to be sporadic in distribution. There has been a dramatic increase in incidence of dengue cases around the world in recent times. Since most of the cases are asymptomatic, the actual numbers of dengue cases are not reported and often misclassified as other diseases. One estimate indicates 390 million dengue infections per year (95% credible interval 284–528 million), of which 96 million (67–136 million) manifest clinically (with any severity of disease) (WHO, 2019). The capital city of India, Delhi, witnessed its worst ever outbreak since 2006 with over 15 000 cases in the year 2015. In 2015, Island of Hawaii, was affected by an outbreak with 181 cases. The Pacific Island countries of Fiji, Tonga and French Polynesia continues to record dengue cases (WHO, 1997).

Diagnosis of dengue virus infection in early stage is helpful in treatment as well as avoiding complications like Dengue Shock Syndrome (DSS) and Dengue Hemorrhagic Fever (DHF). Dengue specific antibodies appear in the circulation of patients after 5 days of infection. The dominant immunoglobulin is IgM which can be detected by IgM antibody capture ELISA (MAC-ELISA). IgM appears in half of the patients with dengue while they are still febrile while in the rest half they appear within 2-3 days of defervescence. In one series of dengue infection (confirmed by virus isolation or paired sera serology), 80% had detectable level of IgM antibody by Day 5 of illness and 99% by day 10. Once detectable, IgM quickly rises to peak in about 2 weeks, after which it starts declining and becomes undetectable by 2-3 months. Anti Dengue specific IgG appears shortly afterwards (WHO, 1997). NS1 (non-structural protein 1), a highly conserved glycoprotein is essential for the viability of dengue virus and produced both in membrane-associated and secretory forms by the virus. Enzyme-linked immunosorbent assays targeting NS1 antigen (NS1 Ag) have demonstrated high concentrations of NS1 antigen in the sera of patients infected with dengue virus during the early phase of the disease. The detection of secretory NS1 protein, thus represents a new approach to the diagnosis of acute dengue virus infection (Dussart *et al.*, 2006).

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In various studies done on reporting epidemics, it was seen that majority of infection occurred in active adults in the age group of 21–60 years but the age group comprising children <15 years of age was quite severely affected (Dar, 1999; Chakravarti, 2008; Gupta, 2006; Loroño-Pino, 1999). This study was done to assess & analyze the trend of the disease progression over the years along with the epidemiological features in patients admitted to Hindu Rao hospital situated in North Delhi.

## MATERIALS AND METHODS

Samples obtained over a period of 4 years (2015-2018) from patients suspected with signs and symptoms of dengue attending the medicine, pediatrics and fever clinics of Hindu Rao hospital were tested for IgM and NS1 positivity by dengue IgM antibody capture ELISA test issued by National Institute of Virology (NIV), Pune and NS1 antigen positivity by Panbio ELISA kit. About 5 ml blood was collected, serum separated and dengue specific IgM positivity and NS1 positivity tests were performed according the manual supplied by the manufacturer.

## RESULTS

In our study, conducted over a period of 4 yrs (2015-2018), increase in number of cases was noted during 2017 & 2018 as compared to 2015 & 2016 (Table 1). Table 2 shows gender wise distribution of total number of positive cases during the period 2015-2018. Males (1412; 61.63%) were affected more as compared to females (879; 38.36%).

**Table 1. Year –wise distribution of confirmed dengue cases (2014-2018)**

Year	2015	2016	2017	2018
Positive cases	223	225	768	1075

**Table 2. Gender wise distribution of positive cases**

Gender	Total
Male	1412
Female	879
Total	2291

**Table 3. Dengue specific IgM antibody positive v/s NS 1 antigen positive cases**

	Samples Tested	Positive (%)
IgM	9968	1711 (17.17%)
NS1	7531	580 (7.70%)
Total	17499	2291 (13.09%)

**Table 4. Month wise distribution of cases from 2015-2018**

Month	2018	2017	2016	2015
January	0	01	02	02
February	0	0	0	0
March	0	0	0	0
April	0	01	0	01
May	02	0	0	0
June	0	0	0	0
July	01	03	01	01
August	24	61	17	08
September	322	210	94	88
October	562	322	72	42
November	155	162	37	77
December	09	08	02	04
Total	1075	768	225	223

**Table 5. Age wise distribution of cases between 2015-2018**

Age Interval	Number of Cases	Percentage of Cases
0-10 years	190	8.29%
11-20 years	506	22.08%
21-30 years	683	
31-40 years	495	61.89%
41-50 years	240	
51-60 years	127	5.54%
61-70 years	41	1.78%
71-80 years	07	0.30%
81-90 years	02	0.08%

In our study, conducted over a period of 4 yrs(2015-2018), a total of 17,499 samples were tested from suspected dengue infection. Out of 17,499 samples, 9968 samples were tested for dengue specific IgM antibody and 7531 for NS 1 antigen positivity. Out of 9968 samples tested for dengue specific IgM antibody, 1711 (17.17%) were positive and out of 7531 samples tested for NS1 antigen, 580 (7.70%) were positive (Table 3). Table 4 shows the month wise distribution of cases from 2015-2018. The cases are more in the months of September to November comprising 93.53% (2143 out of 2291) of total cases. Table 5 shows age wise distribution of cases between 2015-2018. We found that majority (61.89%) of positive cases were between the age group 21-50 yrs of age. In our study we found that there was an increase in number of dengue cases in the year 2017, 2018 in comparison to 2015 & 2016 (Table 3). The majority of cases (not shown in the table) in the last two years, i.e., 2017-2018 were from North and North-East districts of Delhi.

## DISCUSSION

Dengue is an emerging public health issue worldwide as there is no effective vaccine available to prevent this viral infection. Our study showed a negligible change in dengue cases from 2015 to 2016 but an increase in cases was noted from 2017 to 2018 (Table 1). The increase in detection of dengue cases presenting to the hospital may be attributed to active health campaigns generating awareness among general public and availability of prompt diagnostic facilities. The increase in dengue cases may also be hypothesized to be due to appearance of a new serotype of dengue virus. Similar findings were seen in studies done by Deepali Savargaonkar *et al.* (2018). In our study, out of total 2291 positive cases (Table 2), male predominates over female (1412 v/s 879; 61.62% v/s 38.36%). Studies conducted by Aggarwal *et al* in Lucknow, Eong *et al* in Singapore and Ruel Perez in Manila, Philippines also found similar results (Eong, 2001; Ruel Perex, 2011; Agarwal, 1996). Our study points out the fact that high prevalence amongst men may be due to the outdoor work habit of men compared to females. Males are more prone to the mosquito bite during their day time work or while travelling to the work site in the early morning or returning from the work site in the late evening. It can be hypothesized that lower disease incidence in women may be a statistical artefact related to lower reporting and care-seeking for women from traditional practitioners who in turn fails to report the cases to public surveillance systems. The transmission of dengue follows seasonal variation with increased activity in the post-monsoon season (Table 4). Month-wise prevalence of dengue cases between 2015-2018 shows that the number of cases increases from September to November, thereby establishing the fact that the transmission is maximum during immediate post-monsoon period every year.

The reason for increased cases can be explained by increased breeding of the mosquito vector in stagnant water sources following rainfall. Negligible number of dengue cases were reported in the drier months of December–June during the course of our study. Our finding is supported by similar results obtained in a study done by Chakravarti *et al.* (2005). It is worth mentioning here that besides rainfall there are several other factors like wind velocity, temperature & humidity, population density, and presence of susceptible population which may also influence dengue incidence in a given geographical location.

Dengue affects all age groups worldwide and is a major pediatric public health problem in some regions of the world (Gubler, 1998). In our study, most of the cases were in the age group 21-50 yrs (1178; 61.89%) followed by 11-20 yrs (506; 22.08%) (Table 5). The higher burden in age group 21-50 may be due to the fact that this group is the working group and is more likely to get bitten by the Aedes mosquito at workplace as compared to other age groups. Our study strongly contradicts the general notion that dengue is a pediatric disease and supports the fact that there is a gradual age shift in dengue cases presenting to the health setups (Gubler, 1998). In our study we found that there was an increase in number of dengue cases in the year 2017, 2018 in comparison to 2015 & 2016 (Table 3). The majority of cases (not shown in the table) during the year 2017 & 2018 were from North and North-East districts of Delhi. The city of Delhi has witnessed several outbreaks of dengue in the last few years with a maximum number of cases being reported in the year 2015. Delhi is a metro city and caters to the needs of large number of migrant population in addition to its own population, the basic civic amenities of the city are not well equipped to serve its ever increasing population. This has resulted in emergence of unorganized colonies bearing areas with poor urban planning and high density of population. Frequent water logging during monsoon season is a result of a mediocre sewage disposal system in turn leading to increase in mosquito breeding in an area. Strict vector control measures in these areas are therefore advised to prevent future outbreaks. There are certain limitations of our study. Our study is based on laboratory-confirmed cases representing only the tip of the iceberg in the overall pattern of disease. Secondly, molecular studies to ascertain the circulating serotypes were not done.

**Summary:** Our findings highlights the disease burden in different age groups, gender and in different geographical locations. This will be helpful in planning and improving the public health measures in the city.

**Conflict of interest:** The authors have no conflict of interest to declare.

**Funding:** The study was funded by the Department of Microbiology, North DMC Medical College & Hindu Rao Hospital, Delhi.

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