Globus: An International Journal of Medical Science, Engineering and Technology
A Refereed Research Journal
Vol 3 / No 2 / Jul - Dec 2014 ISSN: 2319-8958

CHARACTERIZATION OF DENGUE VIRUS FROM SOUTH INDIAN POPULATION

*Golla Ravi Sankar

Abstract

The present paper explains The reason behind in the rapid transmission of Dengue fever in southern states has examined the relationship between Aedes Aegypti growth properties and weather variables, such as relative humidity and temperature. Dengue hyperendemic area of southern states like kerala, Tamilnadu, Karnataka, Orrisa and Andhrapradesh.

Keywords: Dengue, Virus.

Introduction

Dengue virus is a leading cause of infection and death in the tropics and subtropics. It is a viral mosquito-borne infection. More than one-third of the living areas are at risk for infection worldwide; approximately 400 million people are infected yearly. It is caused by four types of related viruses transmitted by mosquitoes. Dengue virus is a single-stranded RNA virus which is about 40 to 50 mm in diameter and belongs to the flavivirus family. Dengue is one of the most significant human viral pathogen transmitted primarily by the mosquito female *Aedes aegypti* and on certain occurrence by *Aedes albopictus* through hematophagous arthropod vectors to vertebrate hosts**.**

Genomic organization and sequence homology of the Dengue virus based on Antigenic cross reactivity with other Genus. Various Serological tests based on limited cross reactions define the 4 DENV serotypes. Later the Nucleic acid sequencing inveterate the homology of the 4 serotypes as well as their conserved genetic organization, and allowed road classification of DENV into genetically distinct groups within each serotype (Rico-Hesse, 1990). Dengue fever can be caused by (DENV) serotypes (DENV-1, DENV-2, DENV-3, and DENV- 4), which are genetically and immunologically distinct in nature. The co-circulation of DENV serotypes is associated with two types of infections, primary infection and secondary infection (Guzman MG. 2002).

Literature Review

First virologically proved epidemic of DF in India occurred in Calcutta and Eastern Coast of India in 1963-1964. (Sarkar JK *et al.,* 1964.Carey DE *et al.,* 1966[)].Studies reported and shown that the most of the South Indian states are mainly affected by climatic conditions; because of these changes many people are directly or indirectly affected. Leading to excess rains in some locations, deficient rains and untimely burst in rainfall Rise in average temperature, an element of climate change, favours higher breeding and spread of the mosquitoes. The rate and incidences of transmitting dengue fever, a mosquito-borne tropical disease is increasing fast resulting in higher morbidity and mortality in humans worldwide, particularly in tropical and subtropical countries (R. Chandran *et al.,* 2015).

Research Scholar, Sunrise University, Alwar, Rajasthan

The risk of dengue has increased in recent years due to rapid urbanization, and deficient water management including improper water storage practices in urban, peri-urban and rural areas, leading to proliferation of mosquito breeding sites. The cases peak after monsoon and it is not uniformly distributed throughout the year. However, in the southern states the transmission is perennial (National Vector Borne Disease Control –Annual Report-2014-15).

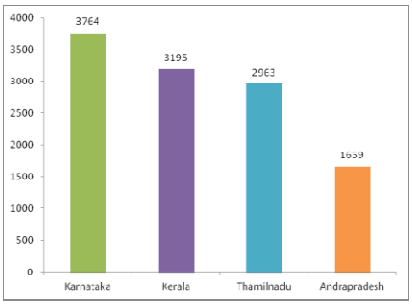

Fig: Reported Dengue cases in India-2015

The reason behind in the rapid transmission of Dengue fever in southern states has examined the relationship between Aedes Aegypti growth properties and weather variables, such as relative humidity and temperature. Dengue hyperendemic area of southern states like kerala,Tamilnadu,Karnataka,Orrisa and Andhrapradesh and the results highlight the importance of climatic factors on the growth of the Aedes Aegypti. The impact of small variations in temperature and humidity on the reproductive activity and survival of the Aedes Aegypti is also the factor. Studies broadly noticed that Aedes Aegypti populations in hot climates can nearly double during periods of mild temperatures rather than in periods of high temperatures (Zhaoxia Wang *et al.,* 2012).

Methodology

Serological detection using Rapid kits:

The acquired immune response to dengue virus infection consists of the production of immunoglobulin's (IgM, IgG and IgA) that are mainly specific for the virus envelope (E) protein. The intensity of the response varies depending on whether the individual has a primary or secondary dengue infection. During a primary dengue infection, the IgM response is typically higher titre and more specific than during secondary infections. The titre of the IgG response is higher during secondary infection than during primary infection. IgA- and IgE-based assays have also been used but the utility of these immunoglobulin's as markers for the serodiagnosis of dengue infections requires further validation.

Dengue-specific IgM is a useful diagnostic and surveillance tool for to know dengue infection. IgM is initially detectable between 3 to 5 days post onset of fever in ~50% of hospitalized patients and has a sensitivity and specificity of ~90% and 98%, respectively, when assays are undertaken five days or more after the onset of fever. Dengue-specific IgM is expressed earlier than dengue-specific IgG (Rosanna *et al.,* 2010).

Dengue infection was initially screened using rapid kits (SD BIOLINE Dengue Duo kit), is a quick, an *in-vitro* immunochromatographic, one step assay designed to detect both dengue virus NS1 antigen and antibodies to Dengue virus (Dengue IgG/IgM) in human serum, plasma or whole blood. SD BIOLINE Dengue Duo rapid test contains two test devices (left side; Dengue NS1 Ag test, right side; Dengue IgG/IgM test).

Test Procedure:

1. Test cassettes were taken from the pouches of the kit, Lay on a clean flat surface and labeled.
2. 5µl of serum sample was added to the Sample Well labeled (A) of the test cassette using a measuring pipette.
3. Follow sample addition with 3 drops of the diluent provided in the dropper bottle by holding the bottle vertically over the (S) well.
4. Results were observed after 5 minutes for strong positives, or up to 30 minutes for weaker positives compared with negatives.

Limitations of the Test:

- Dengue IgG/IgM test is designed to detect antibodies against the Dengue virus in serum.
- For samples that test Positive by the Dengue IgG/IgM test, more specific confirmatory testing should be done.
- A clinical evaluation of the patient's situation and history should also be made before a final diagnosis is established.
- The use of a rapid test alone is not sufficient to diagnose Dengue fever even if antibodies are present. Also, a Negative result does not preclude the possibility of infection with Dengue virus.

Results:

A total 749 serum samples, including samples from the first visit, were tested and 364 (48.59%) found positive for DEN infection. 110 (30.21%) samples were DEN IgM positive; 148 (40.65%) were NS1 antigen positive and 106 (29.12%) samples were positive by RT-qPCR. The gender wise results revealed that males are more infected as compared to females 226 (62.08%) and 138 (37.91%). Serotypes were identified in all RT-qPCR positive samples in that 15 (14.15%) were DENV1, 84 (79.24%) were DENV2, 6 (5.66%) were DENV3 and but only 1 (0.94%) was DENV4. Of the 364 samples, the following clinical features were seen at the time of presentation: fever in 346 (95.1%), vomiting 254 (69.1%), Abdominal pain 119(32.5%), nausea81 (22.9%), rashes61 (16.7%) and mucosal bleeds 63(17.2%). low platelet count [<100,000] in 189 (51.9%). Of the 106 patients in whom dengue virus RNA was detected, the following clinical features were seen at the time of presentation: fever in 69 (65.09%), nausea and/vomiting 24(23.69%), Rash 20(17.92%) and headache 19 (17.92%). DHF was observed in 58 (54.71 %) cases. Skin rash, dehydration, nausea/vomiting, shortness of breath was more significantly associated with DHF than DF.

Table: Symptoms and clinical parameters of DENV infected patients

Characteristics	PERCENTAGE (%)
Fever	(346)95.1
Vomiting	(254)69.1
Abdominal Pain	(119)32.5
Nausea	(81)22.9
Rashes	(61)16.7
Mucosal bleeds	(63)17.2
CLINICAL PARAMETERS	
Hepatomegaly	(8)2.1
Ascites	(14)3.8
Bleeding Manifestations	(92)25.3
Shock	(29)8
Platelet count: <100000	189(51.9%)

Table: Clinical characteristics of DF, DHF and DSS

Characterictics	DF(n=38)	DHF(n=58)	DSS(n=10)
Fever	22(57.89 %%)	37(63.79%)	10(100%)
Headache	7(21.05%)	4(6.89%)	8(0.88%)
Nausea and/vomiting	5(13.15%)	11(18.96%)	8(0.88%)
Rash	4(10.52%)	7(12.06%)	9(0.9%)
Haemorrhage			
Patechiae	-	2(3.44%)	2(20%)
Epistaxis	-	14(24.13%)	2(20%)
Malena	-	7(12.06%)	1(10%)
Shock	-	4(6.89%)	
Other sites of bleeding	-	31(53.44%)	2(20%)

Table: Age and gender wise distribution of all patients

Age	No. of patients (%)		Total
	Male	Female	
≤10	75 (65.21%)	40 (34.70%)	115 (31.59%)
11-20	66 (67.34%)	32 (32.65%)	98 (26.92%)
21-30	24 (57.14%)	18 (42.85%)	42 (11.53%)
31-40	20 (47.61%)	22 (52.38%)	42 (11.53%)
41-50	22 (64.70%)	12 (35.29%)	34 (9.3%)
51-60	11 (57.89%)	8 (42.10%)	19 (5.21%)
>60	8 (57.14%)	6 (32.85%)	14 (3.84%)
Total	226 (62.08%)	138 (37.91%)	364

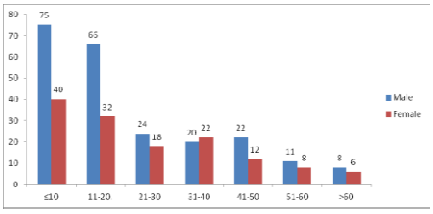

Fig: Showing different age groups in all patients

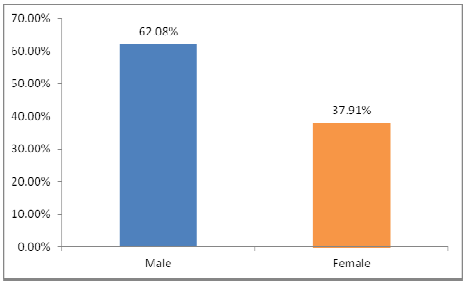

Fig: . Showing DENV positive difference in male and female patients

Discussion

The monitoring of DENV activity is required for public health importance, as the dengue fever and qPCR. Age wise distribution revealed that the highest number of dengue cases were detected in the age group of ≤10 years, followed by 11–20 years and above. In the highest age group (above 60 years), the number of positive cases were too small and only 3.84% dengue IgM positivity was found in the male individuals. In all the age groups, males were more affected than the females. During the year-round study, although small number of samples from suspected dengue cases were referred to us during the period from January to May, only a few were positive to dengue IgM antibody by ELISA method. It is evident from our study that the dengue cases actually started from the month of June and attained its peak in the month of November during this year, which is the post-monsoon period. It may be explained by the fact that the stagnant fresh water during the rainy seasons (June to October) favoured the breeding of the vector mosquitoes.

Conclusion

Our study has important implications, for understanding dengue serotype distribution, transmission and developing control strategies. Our findings confirm that there is a high infection pressure at young ages, as more than half of children experience their first infection before the age of 5 years. This age group is also at highest risk of mortality. The high level of transmission at very young ages, suggests that control strategies and future vaccination schedules that focus these age groups are likely to provide the most benefit. Finally, a number of studies have indicated that transitions in dengue epidemiology and serotype distribution, characterized by average age, environmental factors of cases.

DHF/DSS are increasing worldwide and are spreading in the places, where it was previously not reported. The first isolation of DENV serotype 1 and 4 was reported from India in 1964 and serotype 3 in 1968 (Ref). Although concurrent infection with more than one serotype of DENV in the same individual is uncommon, high percentage of concurrent infections with different DENV serotypes had been detected at an outbreak in Delhi, India, in 2006. Kolkata is a dengue endemic zone; frequent outbreaks of DF and DHF have been occurring since last centuries. In Kolkata, dengue was first documented in 1824 and several epidemics took place in the city during the years 1836, 1906, 1911, and 1972, affecting 40% of the city people (). The last large-scale dengue outbreak has been recorded in the year 2005. In the rural areas of West Bengal, dengue is gradually spreading and establishes new reports. No continuous monitoring of the molecular detection of the dengue serotype has yet been attempted in the city of Kolkata, either in epidemic or in sporadic dengue outbreaks.

In this study, 364 samples are showing positive for DENV out of DENV suspected 749 samples. But in that 110 samples are primarily detected with IgM/IgG, 148 samples are detected with NS1 Ag and 106 samples are showing positivity for RT-

References

1. Ackermann M, Padmanabhan R: De novo synthesis of RNA by the dengue virus RNA-dependent RNA polymerase exhibits temperature dependence at the initiation but not elongation phase. J Biol Chem 2001, 276:39926–39937.
2. Alcon S, Talarmin A, Debruyne M, Falconar A, Deubel V, Flamand M:Enzyme-linked immunosorbent assay specific to Dengue virus type 1nonstructural protein NS1 reveals circulation of the antigen in the blood during the acute phase of disease in patients experiencing primary or secondary infections. J Clin Microbiol 2002, 40:376–381.
3. Allison SL, Schalich J, Stiasny K, Mandl CW, Heinz FX. Mutational evidence for

an internal fusion peptide in flavivirus envelope protein. E J Virol. 2001; 75:4268–4275.

4. Munish Rana (2014). "A study on the role of dye lasers"**,** Globus An International Journal of Management & IT, 6 (1) : 1-3.

5. Amarasinghe, A., *et al.,* (2014). Uncovering Dengue in India. Global Journal of Medicine and Public Health, 3(3).

6. Amberg, S. M., A. Nestorowicz, *et al.,* (1994). "NS2B-3 proteinase-mediated processing in the yellow fever virus structural region: in vitro and in vivo studies." J Virol 68(6): 3794-3802.