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Study of Ecological and Epidemiological Factors of Dengue Viral Fever in Districts of West Bengal in a Tertiary Care Hospital

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Abstract: *Dengue fever is one of the major tropical diseases caused by dengue virus especially in tropical and subtropical countries, mainly involving urban and semi-urban areas. A hospital based observational study was carried out in our tertiary care centre from 01.11.2018 to 31.12.2018 to determine ecological and epidemiological factors of dengue viral fever in districts of West Bengal. A total no of 692 serum samples were tested for anti-dengue IgM antibodies and NS1 antigen with overall prevalence of 6.79%.The rate of seropositivity was highest i.e. 46.8% in 15-30 years age group and the study found statistically significant association between rate of seropositivity and age group (p value <0.05). Though there was male preponderance but it was not found to be statistically significant. Maximum Dengue cases were observed in Kolkata districts (38.12%) followed by Howrah (17%) districts. Majority of cases occurred in the month of November. The dengue fever was affecting both the genders almost equitably and mostly the younger age group from urbanas well as rural areas. Thereby understanding of local epidemiology, risk factors and disease burden in dengue is essential to initiate preventive measures.*

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I. Introduction

Dengue is one of the topmost public health concerns today, especially in tropical and subtropical countries, mainly involving urban and semi-urban areas. It is caused by the dengue virus (DENV, 1-4 serotypes), and categorised under the genus Flavivirus. The first evidence of occurrence of Dengue fever in the country was reported in 1956 from Vellore district in Tamil Nadu followed by the first epidemic in Kolkata, West Bengal during 1963-64.[1] The number of dengue cases has increased 30-fold over the past five decades globally and is endemic in more than 100 countries with estimated 50 million infections annually.[2] Dengue is endemic in many parts of India and recently in the last few years many places have even experienced epidemics.[3] The expansion of dengue in India has been related to unplanned urbanization, changes in environmental factors, host–pathogen interactions and population immunological factors. Inadequate vector control measures have also created favourable conditions for dengue virus transmission and its mosquito vectors. India receives 75% of its rainfall during the period from June to September and monsoon rainfall provides ample breeding habitats for *Ae. aegypti*, thus leading to high vector densities.[4,5] For tropical zones, including India, dengue is highly seasonal. [5]Warm temperatures and high humidity favour increased longevity of the adult mosquitoes and shorten the viral incubation period within the vector thus leading to faster virus replication and increased transmission intensity. Thereby this study was undertaken to know the geographical and epidemiological factors that's contributing the spread of dengue virus infection around the adjoining districts of our tertiary care hospital in West Bengal.

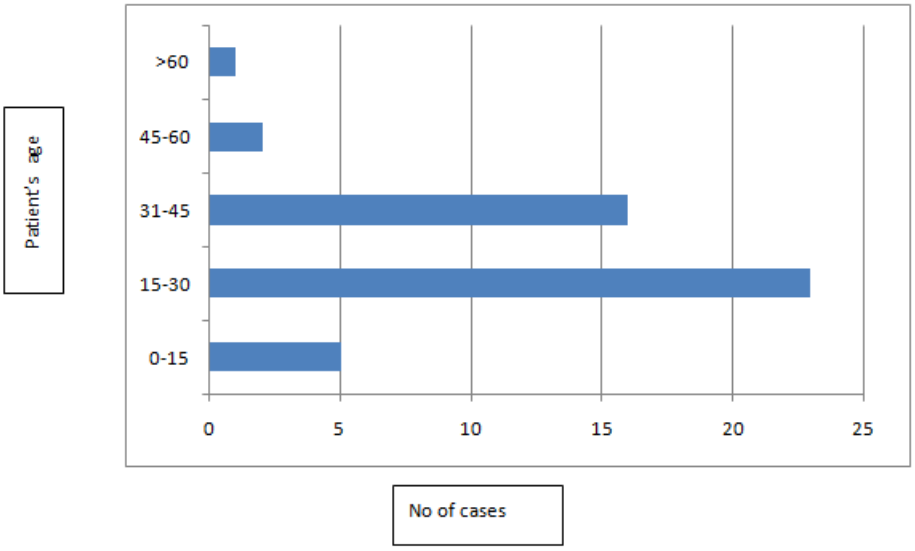
II. Material & Methods

It was a hospital based observational study undertaken to assess the geographical and epidemiological profile of all dengue reactive patients admitted from 01.11.2018 to 31.12.2018 in our tertiary care hospital. Approximately 5 ml of blood samples from all clinically suspected dengue cases were tested as per WHO criteria. Persons having <5 days of fever were subjected to NS1[6] antigen testing by InBios pvt ltd and ≥5 days fever days of fever were tested for the presence of dengue specific IgM antibodies by using MAC ELISA,[6] developed and commercialized by InBios Pvt Ltd. All the NS1 and IgM reactive cases were included in study. Detailed about reactive patient's demographic profiles were collected. Any variations in disease reporting by gender, age and season were assessed.

III. Result and Analysis

A total no of 692 serum samples were tested for anti-dengue IgM antibodies and NS1 antigen from 01.11.2018 to 31.12.2018 with overall prevalence of 6.79%. Out of these, 47 were serologically reactive; 17 for anti-dengue IgM antibodies and 30 for NS1 antigen. Out of the 47 total positive cases of dengue, the rate of seropositivity was highest i.e. 46.8% in 15-30 years age group followed by 31-45 years (34%) and the study found statistically significant association between rate of seropositivity and age group (p value <0.05) (Graph 1). Out of 692 samples tested, 390 were males and the rest females. Out of the 47 total positive cases of dengue, the rate of seropositivity i.e. 63.82% was higher in males as compared to females (36.17%) and there was no significant association between rate of seropositivity and gender (p value= 0.3628).(Table 1)

Maximum Dengue cases were observed in Kolkata districts (38.12%) followed by Howrah (17%), South 24 PGS(10.63%) and Hooghly (8.5%) districts .(Table 2) Though Most of the cases were from Kolkata and Howrah districts other districts also reporting the dengue cases regularly. Majority of reactive cases were reported from the month of November.



Graph1. Age wise distribution of dengue reactive cases

Table No.1 Gender Analysis of the Dengue Reactive Cases (n=47)

No. Of Reactive cases	Male(%)	Female(%)
NS1(n=35)	21(44.68%)	14(29.78)
IgM Dengue(n=12)	09(19.14%)	03(6.38%)

Table No.2 Total number of Reported Cases-47(from different districts of West Bengal)

District	Reactive
Kolkata	18
Howrah	8
Hoogly	4
N 24 Pgns	3
S 24 Pgns	5
Murshidabad	3
West Medinipur	3
Bankura	3
Others	04

IV. Discussion

Dengue viruses are arboviruses capable of infecting humans and causing outbreaks. WHO has declared dengue to be hyper endemic in India and cyclical epidemics of dengue are becoming more frequent. There has been a steady rise in the number of dengue cases reported every year. Since the 1990s, epidemics of dengue have become more frequent in many parts of India. During a period (2010–2014), 213 607 cases (incidence: 34.81 per million population) of dengue fever were observed. [7] Thus, the number of dengue cases during the past 5 years has increased markedly, by a factor of ~2.6, with respect to the 1998–2009 period.[7,8] The highest numbers of cases were reported from Punjab followed by Tamil Nadu, Gujarat, Kerala, and Andhra Pradesh.[4] All four serotypes i.e., dengue 1,2,3,4 have been isolated in India. In the present study the prevalence of dengue was 6.7%. The results were congruent with other studies whereas few other studies have reported lower

prevalence rate ranging 3-13% and some studies have reported higher prevalence i.e. 40%.This difference in seroprevalence could be due to differences in study settings, differences in study periods, differences in sampling techniques, data collection tools as well as differences in sample processing techniques. The present study found maximum positive cases 363 (76.41%) in the age group of <30 years similar to the findings of other studies.[9,10] However, rate of positivity was highest in age group < 15 years i.e. 30.33% followed by 16-30 years i.e. 20.4% similar to findings of several Indian and international studies.[11,12] On the contrary few other Indian studies have reported to 45 years as the most affected age group.[13] Comparatively lower immunity and intrinsically more permeable vascular endothelium in children render them more susceptible to dengue infections. A seasonal trend of dengue over one year period was assessed. According to intensity of rainfall, weather data was divided in three periods, namely; pre monsoon period: from February-May, monsoon period: from June-September and post monsoon period: from October-January.

Certain studies showed highest number of cases during Aug-Nov (Maharashtra), Sept- Oct (Bidar), October (Delhi), Oct-Nov (Northeast), September (Lucknow, Udupi).[13,14,15,16] The reason for post monsoon peak in our study may be due to prime occupation of the people being agriculture and increased breeding of vector mosquitoes owing to collection of rain water in domestic and peridomestic areas. Dengue fever has assumed an endemic status in more than 100 countries in Africa, America, Eastern Mediterranean, South-East Asia and Western Pacific areas. South-East Asia and Western Pacific regions are worst affected. Climatic variation spread of dengue vectors to newer geographic regions, increasing cross border travel, global trade, and urban movement have collectively raised the status of dengue fever to a problem of global concern [17]. In India, the vulnerability of dengue has increased in recent years due to rapid urbanization, lifestyle changes and deficient water management including improper water storage practices in urban, periurban and rural areas, leading to proliferation of mosquito breeding sites. Most of the cases are from unauthorized dwellings where improper drainage of water was present. Lack of potable water, poor hygienic conditions, overcrowding, and stored water may lead to potential breeding sites favourable for the mosquitoes However, in the Southern states and Gujarat the transmission is perennial.

The study also reveals that dengue infection is not only prevalent in Kolkata but also semiurban, rural areas Hooghly, Howrah, N 24 Pgn, S 24 Pgn Murshidabad and Birbhum districts. This suggests that dengue infection is no more an urban area infection but it is extending its arms to rural areas also, which may become a cause for concern to health authorities. This study calls for a careful vigil to prevent the possible spread of the vectors between different areas.

V. Conclusion

Dengue has become widespread and repeated attacks due to different serotypes are becoming common. Early diagnosis of dengue allows institution of appropriate supportive therapy and decreases risk of complications. In this regard, the role of the laboratory for diagnosis of Dengue, through serological, molecular and virological methods remains crucial to understand the exact burden of disease. Monitoring of climatic and environmental factors has important association with high vector density. Understanding of local epidemiology, risk factors and disease burden in dengue is essential to initiate preventive measures in time so that the outbreaks and epidemics can be avoided or controlled.

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