



SEASONALITY AND MORBIDITY PROFILE OF DENGUE PATIENTS FROM AN APEX INFECTIOUS DISEASE HOSPITAL OF EASTERN INDIA

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ABSTRACT

Background: Dengue is one of the most predominant vector-borne infections worldwide, caused by an arbo-virus and transmitted by *Aedes aegypti* mosquito. About half of the world's population is now at risk with around 100-400 million dengue cases occurring each year.^[1] Dengue causes significant morbidity and mortality in many tropical countries including India.

Objective: To determine the morbidity profile and seasonal trend of dengue.

Methodology: A hospital based descriptive observational study was conducted during January to December 2019 (over 1 year) in an apex infectious disease hospital of Kolkata, West Bengal. Total 1340 admitted dengue patients were studied through interview technique and review of relevant reports.

Results: Out of total 1340 dengue patients majority were in the age group of 21-30 years (30.9%), male (56.1%), belonged to urban area (59.3%). Cases were showing inclining trend from the month of August, peaked at October-November, thereafter declined in December. Among the dengue cases 89.5% were classified as DF, 8.6% DHF and 1.9% DSS; case fatality rate was 0.45%. Overall 25.9% patients developed hypotension, 3.9% had hemorrhagic skin rash and 6.6% presented with other hemorrhagic manifestations.

Conclusion: In order to reduce dengue morbidity and mortality timely effective management and severity assessment by clinician is indispensable along with area specific awareness generation activity to be initiated during pre-monsoon period for vector control and personal protection by involvement of local leaders.

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INTRODUCTION

The global incidence of dengue has grown dramatically in recent decades; WHO reported almost 15 fold rise over last two decades, from 2000 (505,430 cases with 960 deaths) to 2015 (3,312,040 cases with >4000 deaths).^[1,2] The largest number of dengue cases ever reported globally was in 2019, all WHO regions were affected.^[2] Though dengue infection risk exists in 129 countries, Asia accounts for 70% and India shares nearly 34% of global dengue burden.^[1,2,3] First Dengue outbreak of India occurred in Calcutta in 1963.^[5] Thereafter several outbreaks have been reported in various parts of the country during last four decades.^[2]

The primary Dengue infection in a non-immune person usually causes dengue fever (DF) and subsequent infection by a different serotype causes more severe illness like Dengue hemorrhagic fever (DHF) or Dengue shock syndrome (DSS).^[4]

In absence of any specific anti-viral therapy or vaccine against dengue; prevention depends largely upon vector control along with prompt case detection and management.^[4] Early detection of disease progression and access to proper medical care lowers fatality rates of severe dengue to below 1%.^[2]

Dengue virus serotypes have changing geographical distribution, associated with variable clinical presentation and disease trend which warrants the need for continuous research.^[3]

With these above perspectives the present study was undertaken among the admitted dengue patients in an apex referral infectious disease hospital with the objectives of assessing demographic and morbidity profile of patients and seasonality of occurrence of disease.

METHODOLOGY

This was a hospital based descriptive, observational study conducted over one year study period. Total 1340 cases of Dengue fever were admitted from January to December 2019 in this infectious disease hospital and were taken as study sample.

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Data were collected in a pre-designed, pre-tested questionnaire following three techniques. (1) Interview of patients or caregivers (of critically ill patients and children) was conducted to collect information about patients' demographics eg. age, gender, religion, area of residence, onset of symptoms etc. (2) Patients bed head tickets (BHTs) were reviewed to get the information regarding clinical profile and complications if any, treatment given and final outcome of the patients, timing of admission etc. (3) Reviewing laboratory investigation reports to know about the methods of confirmation of diagnosis and different hematological parameters. The study was conducted after obtaining permission from Institutional Ethics Committee. Verbal consent was obtained from the patients/care-givers after explaining the purpose of the study.

The study cohort included patients who were serologically diagnosed as dengue-positive, using the dengue NS1 (Non structural protein 1) antigen and dengue specific IgM or, IgG antibodies. Serum samples from clinically suspected Dengue cases having a history of fever for 1-5 days were tested for NS1 antigen and those having fever for >5 days were tested for IgM antibodies by using IgM antibody capture enzyme linked immune-sorbent assay (MAC-ELISA). NS1 antigen can be detected from as early as 1st day of onset of symptoms and persists upto 18 days. IgM antibodies appear as early as 3rd day and can persist for 30-60 days, whereas IgG antibodies appear at about 7th day, peak at 2-3 weeks and persist for life.^[1]

The data were entered in MS Excel 2007 and analysed using MS Excel and IBM SPSS 16.0. Qualitative data was represented through frequencies, percentages and diagram. Quantitative data was represented in the form of mean and SD.

RESULTS

A total of 1340 dengue cases were admitted in this hospital during January-December 2019. Table.1 showed that majority of the patients was in the age group of 21-30 years (30.9%), whereas 2.9% patients were aged above 60 years. The male patients (56.1%) slightly outnumbered female patients (43.9%), male: female ratio was 1.05. Majority (75.7%) of the patients were Hindu, rest (24.3%) were Muslims. Overall 59.3% patients belonged to urban areas, whereas 40.7% reside in rural areas.

Majority (87.7%) of the Dengue cases were reported from the metropolitan city of Kolkata (26%) and its suburban areas of North-24-Parganas (47.6%) and South-24-Parganas (14.1%) districts; 12.3% cases were from other neighboring districts, majority of them were referred with complications.

It was revealed from figure.1 that occurrence of dengue cases was prevalent throughout the year. Number of patients increased from the month of August and reached at peak during October-November, after that cases followed sharp declined from December onwards.

Regarding laboratory confirmation of diagnosis, 1142 (85.2%) blood samples were tested positive for NS1 antigen, 170 (12.7%) samples were confirmed by detection of dengue specific IgM antibody, 24 (1.8%) samples had given positive results for both NS1 and IgM, while 4 (0.3%) samples which gave equivocal results to both the above mentioned tests were tested positive for dengue specific IgG antibody. (table.2)

Based on the WHO (1997) criteria for clinical classification for dengue, 89.5% patients were classified as DF, 8.6% DHF and 1.9% DSS. Dengue patients presented with symptoms of fever (92.7%), body-ache (29.6%), headache (23%), retro-orbital pain (42.3%), pain abdomen (23.5%), vomiting (43.1%), hypo-tension (25.9%), anorexia (19.3%), hemorrhagic skin rash (3.9%), diarrhoea (17.6%), melena (3.2%), hematuria (1.9%) and bleeding from nose and gum (1.5%) as shown in table.3.

Laboratory analysis relevant to Dengue included haematocrit (HCT) value and total leukocyte count at the time of admission as well as lowest platelet count. Thrombocytopenia (platelet <1 lakh/cu mm) was found in 84.4%, severe thrombocytopenia (platelet <20000 /cu mm) in 10%, HCT >40% was found in 51.1%, leucopenia (WBC <4000/ cu mm) in 13.3% patients.

Out of the total dengue patients 3.6% were co-infected with malaria, 2.1% developed hepatitis, 3.6% developed meningitis, 1.8% had suffered from acute kidney disease, 5.5% found to be anemic, 0.5% had seizure episodes and 0.5% ended with sepsis. 9.1% patients received platelet transfusion; while 1.8% received fresh frozen plasma (FFP). Mean length of hospital stay (mean±SD) was 3.8 ±1.5 days with range of 2-7 days.

Out of total 1340 patients 6 were died due to dengue related complications eg. shock, multi organ dysfunction syndrome and sepsis. Thus dengue case fatality rate in this hospital was found to be 0.45% during 2019.

Table 1 Demographic characteristics of admitted dengue patients (N=1340)

Demographic variables	No.	%	
Age groups (in years)	0-10 years	4	0.3
	11-20 years	295	22.0
	21-30 years	414	30.9
	31-40 years	311	23.2
	41-50 years	187	14.0
	51-60 years	90	6.7
Gender	>60 years	39	2.9
	Male	752	56.1
Residence	Female	588	43.9
	Urban	795	59.3
Religion	Rural	545	40.7
	Hindu	1014	75.7
	Muslim	326	24.3

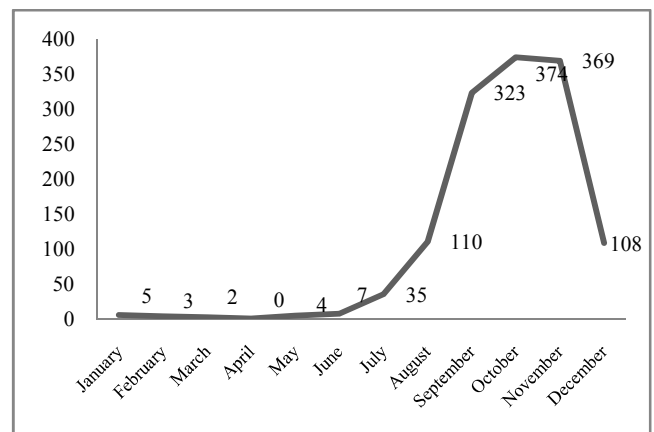


Figure 1 Line diagram showing month-wise distribution of Dengue cases in 2019 (N=1340).

Table 2 Serology in Dengue fever patients (n=1340).

Parameters	No. of Dengue positive cases	%
NS1 positive	1142	85.2
IgM positive	170	12.7

Both NS1 & IgM positive	24	1.8
IgG positive	4	0.3

Table 3 Case classification and clinical characteristics of dengue patients (N=1340).

Variables	Number	%
Dengue classification		
Dengue fever (DF)	1199	89.5
Dengue hemorrhagic fever (DHF)	115	8.6
Dengue shock syndrome (DSS)	26	1.9
Clinical Characteristics		
Fever	1242	92.7
Headache	131	9.8
Body-ache	396	29.6
Arthralgia	79	5.9
Retro-orbital Pain	566	42.3
Skin rash	52	3.9
Nausea/ vomiting	578	43.1
Anorexia	259	19.3
Abdominal pain & tenderness	315	23.5
Diarrhoea	236	17.6
Melena	43	3.2
Hematuria	26	1.9
Epistaxis & bleeding gums	20	1.5
Dysuria	105	7.8
Dry cough	50	3.7
Shortness of breath	52	3.9
Hypo-tension	347	25.9

DISCUSSION

The present study, conducted among 1340 admitted dengue patients during 2019, revealed that majority of them were between 21-30 years (30.9%). Similar age group was found to be most commonly affected in the earlier studies done by Gupta G.^[5] (30.4%) and Savargaonkar D. *et al.*^[6] (29.4%). Whereas Mitra K. *et al.*^[7] and Padhi S. *et al.*^[3] reported majority were between 11-20 years; Anand K.S.S.^[8] found majority in 41-50 years age group. Another study by Jamaiah I. *et al.*^[9] showed that DHF affected much younger patients (10-19 years) as compared to DF (20-29 years) in majority.

The current study showed that male patients (56.1%) slightly outnumbered females (43.9%), which corroborated with findings of Mitra K. *et al.*^[7] (57.1% and 42.9%). Other studies found much higher proportion of male dengue patients; Solanke S.N. *et al.*^[3] (70.8%), Anand K.S.S.^[8] (68%), Gupta G.^[5] (64.7%) and Imam A.^[10] (62.8%).

Out of the total admitted patients 59.3% cases were reported from urban area and rest belonged to rural area; this corroborated with the findings of Gupta G.^[5] (64.7%).

Seasonal trend analysis revealed dengue cases showed inclining trend from the month of August and reached its peak in October- November, then declined in December; which corroborated with findings of Padhi S. *et al.*^[3], Gupta G.^[5] and Savargaonkar D. *et al.*^[6]. Another study conducted by Mitra K. *et al.*^[7] in WB reported that cases increased since June, peaked at September- October; came down at December-January.

Serological diagnosis of dengue was made in majority of the cases (85.2%) by NS1 Antigen, which indicated diagnosis within 5 days of onset of fever. Earlier studies found that much lower proportions of dengue were diagnosed by NS1 positivity: Solanke S.N. *et al.*^[3] (41.7%), Vazhayil P.P.^[4] (57.7%), Chaloe Wong J. *et al.*^[11] (57.8%) and Gupta G.^[5] (70%). Present study revealed that 84.4% patients developed

thrombocytopenia and 10% developed severe thrombocytopenia, HCT >40% was found in 51.1% and leucopenia was detected in 43.3% patients. Similar proportion of dengue patients reported to develop thrombocytopenia by Imam A. *et al.*^[8] (71.9%); severe thrombocytopenia by Vazhayil P.P.^[4] (8.9%) and Kale *et al.*^[12] (6.7%); leucopenia by Vazhayil P.P.^[4] (48.7%) and Imam A. *et al.*^[10] (57.9%).

Out of the total 1340 dengue cases 89.5%, 8.6% and 1.9% developed DF, DHF and DSS respectively; which corroborated with earlier studies done by Mallhi T.H.^[13] (88.1%, 11.1% and 0.8% respectively), Padhi S. *et al.*^[3] (97.6%, 2.2% and 0.2% respectively) and Jamaiah I. *et al.*^[9] (81% and 19% respectively).

The present study revealed that dengue patients presented with clinical features of fever (92.7%), headache (23%), abdominal pain (23.5%), retro-orbital pain (42.3%), vomiting (43.1%), diarrhoea (17.6%), hemorrhagic skin rash (3.9%), melena (3.2%), hematuria (1.9%), epistaxis and gum bleeding (1.5%), hypo-tension (25.9%) etc. Earlier studies by Solanke S.N. *et al.*^[3], Vazhayil P.P.^[4], Savargaonkar D. *et al.*^[6], John K.J. *et al.*^[14], Mallhi T.H.^[13] etc also mentioned similar clinical features among dengue patients.

The present study found that 9.1% patients received platelet transfusion; while 1.8% received fresh frozen plasma (FFP). John K.J. *et al.*^[14] found much higher proportion of patients received platelet (27%) and FFP (19.5%) transfusion; Imam A. *et al.*^[10] found 15.4% required blood products.

Out of the total dengue patients 3.6% were co-infected with malaria, 2.1% developed hepatitis, 3.6% developed meningitis and 1.8% had suffered from acute kidney disease. John K.J. *et al.*^[14] also reported that on admission few patients presented with hepatitis (65.8%), encephalitis (6.2%), renal dysfunction (5.6%); Savargaonkar D. *et al.*^[6] observed co-infection of malaria and dengue in seven (0.5%) patients.

Mean length of hospital stay (mean±SD) was 3.8 ±1.5 days with range of 2-7 days. Similar findings were observed by Solanke S.N. *et al.*^[3] (3.7±1.4 days) and John K.J. *et al.*^[14] (4.9±2.4 days).

CONCLUSION AND RECOMMENDATIONS

Present study revealed that dengue was prevalent throughout the year, though majority of case occurred in monsoon and post-monsoon season probably due to high vector breeding. During the year 2019 dengue morbidity was quite high with low case fatality in this hospital. Sustained awareness has to be generated among the general population for vector control in pre-monsoon period through inter-personal communication by health workers at community level along with mass media campaign to reduce dengue burden. Early diagnosis of complications with access to proper medical care is crucial to avert further deterioration and case fatality. Any sharp rise in dengue occurrence requires further research regarding any changes in environment or vector behaviour and initiation of prompt control measures.

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