Original Research Article

Clinical profile and outcomes of dengue fever during monsoon season at a tertiary care hospital in South India

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Received: 11 September 2021
Accepted: 28 September 2021

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ABSTRACT

Background: Dengue is a mosquito-borne infectious disease of the tropical and subtropical countries which is rapidly becoming a global burden. It is caused by any of the four serotypes of dengue virus. Dengue disease presentation varies from mild fever with myalgia and fatigability to severe conditions of dengue haemorrhagic fever and shock syndrome. This study describes the clinical features, laboratory parameters and outcomes of the dengue fever patients during the monsoon season in a tertiary care hospital.
Methods: This is retrospective, single centre study carried out at Yenepoya medical college and hospital (YMCH), Mangalore a coastal town in southern India. All patients who were adults (aged>16 years), positive for rapid (NS1 antigen) test or dengue IgM Elisa and admitted from 1-5-2019 to 31-9-2019 (monsoon season) were included in this study. Data was collected from the medical records of YMCH.
Results: The male to female ratio of patients in this study was about 4:1. About 70.1% belonged to the age group between 16-35 years. The predominant symptoms on admission were fever, headache, myalgia, nausea and vomiting, abdominal pain, loose stools, bleeding manifestations and skin rashes. Average days of hospitalization are 5.88 days (SD 2.94). Thrombocytopenia leukopenia raised hematocrit and transaminases are the commonly observed laboratory findings. Ascites, pleural effusion, gall bladder wall edema, sepsis, bradycardia, hypotension, ARDS, and acute kidney injury are the complications observed during the illness. Mortality rate in this study is 1.9%.
Conclusions: As seen in this study dengue fever is predominantly affecting the younger age group. The early confirmation of diagnosis, identifying the warning signs and prompt supportive management will help in preventing the further complications and in reducing the mortality. Increased public awareness and vector control measures are important factors to be taken into consideration in the prevention of dengue.

Keywords: Dengue, Complications, Mortality, Prevention

INTRODUCTION

Dengue is a mosquito-borne infectious disease of the tropical and subtropical countries which is rapidly becoming a global burden. It is caused by any of four antigenically distinct serotypes of dengue virus (DENV1, DENV2, DENV3 and DENV4) belonging to *Flaviviridae* family and is transmitted by female Aedes aegypti and Aedes albopictus mosquitoes. Dengue disease presentation varies from mild fever with myalgia and fatigability to severe conditions of dengue haemorrhagic fever and shock syndrome.[1] Population growth, uncontrolled urbanization and breeding of mosquitoes in tropical and subtropical countries has led to increased transmission of dengue.[2]

Dengue is becoming serious health problem worldwide. The demographic and clinical profile dengue infections have changed rapidly in recent years.[4] Dengue fever was enlisted by the WHO as one of the ten threats to global health in 2019. The number of cases reported increased from 2.2 million in 2010 to over 4.2 million in 2019. The largest number of dengue cases ever reported globally was

in 2019.[3] According to the WHO report, some 2.5 billion people--two fifths of the world's population in tropical and subtropical countries are at risk of infection. About 2.5% of the patients affected with dengue die of the disease.[2]

In India dengue cases will rise during monsoon season due to collection of water in many places and standing water acts as breeding ground for mosquitoes. Dengue has more frequent outbreaks and transmission leading to increased proportion of severe cases and deaths in India. Since the mid-1990s, epidemics of dengue in India have become progressively larger and more frequent.[8] Many parts of India are now endemic for dengue infection and has become a serious concern. Dengue presents with various clinical spectrum and manifestations and thus makes the diagnosis a challenging task. This may delay the initiation of treatment leading to complications and increase in mortality. The present study is conducted at a tertiary care hospital in Mangalore designed to investigate clinical features, laboratory parameters and outcomes of dengue fever patients admitted during the monsoon season.

METHODS

This is retrospective, single centre study carried out at Yenepoya medical college and hospital, which is a tertiary care hospital at Mangalore, a coastal town in southern India. All patients who were adults (aged >16 years), positive for rapid (NS1 antigen) test or dengue IgM Elisa and admitted between 1-5-2019 and 31-9-2019 (monsoon season) were included in this study.

Data was collected from the medical records of Yenepoya medical college and hospital. Details of the age and gender distribution, signs and symptoms were recorded. Laboratory investigation reports of the patients at the time of admission were obtained. Ultrasonography scanning reports of abdomen and chest (done to look for signs of leakage and fluid accumulation) were noted. Details of treatment, hospital stay, organ involvement, complications and the outcomes were also recorded.

Data analysed by frequency, percentage, mean and standard deviation. The clinical and laboratory parameters were analysed.

RESULTS

About 210 patients with dengue fever were admitted into the general medicine department with varying symptoms. Out of 210 patients, 172 (81.9%) were males and 38 (18.1%) were females. The male to female ratio was about 4:1. Majority of the patients 143 (70.1%) belonged to the age group between 16-35 years. About 75% of the patients are below the age of 40 years.

The predominant symptoms on admission were fever 209 (99.52%), headache 138 (65.71%), myalgia 146 (69.52%), nausea and vomiting 73 (34.76%), abdominal pain 46

(21.9%), loose stools 21 (10%), bleeding manifestations 11 (5.24%) and skin rashes 10 (4.76%).

Table 1: Age-wise distribution.

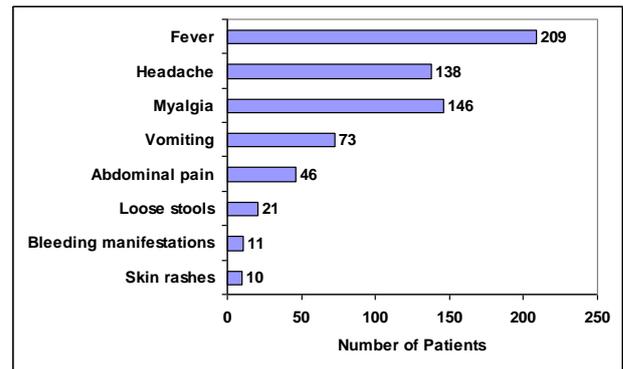| Age (years)	Number of patients
16-25	77
26-35	66
36-45	31
46-55	22
56-65	8
>65	6

Figure 1: Clinical manifestations.

Among 210 patients, 15 (7.14%) had diabetes mellitus, 10 (4.76%) had hypertension, 4 (1.9%) had coronary heart disease, 2 (0.95%) had bronchial asthma, 2 (0.95%) had chronic liver disease and 1 (0.47%) had chronic kidney disease.

At the time of admission 156 (74.28%) patients had dengue with no warning signs, 48 (22.85%) patients had dengue with warning signs and 6 (2.85%) were having severe dengue. Out of these 210 patients, 16 (7.62%) patients required intensive care unit admission. The number of days spent by the patients in the hospital varies from 3 to 21 days. Average days of hospitalization is 5.88 days (SD 2.94).

The laboratory parameters of the patients on admission had been recorded. The mean hemoglobin was 14.22 gm/dl (SD 1.93). The 34 (16.19%) patients had >16 gm/dl of hemoglobin. The mean WBC count was 5485.04 (SD 4872.83) per microliter. The 89 (42.38%) patients had leukopenia (4000/microliter) on admission. Average platelet count was 92438 (SD 61897.57) per microliter. About 130 (61.9%) patients had thrombocytopenia (<100000/microliter) on admission. Among these 20 (9.2%) of patients had <20000/microliter of platelets.

The average haematocrit was 42.52% (SD 5.53). About 61 (29.04%) patients had >45% of haematocrit on admission. Average haematocrit in dengue patients with no warning signs is 42.42% (SD 4.51) and dengue patients with warning signs is 44.13% (SD 6.67).

Table 2: Number and percentage of patients with respect to laboratory parameters.

Laboratory parameters		Number and percentage of patients (%)
Hb >16 gm%		34/210 (16.19)
Haematocrit (PCV) >45%		61/210 (29.04)
Total leucocytes (WBCs) <4000/cmm		89/210 (42.38)
Platelet count	<1,00,000	130/210 (61.9)
	<20,000	20/210 (9.2)
AST (>45 U/L)		160/210 (76.2)

Liver is most affected organ on admission in our study and liver transaminases are found to be increased in majority of patients. The 160 (76.2%) patients had elevated (>45 U/L) AST and 106 (50.47%) patients had elevated (>55U/L) ALT. The mean AST was 231.65 (SD 962.14) and the mean ALT was 112.93 (SD 390.06). Leaking and accumulation of fluid is common in dengue patients which may complicate the course of the disease.

Ultrasonography of abdomen revealed ascites in 14 (6.66%), pleural effusion in 12 (5.71%), gall bladder wall edema in 10 (4.76%) and hepatomegaly in 6 (2.85%) patients. In this study 3 (1.3%) had sepsis, 4 (1.7%) had bradycardia, 2 (0.9%) had hypotension, 2 (0.9%) developed ARDS, and 2 (0.9%) developed acute kidney injury as the complications during the illness.

Table 3: Ultrasonography findings.

USG findings	Number of patients (%)
Ascites	14 (6.66)
Pleural effusion	12 (5.71)
GB wall edema	10 (4.76)
Hepatomegaly	6 (2.85)

Out of 210 admitted, 16 (7.62%) patients required intensive care treatment and rest 194 (92.38%) patients were treated in general ward. Of the total patients 8 (3.8%) patients received platelet transfusion, 5 (2.38%) patients received blood transfusion, 2 (0.9%) required mechanical ventilation and 1 (0.47%) patient undergone hemodialysis.

In this study 4 (1.9%) patients died, and 206 (98.1%) patients recovered and discharged from the hospital.

DISCUSSION

We collected data of dengue fever patients admitted during monsoon period, between the months of May and September 2019 when the dengue infection usually peak. Most of the studies showed similar peak of dengue infection during this time.[4,5,8] This is because this period is suitable for growth of vector Aedes aegypti.[4] Our study shows significantly high positivity rate in males (81.9%) than females (18.1%) compared to other studies. The male to female ratio is about 4:1. Similar studies done by Kumar et al and Padmaprakash et al showed male to female ratio of 1.8:1 and 3:1 respectively.[5,7] In another study by Deshwal et al shows male to female ratio of 2.7:1.[10] The high infection rate in males may be due to the engagement of more outdoor activities, exposing them to mosquito bites during daytime and low infection rate in females may be due to indoor activities and low reporting rate.[8]

This study revealed that young adults belonged to the age group between 16-35 years were more affected. Previous studies also shown similar observation.[4,610] The average age of infection in our study is 32.83 (SD 12.99) years. Similarly in the studies by Rabbani et al and Padmaprakash et al the average age of infection is 27.35 (SD 11.43) and 30.6 (SD 10.48) respectively.[6,7] The average duration of hospitalization in our study is 5.88 (SD 2.94) days. In the study by Padmaprakash et al average duration of hospitalization is 5.73 (SD 2.75) days.[7] In our study 74.28% of patients were dengue with no warning signs, 22.85% were patients with warning signs and 2.85% of the patients were having severe dengue.

Our study reveals fever as the most common (99.52%) symptom as in most other studies which also show fever as the commonest (98-100%) symptom.[4,5,7,9-13] Myalgia is seen 69.71% of patients in our study. In the study by Singh et al (North India) myalgia was seen in 62.03% of patients and in a study by Kumar et al (South India) 64.6% had myalgia.[4,5] The symptom of myalgia varied from 77% to 96% in other studies.[7,10-12] Headache was reported in 65.71% of the patients in this study. Similarly in the study by Padmaprakash et al headache was present in 67.24% of patients.[7] 90% of patients had headache in the study at West Bengal by Chatterjee et al.[11] In other studies, symptom of headache varied between 75% and 78% of the patients.[4,9,12,13]

Nausea and vomiting were present in 34.76% of the patients in our study. Similarly, 35.41% had nausea and vomiting in the study by Padmaprakash et al, 38.83% had nausea and vomiting in the study by Dinkar et al.[7,9] However nausea and vomiting was seen in increased numbers in the studies by Singh J et al 56.01%, Kumar A et al 47.6%, Kittitrakul et al 87.7%.[4,5,13] In this study abdominal pain was seen in 21.9% of patients. In the study by Deshwal et al 24.41% of patients had abdominal pain.[10] Other studies show increased number of patients (37-62%) presenting with abdominal pain.[4,5,9,11-13] 10% of patients had loose stools as one of the presenting symptoms in this study. Similarly in other studies 9%-15% of the patients had loose stools.[5,11-13] In the study done at North India by Dinkar et al only 1.95% had loose stools.[9]

In this study bleeding manifestations were seen in 5.24% of the patients which is low compared to other studies. Petechiae was the commonly found bleeding manifestation in our study. Bleeding manifestation was seen in 67.2% of patients in the South Indian study by Kumar et al and petechiae was the most common manifestation.[5] In the North Indian study by Singh J et al bleeding manifestations

seen in 31% of patients.[4] Other studies showed variation in bleeding manifestations from 10% to 23%.[7,9,11-13] Skin rashes were reported in 4.76% of patients in this study which is also low compared to other studies. Rashes were present in 19.9% of patients in the study by Singh et al 21.7% by Kumar et al 17.14% by Dinkar et al 37.86% by Deshwal et al 28% by Chatterjee et al and 15.2% by Daniel et al.[4,5,9-12]

Haematocrit was an important factor to predict severity of dengue.[6] This study has reported the mean hematocrit of 42.52% (SD 5.53). 29.04% of patients had hematocrit of >45%. Similarly in a study done at Kerala (South India) by Daniel et al 27.9% of patients had hematocrit of >45%.[12] Study done in Agra (North India) by Deshwal et al had reported of 20.77% patients having hematocrit >45%.[10] The mean hematocrit was 42.42% (SD 4.51) for the patients of dengue with no warning signs and 44.13% (SD 6.67) for the patients of dengue with warning signs. Similarly in a North Indian study by Rabbani et al the mean hematocrit was 39.79% (SD 3.23), 39.49% (SD 4.25) among those without warning signs and 42.22% (SD 3.54) among those with warning signs.[6]

Leukopenia is an established feature of dengue fever and is due to bone marrow suppression by the dengue virus.[13] In this study 42.38% patients had leukopenia (4000/microliter) on admission. In the study by Daniel et al done at Kerala (South India) leukopenia is seen in 40% patient.[12] Study by Singh et al reported 36.11% patients with leukopenia and study by Dinkar et al leukopenia was found to be in 26.68% of patients.[4,9]

Thrombocytopenia is a common feature in dengue infection and is a predictive biomarker for the severity of dengue.[13] Thrombocytopenia occurs due to bone marrow suppression. The present study reported thrombocytopenia of less than 1 lakh/microliter in 61.9% of patients on presentation. Study by Singh et al reported 89.35% of patients with thrombocytopenia while study by Dinkar et al reported 99.13% of patients with thrombocytopenia.[4,9] A study from Kerala (South India) by Daniel et al reported 90% of thrombocytopenia.

Raised transaminases in dengue infection can be a result of the direct effect of the virus on liver cells or the unregulated host immune response against the virus. The 76.2% and 50.47% of patients have elevated AST and ALT respectively in this study. Study by Singh et al had reported the elevated AST and ALT in 56.48% and 58.33% of patients respecctively.[4] In a study by Kittitrakul et al done in Thailand, 88.2% and 69.3% of patients had elevated AST and ALT respectively. Study at Agra (North India) by Deshwal et al revealed that the transaminases were elevated in 88.54% of patients.[10] In a study by Wong et al done at Singapore, elevated AST and ALT was seen in 90.6% and 71.7% of patients respectively.[15] The high levels of transaminases correlate the degree of hepatocellular injury but without any association with prognosis.[4]

Plasma leakage is the complication of severe dengue disease. It is caused by a diffuse increase in capillary permeability and manifests as a combination of haemoconcentration, pleural, pericardial effusion or ascites and various organ involvements.[3] This study documented leaking manifestations in the form of ascites in 6.66% patients and pleural effusion in 5.71% by ultrasound examination. Marginally lower number of patients with ascites and pleural effusion are reported in some of the similar studies.[4,9] However studies by Deshwal et al (North India) and Daniel et al (South India) revealed higher number of patients with ascites and pleural effusion.[10,12] Hepatomegaly is seen in 2.85% of patients in this study. Study by Deshwal et al reported 14.75%, study by Kittitrakul et al reported 34.6%, study by Chatterjee et al reported 13.5% and study by Daniel et al reported 17.65 of patients with hepatomegaly.[10,11,14]

Ultrasonography examination also reported 4.76% of patients having gall bladder wall edema on presentation which is very less compared to other studies.[19,20] The cause of gall bladder wall thickening is increased vascular permeability which causes plasma leakage and serous effusion with high protein content.[18]

In this study 1.7% had bradycardia, 1.3% had sepsis, 0.9% had hypotension, 0.9% had ARDS, and 0.9% had acute kidney injury. Study by Singh et al reported hypotension in 8.33%, renal dysfunction in 5.55% and ARDS in 0.92% of patients.[4]

Our study reported mortality of 1.9%. Study by Singh et al reported no mortality.[4] Other studies reported mortality rate varying from 0.77% to 3.8%.[5,10-12] Out of 4 patients who died, 3 died due to haemorrhagic manifestations, one died due to ARDS.

This study has some limitations. This is hospital record-based study, and the study doesn't include patients of pediatric age group (age<16 years).

CONCLUSION

As seen in this study dengue is predominantly affecting the younger age group. In this study fever with myalgia are the predominant symptoms. Thrombocytopenia, leukopenia and raised transaminases are the commonly observed laboratory findings. In this study the mortality rate was 1.9% only.

Dengue presents with varied clinical manifestations as it affects multiple systems. Awareness of these various clinical presentations is needed for early recognition and confirmation of diagnosis. Identifying the warning signs and prompt supportive management will help in preventing the further complications and in reducing the mortality. Dengue infection poses a huge burden to the health care system in a largely populated country like India. Increased public awareness and vector control

measures are important factors to be taken into consideration in the prevention of dengue.

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