Paediatrics Section

Clinical Profile of Dengue Fever and its Utility in Early Prediction of Severe Dengue Among Children Less than 18 Years at a Tertiary Care Hospital in Northern India

ROHIT CHIB[1], SUDESH SINGH[2], MANJU DEVI[3], NAJMUS SAQIB[4]

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ABSTRACT

Introduction: Dengue is the emerging mosquito-borne infectious disease in India. Dengue is endemic in many countries across the world. Dengue is one of the major causes of paediatric morbidity and mortality and clinical profile of dengue patients change from time to time and region to region. The elucidation of the clinical profile is very important for patient management and saving lives.

Aim: To assess the clinical profile of Dengue Fever (DF) and its utility in early prediction of severe dengue among children 0 to 18 years according to National Guidelines for Clinical Management of DF 2014 at a tertiary care hospital, in Northern India.

Materials and Methods: This was an observational study done at GMC Kathua, Northern India from 1st June 2021 to 30th November 2021. All the clinically suspected patients of dengue in the age group 0 to 18 years were subjected to NS1 antigen and Immunoglobulin M (IgM), Immunoglobulin G (IgG) antibody tests, all patients positive for these were considered as confirmed dengue patients and were included into the study. Parameters studied were the clinical profile of DF and its utility in prediction of severe dengue. Data was analysed by Statistical Package for the Social Sciences (SPSS) software version 28.0.1.0 (142) and different groups were compared by using the Chi-square test and multivariate logistic regression. The p-value<0.05 was considered significant.

Results: Out of the total 640 febrile patients, 71 (11.1%) were positive for dengue and were enrolled in the study. NS1 was positive in 67.6%, IgM in 56.33% and IgG (along with NS1 or IgM or both) in 32.4%. Flushed facies at 81.6% was the most common clinical finding followed by myalgia 74.6%, headache 73.2%, facial puffiness 66.2%, vomiting 54.9%, rash 50.7%, arthralgia 33.8% and retro-orbital pain in 16.9%. The total number of patients with co-morbidities was 7 (9.9%). Patients with warning signs having hepatomegaly ≥2 cm Below Costal Margin (BCM) were 49.3%, followed by recurrent vomiting 38%, pain abdomen 38%, restlessness 33.8%, minor bleeding 28.2% and lethargy 23%. Signs of cardiovascular collapse were cold calamities 26.7% followed by shock 23.9% and narrow pulse pressure <20 mmHg 12.6%. The metabolic disturbance was seen in 12 (16.9%) patients and severe organ involvement in 11 (15.5%). The tourniquet test was positive for 52.1%. A whole blood transfusion was given to eight patients. Only one patient expired with total mortality of 1.4%.

Conclusion: Vomiting and myalgia were found to be statistically significant for early prediction of severe dengue, which may help in early initiation of treatment and decrease both morbidity and mortality. Patients presenting with atypical manifestations of severe organ involvement were also included under the severe dengue category, which was not possible according to previous guidelines.

Keywords: Haemorrhage, Hypotension, Petechiae, Shock

INTRODUCTION

The DF has been identified as an emerging infectious disease in India. Dengue is the most important mosquito-borne disease, which is found to be endemic in more than 100 countries [1]. In South-east Asia, dengue is the major cause of paediatric morbidity and mortality [2]. Apart from urban areas this disease is also spreading in rural areas [3]. There are certain salient clinical features for the diagnosis of disease, but it can also present with varied clinical manifestations [4]. The interpretation of the clinical profile is prime for patient management and thus, critical for saving lives [5].

Due to limitations in World Health Organisation's (WHO) 1997 dengue classification guidelines, WHO revised their guidelines in 2009 [6], clinical classification was again revised as National Guidelines for DF 2014, classifying cases into mild (D1), moderate (D2) and severe (D3) dengue which was much easier to understand [7,8]. Again on 20th October 2020, Ministry of Health and Family Welfare, Government of India approved the latest National Guideline for Dengue Case Management, during Coronavirus Disease 2019 (COVID-19) pandemic [9].

Manifestations of DF vary from being asymptomatic to Dengue Shock Syndrome (DSS) and differ from epidemic to epidemic even in the same region and with period of time [8,9]. Early recognition of fever is important as delay in treatment results in increased morbidity and mortality [10]. Dengue according to the 2014 classification, presents as a spectrum of disease rather than a distinct phase as in the earlier classifications [11], this knowledge affects the clinical management and triaging of the patients

So, the present study was done with an aim to assess the clinical profile of dengue patients and its utility in early prediction of severe dengue among children 0 to 18 years as per National Guidelines for Clinical Management of DF 2014.

MATERIALS AND METHODS

The present observational study was conducted at Department of Paediatrics, GMC Kathua, Jammu and Kashmir, India, from 1st June 2021 to 30th November 2021. All the children who presented to the department of paediatrics GMC Kathua with suspected DF were subjected to blood tests for dengue infection. The study aimed to find out the clinical pattern of dengue patients and its utility in the

early prediction of severe dengue among children 0 to 18 years according to the National Guidelines for Clinical Management of DF 2014 [8]. Ethical clearance from Institutional Ethical Committee was taken under letter no IEC/GMCK/86.

Inclusion criteria: All the clinically suspected dengue patients in the age group 0 to 18 years irrespective of the duration of illness were subjected to both the dengue NS1 antigen tests (by immune-chromatography method) and IgM, IgG antibody tests done by the same method. All the clinically suspected patients positive for dengue antigen and/or antibody tests were taken as confirmed dengue patients [11] and were included in the study.

Exclusion criteria: Dengue confirmed patients with co-infections like enteric fever and malaria were excluded from the study.

Study Procedure

History, findings on clinical examination and laboratory investigations of all the dengue confirmed patients were recorded on the proforma on the day of admission and monitored for further progression of the disease. Laboratory investigations recorded were complete blood count {(Total Leucocyte Count (TLC) <5000/mm^3 for leucopenia, platelets <1 lac/mm^3 and haematocrit}, Liver Function Tests (LFT) {Alanine Transaminase (ALT) and Aspartate Transaminase (AST) ≥2 times upper limit of normal}, coagulation profile {Prothrombin Time (PT), activated Partial Thromboplastin Time (aPTT) and International Normalised Ratio (INR)}, serum electrolytes (sodium, potassium and calcium), Arterial Blood Gas (ABG) analysis and blood sugar; above parameters were used for grading of dengue patients [8].

Other parameters like recurrent vomiting, pain abdomen, lethargy, restlessness, minor bleeds, hepatomegaly ≥2 cm Below Costal Margin (BCM), rapid pulse, narrow pulse pressure <20 mm of Hg, cold clammy extremities, hypotension for age, significant bleeding, severe organ involvement, severe metabolic disturbance and shock findings were also entered into proforma. Simultaneously, Ultrasonography (USG) abdomen and chest radiographs for pleural effusion and ascites with the percentage change in haematocrit >20% (at time of admission and discharge) were recorded for evidence of plasma leak and tourniquet test for haemorrhagic tendencies, all above parameters were recorded for clinical classification of DF [8].

All cases of fever with laboratory-positive NS1, IgM or IgG (along with NS1 or IgM or both) were classified clinically into mild, moderate and severe dengue according to national guidelines for clinical management of DF 2014. The DF without complications like haemorrhagic tendencies, hypotension and organ involvement and evidence of capillary leakage (on chest X-ray, USG abdomen or 20% change in haematocrit) were included under mild illness [8].

Moderate dengue: It included patients with co-morbidities and high-risk factors (like diabetes, hypertension, immunosuppression, anticoagulation, haemoglobinopathies or infants) and or dengue with warning signs and symptoms (Like recurrent vomiting i.e., ≥2 episodes/hour, Abdominal pain/tenderness, general weakness/lethariness/restlessness, mild pleural effusion/ascites, Hepatomegaly ≥2 cm below the costal margin and increased haematocrit >20% above baseline) and/or Dengue Haemorrhagic Fever (DHF) I and II with minor bleeds [8].

Severe dengue: It includes patients with DF or DHF with significant haemorrhage, shock (DHFIII and IV-DSS), severe organ involvement {Expanded Dengue Syndrome (EDS)} and/or severe metabolic disturbances (like hypoglycaemia, Arterial Blood Gas (ABG) changes, sodium, potassium and calcium changes) after prolonged shock [8,12].

Clinical features of DF: A febrile illness upto seven days with the below symptoms: of facial puffiness, flushed facies, rash,

retro-orbital pain, headache, vomiting, pain abdomen, myalgia, arthralgia or haemorrhagic tendencies [8].

Dengue Haemorrhagic Fever (DHF) defining criteria [13]:

a)   A case with clinical features of DF

b)   Haemorrhagic tendencies as noticed by one of the following:

- A positive tourniquet test.
- Petechiae, ecchymosis or purpura.
- Bleeding from the gastrointestinal tract, injection sites or other sites.

c)   Thrombocytopenia (with <1 lac cells per mm^3).

d)   Increased plasma leakage due to increased vascular permeability, as shown by any of the following:

- A drop of 20% or more in haematocrit after fluid replacement, when compared to baseline.
- Other signs of plasma leakage (like pleural effusion and ascites).

Dengue Shock Syndrome (DSS) [8]: All the criteria for DHF with features of circulatory failure as noticed by rapid and feeble pulse and narrow pulse pressure (mmHg) or hypotension for age, cold and clammy skin and restlessness.

Grading of Dengue Fever (DF)/Dengue Haemorrhagic Fever (DHF) into four grades [13]:

DHF I: Features of DF plus positive tourniquet test with any feature of the plasma leakage and thrombocytopenia with platelet count less than 1 lac/mm^3.

DHFII: Features of DHFI plus any spontaneous haemorrhage into mucocutaneous or other organs (like black tarry stool, epistaxis or gum bleeds) and pain in the abdomen.

DHFIII (DSS): Features of DHFII plus symptoms and signs of circulatory failure (like cold clammy skin, rapid weak pulse, hypotension, narrow pulse pressure less than 20 mmHg).

DHFIV (DSS): Features of DHFIII with symptoms and signs of profound shock with undetectable pulses or blood pressure.

Organ involvement {Expanded Dengue Syndrome (EDS)}: Unusual clinical manifestations of organ involvement observed in EDS are shown in [Table/Fig-1] [8].

S. No.	System involvement	Unusual or atypical manifestations
1	Central nervous	Encephalopathy, encephalitis, intracranial bleeding, febrile seizures.
2	Gastrointestinal	Acute hepatitis/fulminant hepatic failure, cholecystitis, cholangitis, acute pancreatitis.
3	Renal	Acute renal failure, haemolytic uremic syndrome, acute tubular necrosis.
4	Cardiac	Cardiac arrhythmia, cardiomyopathy, myocarditis, pericardial effusion.
5	Respiratory	Pulmonary oedema, acute respiratory distress syndrome, pulmonary haemorrhage.
6	Eye	Conjunctival bleed, macular haemorrhage, visual impairment, optic neuritis.

[Table/Fig-1]: Showing unusual or atypical manifestations of organ involvement in dengue [8].

Tourniquet test: The tourniquet test was performed by inflating the blood pressure cuff to a mid-point between the diastolic and systolic pressures and maintaining that pressure for nearly five minutes, the test was considered positive when 10 or more petechiae appear per one square inch area over the forearm [14] and was used as evidence for haemorrhagic tendency.

Hypotension for age was defined as the systolic pressure below the 5th percentile for that age, that is ≤60 mmHg in <1 month, ≤70 mmHg in one month to one year, ≤70+(2×age in years) mmHg in 1 to 10 years and ≤90 mmHg in >10 years [15].

As per national guidelines for dengue 2014, significant bleeding was defined as >10% of blood loss from the total blood volume of the body (total blood volume is 80 mL/kg) and indications for whole blood transfusion were fixed at, haemoglobin levels ≤5 mg%, also significant bleeding and concealed bleeding were defined by haematocrit drop and unstable vital signs despite adequate volume replacement [8].

STATISTICAL ANALYSIS
Data were analysed by SPSS software version 28.0.1.0 (142) and different groups were compared by using the chi-square test. Logistic regression was applied to identify the factors for early picking up of severe dengue infection. The p-value<0.05 was considered statistically significant.

RESULTS
The total patients admitted to the Department of Paediatrics during study period were 640, out of which febrile patients positive for dengue NS1 antigen and/or antibody were 82. Dengue positive patients having coinfections were 11 (eight patients were positive for malaria and three for enteric fever) so, excluded from the study. Finally, 71 (11.1%) children upto age of 18 years diagnosed with DF were included in the study. All laboratory-proven dengue patients, based on the clinical spectrum presented during the hospital stay, were classified into mild dengue (D1) 34 (47.9%), moderate dengue (D2) 20 (28.2%) and severe dengue (D3) 17 (23.9%).

In the present study, 53 (74.6%) were boys and 18 (25.4%) girls. A higher percentage of boys had severe dengue 15 (88.2%) as compared to the girls. A total of 65 (91.5%) patients were urban in comparison to 6 (8.4%) rural. [Table/Fig-2] shows age-wise distribution of dengue patients across dengue clinical severity groups. Patients between ≥5 to <10 years with 27 (36%) patients were most commonly admitted into the present study.

S. No.	Age group	Mild dengue 34 (%)	Moderate dengue 20 (%)	Severe dengue 17 (%)	Total 71 (%)
1	<1 year	0	0	2 (11.8)	2 (2.8)
2	≥1 to <5 years	7 (20.6)	7 (35.0)	2 (11.8)	16 (22.5)
3	≥5 to <10 years	12 (35.3)	8 (40.0)	7 (41.2)	27 (38.0)
4	≥10 to 18 years	8 (23.5)	12 (60.0)	6 (35.3)	26 (36.6)

[Table/Fig-2]: Age-wise distribution of patients across the clinical severity groups (n=71).

[Table/Fig-3] shows, that the flushed facies was the most common clinical presentation with 58 (81.6%) patients followed by myalgia 53 (74.6%), headache 52 (73.2%), facial puffiness 47 (66.2%), vomiting 39 (54.9%), rash 36 (50.7%), recurrent vomiting 27 (38%), pain abdomen 27 (38%), restlessness 24 (33.8%), arthralgia 24 (33.8%), lethargy 17 (23.9%), and retro-orbital pain in 12 (16.9%) patients.

Flushed facies was the most common clinical presentation with 31 (91.17%) patients under mild, 14 (70%) moderate and 13 (76.5%) severe dengue. Facial puffiness was the second most common presenting feature with 19 (55.9%) patients under mild, followed by 11 (55%) moderate and 17 (100%) severe dengue categories. Vomiting was positive in 9 (26.4%) cases of mild, 14 (70%) moderate and 16 (94.1%) severe dengue; myalgia was found to be positive in 27 (79.4%) cases of mild, 13 (65%) moderate and 13 (76.5%) cases of severe dengue [Table/Fig-3].

Flushed facies and facial puffiness were found to be non significant across the study for the prediction of severe dengue, as shown in [Table/Fig-4]. Vomiting and myalgia were found to be significant with p-value<0.05 for prediction of severe dengue.

Total patients with high risk/co-morbidities were 7 (9.9%) (as shown in [Table/Fig-5]); out of which, two patients were on immunosuppression (one patient was of idiopathic uveitis on low dose corticosteroids and methotrexate and another patient was of steroid-dependent nephrotic syndrome on low dose steroids, both were managed as severe dengue and discharged), three were obese (two were managed as severe and one as moderate dengue and all three were discharged) and there were two patients <1 year (one patient discharged and another admitted as a case of multiorgan damage with refractory shock with hypoglycaemia expired within four hours of hospitalisation).

Warning signs were hepatomegaly ≥2 cm BCM in 35 (49.3%) patients followed by recurrent vomiting 27 (38%), pain abdomen 27 (38%), restlessness 24 (33.8%), minor bleed 20 (28.2%) and lethargy 17 (23.9%) patients. [Table/Fig-6] shows the frequency of warning signs observed in patients with DF. Also, signs of cardiovascular collapse (as shown in [Table/Fig-6]) were cold calamities seen in 19 (26.7%) patients followed by shock 17 (23.9%), hypotension for age 17 (23.9%) and narrow pulse pressure <20 mmHg 9 (12.6%) patients.

There was a high rate of admission of mild dengue cases because of parent anxiety. The most common bleeding manifestations in the form of minor bleeds were petechiae, ecchymotic patches, gum bleeding followed by melena, bleeding from the cannula sites, haematuria and epistaxis. Severe organ involvement was seen in

S. No.	Clinical parameters	Mild dengue 34 (47.9%)	Moderate dengue 20 (28.2%)	Severe dengue 17 (23.9%)	Total (out of 71)
1	Flushed facies	31 (91.2)	14 (70.0)	13 (76.5)	58 (81.6)
2	Facial puffiness	19 (55.9)	11 (55.0)	17 (100)	47 (66.2)
3	Vomiting	9 (26.5)	14 (70.0)	16 (94.1)	39 (54.9)
4	Rash	22 (64.7)	8 (40.0)	6 (35.3)	36 (50.7)
5	Headache	24 (70.5)	13 (65.0)	15 (88.2)	52(73.23)
6	Myalgia	27 (79.4)	13 (65.0)	13 (76.5)	53 (74.6)
7	Arthralgia	13 (38.2)	7 (35.0)	4 (23.5)	24 (33.8)
8	Recurrent vomiting	0	14 (70.0)	13 (76.5)	27 (38.0)
9	Pain abdomen	0	15 (75.0)	12 (70.5)	27 (38.0)
10	Lethargy	0	7 (35.0)	10 (58.8)	17 (23.9)
11	Restlessness	0	15 (75.0)	9 (52.9)	24 (33.8)
12	Minor bleed	0	11 (55.0)	9 (52.9)	20 (28.2)
13	Significant bleeding	0	0	8 (47.1)	8 (11.3)
14	Retro-orbital pain	6 (17.6)	5 (25.0)	1 (5.8)	12 (16.9)

[Table/Fig-3]: Shows the frequency of symptoms and signs observed in Dengue Fever (DF) patients.

S. No.	Factor	Odds ratio	95% CI	p-value
1	Facial puffiness	1.253	0.261-0.261	0.778
2	Flushed facies	0.086	0.005-1.513	0.094
3	Vomiting	50.643	3.074-834.254	0.006
4	Rash	0.119	0.013-1.137	0.065
5	Headache	0.624	0.025-15.592	0.774
6	Myalgia	0.055	0.003-0.948	0.046
7	Arthralgia	0.117	0.013- 1.070	0.057
8	Retro-orbital pain	0.084	0.001-7.402	0.279

[Table/Fig-4]: Logistic regression analysis of risk factors for severe dengue.

Immunosuppression	Obesity	Infants
2 admissions (one patient of idiopathic uveitis and one patient of steroid-dependent nephrotic syndrome)	3 admissions	2 admissions

[Table/Fig-5]: Admissions under different categories of high risk/co-morbid conditions.

S. No.	Clinical signs of dengue patients	S. no.		No. of cases N (%)
1	Warning signs reported during study	1	Hepatomegaly ≥2 cm BCM	35 (49.3%)
		2	Recurrent vomiting	27 (38%)
		3	Pain abdomen	27 (38%)
		4	Restlessness	24 (33.8%)
		5	Minor bleed	20 (28.2%)
		6	Lethargy	17 (23.9%)
2	Signs of cardiovascular collapse	1	Cold calamities	19 (26.7%)
		2	Shock	17 (23.9%)
		3	Hypotension for age	17 (23.9%)
		4	Narrow pulse pressure <20 mmHg	9 (12.6.%)

[Table/Fig-6]: Showing distribution of warning signs and signs of cardiovascular collapse across different dengue patients.

11 patients, out of which five patients were having seizures (all were more than six years), two had acute respiratory distress syndrome and four patients had gallbladder wall oedema on Ultrasonography (USG) abdomen with tenderness right hypochondrium. The metabolic disturbance was noted in 12 patients (hypoglycaemia in one patient, hyponatremia in two and ABG changes in eight patients).

On basis of the clinical spectrum for dengue illnesses; one patient was under the category of DF with a capillary leak, similarly, three patients were of DF with warning signs, six of DF with warning signs and capillary leak and 10 patients of DHFI and DHFII with minor bleeds, all these 20 patients were included under moderate dengue category. Whereas, there were eight patients of DHFIII and DHFIV (DSS), eight patients of DF with shock and one patient of dengue with significant bleeding (because no thrombocytopenia was noticed, so not included in DHF) and all these 17 patients were included under severe category as shown in [Table/Fig-7].

Platelet <1 lac/mm³ was noted in 38 patients (53.5%). The majority of patients were having platelet counts between 50,000 to 1 lac/mm³. Significant bleeding manifestations were noted in patients having platelet count between 20,000 to 50,000/mm³. Thrombocytopenia <20,000/mm³ was not noticed in any patient, so no patient received platelet transfusion. Whole blood transfusion was given in eight patients with significant bleeding and hypotension for age with dropping haematocrit after adequate fluid resuscitation.

Other laboratory parameters like, TLC count <5000/mm³ (for leucopenia) were seen in 40 (56.3%) patients and positive

S. No.	Clinical spectrum	S. No.		No. of cases	Total
1	Moderate dengue clinical spectrum	1	Dengue Fever (DF) with a capillary leak	1	20
		2	DF with warning signs	3	
		3	DF with warning signs and capillary leak	6	
		4	DHFI and DHFII with minor bleeds	10	
2	Severe dengue clinical spectrum	1	DHFIII and DHFIV (DSS)	8	17
		2	DF with shock	8	
		3	DF with significant bleeding	1	

[Table/Fig-7]: Showing distribution of different patients across moderate and severe dengue.

tourniquet (for haemorrhagic tendencies) test was seen in 37 (52.1%) patients.

The NS1 was positive in 48 (67.6%), IgM in 40 (56.33%) and IgG (IgG+IgM positive in 14, IgG+IgM+NS1 in eight and IgG+NS1 in one patient) in 23 (32.4%) patients. Maximum cases of NS1 were detected within five days of fever onset 37 (77%). IgM was positive from the 3rd day, to the 13th day where as IgG was positive 4th to the 15th day of dengue illness. LFT was abnormal in 15 (21.1%) of patients, no patient was having ALT/AST>1000 units. Coagulation profile abnormality was positive in 22 (30.9%).

Pleural effusion was noticed in 21 (29.6%), ascites 19 (26.7%) and haematocrit showing >20% change in 27 (38%) patients and these parameters were used as evidence for capillary leaks. USG abdomen showing ascites, effusion and gallbladder wall oedema was positive in 23 (32.4%) and chest X-ray showing effusion was seen in 22 (30.9%) of patients, USG abdomen showing gall bladder wall oedema in four patients, were also having pain right hypochondrium. [Table/Fig-8] shows the profile of Investigations across dengue patients. There was nothing noteworthy among high-risk co-morbidities, warning signs for severe dengue and laboratory parameters for for the prediction of severe dengue.

S. No.	Parameters	Mild dengue (34)	Moderate dengue (20)	Severe dengue (17)	Total (71)
1	Platelet <1 lac/mm³	13 (38.2)	14 (70)	11 (64.7)	38 (53.5)
2	TLC <5000/mm³	16 (47)	14 (70)	10 (58.8)	40 (56.3)
3	Tourniquet test	17 (50)	10 (50)	10 (58.8)	37 (52.1)
4	NS1	24 (70.5)	13 (65)	11 (64.7)	48 (67.6)
5	IgM	14 (41.2)	13 (65)	13 (76.5)	40 (56.3)
6	IgG+IgM	4 (11.8)	5 (25)	5 (29.4)	14 (19.7)
7	IgG+NS1	0	0 (0.0)	1 (5.9)	1 (1.4)
8	IgG+IgM+NS1	2 (5.8)	3 (15.0)	3(17.6)	8 (11.3)
9	LFT (ALT/AST >2 times normal)	0	1 (5.0)	14 (82.4)	15 (21.1)
10	Coagulation profile	0	11 (55)	11 (64.7)	22 (30.9)
11	Pleural effusion	0	14 (70)	7 (41.2)	21 (29.6)
12	Ascites	0	11 (55)	8 (47.1)	19 (26.7)
13	USG abdomen	0	14 (70)	9 (52.9)	23 (32.4)
14	Chest X-ray	0	15 (75)	7 (41.2)	22 (30.9)

[Table/Fig-8]: Laboratory parameters across the dengue patients.

DISCUSSION

The present study was conducted at a tertiary care hospital. All clinically suspected children who presented with symptoms of fever and facial puffiness, flushed facies, rash, retro-orbital pain, headache, vomiting, pain abdomen, myalgia, arthralgia or bleeding manifestations were subjected to both Dengue NS1 antigen and IgM, IgG antibody tests.

The present type of study, had never been done over the paediatric population of district kathua and its adjoining areas and will be important

in providing knowledge about clinical profile of dengue patients of that area. The common age group suffering from dengue was 5 to 10 years with 27 patients (38.0%) followed by >10 years 26 (36.6%), 1 to 5 years 16 (22.5%) and <1 year 2 (2.8%) patients. In another study by Jain H, children of age group of 5-10 years were commonly affected by dengue, which is similar to the present study [7].

The total number of boys in the present study was 58 (81.7%) and the number of girls was 13 (18.3%). In a study by Kulkarni MJ et al., in which a total of 948 children were admitted with dengue out of which 671 (70.8%) were boys and 277 (29.2%) girls [16]. Another study by Purkait R and Basu R, in which out of total 110 cases 69 (62.73%) were males and the remaining 41 (37.27%) were females, so there were more males than females in the present study than in comparison to others [17]. More males might be affected because of more outdoor activities among males, another study by Anker M and Arima Y, have found greater male dengue incidence among both children and adults which was likely due to gender-related differences in exposure such as time away from home and participation in outdoor games [18].

Vomiting was positive in 39 (54.9%) patients and myalgia in 53 (74.6%), both of which were statistically significant for the detection of severe dengue with p-value<0.05, as shown by regression analysis. This was similar to a study done by Zhang H et al., in which p-value for vomiting was also found to be statistically significant for severe dengue prediction [19].

The NS1 was positive in 48 (67.6%), IgM in 40 (56.33%) and IgG (IgG+IgM in 14, IgG+IgM+NS1 in eight and IgG+NS1 in one patient) in 23 (32.4%) patients. Maximum cases of NS1 were detected within 5 days of fever onset (76%). IgM was positive on the 3rd to 13th day, whereas IgG was positive 4th to 15th day of dengue illness. A combination of NS1 and IgM detection in samples during the first few days is recommended, to increase the dengue diagnostic sensitivity [20,21].

The IgG was the dominant immunoglobulin in secondary dengue infections, which was noticed at higher levels even in the acute phase of secondary infections. IgM levels were comparatively lower or undetectable in secondary dengue infections than in the primary ones, as mentioned in 2009 WHO guidelines for dengue [6]. However, in the present study, IgG was present along with either IgM (in the majority of cases) or IgM and NS1 or with NS1 antigen.

Revised National Guidelines for DF 2014 were applied to categorise the patients clinically into as mild (D1), moderate (D2) and severe (D3) dengue, which was much easier to understand [8], as cases were easily classified into mild, moderate and severe dengue on basis of clinical spectrum of dengue illnesses. Patients presenting with atypical manifestations of organ failure like seizures, acute respiratory distress syndrome and gall bladder wall oedema on the USG abdomen were included under the severe dengue category, which was not possible according to previous guidelines.

A total number of patients less than one year in the present study were two, both were managed as severe dengue cases, one was discharged and another was admitted as a case of multiorgan damage with deranged coagulation profile, Liver Function Test (LFT), significant bleeding, refractory shock with hypoglycaemia and expired within four hours of hospitalisation. Only one patient died out of 71 patients in the present study with a total mortality rate of 1.4%, which is consistent with the study done by Sahana KS and Sujatha R, in which two patients died, out of the total 81 patients with mortality rate of 2.5% [22].

So, from the present study it can be concluded that vomiting and myalgia were found to be helpful in early prediction of severe dengue.

Limitation(s)

Limitations of the present study were the unavailability of dengue serotype information causing the outbreak and the relatively small number of patients. So, a large multi-centre study is required in future to get familiar with the revised WHO classification for India and to know the practicability of its application.

CONCLUSION(S)

The total number of patients registered in the present study were 71, children between 5 and 10 years were most affected by DF with the majority of cases from urban areas 65 (91.5%). Flushed facies with 81.6% was the most common clinical feature followed by myalgia 74.6% and headache 73.2%. Vomiting and myalgia were found to be statistically significant p-value<0.05 for early prediction of severe dengue. Flushed faces along with myalgia headache, facial puffiness helped in the early picking up of dengue patients in the Outpatient Department (OPD). Patients presenting with atypical manifestations of organ failure like seizures, acute respiratory distress syndrome and gall bladder wall oedema on USG abdomen were included under the severe dengue category, which was not possible according to previous guidelines.

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PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Paediatrics, GMC Kathua, Jammu and Kashmir, India.
2. Assistant Professor, Department of Paediatrics, GMC Kathua, Jammu and Kashmir, India.
3. Medical Officer, Department of Health and Family Welfare, Health and Family Welfare, Jammu and Kashmir, India.
4. Assistant Professor, Department of Paediatrics, GMC Doda, Jammu and Kashmir, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Rohit Chib,
C/o Roshan Lal Chib, House No. 60, Green Park, Officer Enclave, Udhaywalla,
Lower Palourae, Pincode-180002, Jammu and Kashmir, India.
E-mail: rohitchibgbpant@gmail.com

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