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Research Article

A Demographic and Clinical Study on the Assessment of Dengue Fever Cases in a Tertiary Care Hospital Bangalore – A Prospective Study

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ABSTRACT

Dengue is an acute viral infection in tropical and subtropical regions. Dengue is a major public health difficulty in numerous regions of the world. Demographic features of dengue fever have changed tremendously in India. The aim of the study is to explore the epidemiological and clinical features of dengue fever. During the study period, positive cases were reported in the months of September to February. In our study population, of the 57-dengue patient's majority were males with 59.64% and females were 40.35%. Maximum infected age group was 26 to 30 years with 18 (31.57%) and minimum was 6-10 years with 1 (1.75%) patient. Fever was present in almost all the cases followed by headache, Myalgia, Arthralgia, vomiting and diarrhea, body pain, nausea, abdominal pain, skin rash and giddiness. Hyperthermia, tachycardia, tachypnea was also noticed. Dehydration (8.77%), Epigastric tenderness (7.01%), toxic tongue coat (7.01%) and Icterus (10.52%) were present in patients. High blood sugar levels (10.52%), slightly turbid urine (8.77%), leukopenia (47.36 %), and thrombocytopenia (91.22 %), neutropenia (22.80%), and lymphocytopenia (47.36 %), monocytopenia (8.77%), Leukocytosis (12.28 %), Neutrophilia (26.31%), Lymphocytosis (31.57%), and Eosinophilia (29.82%) were found. Dengue virus is currently a problematic global infection and clinical and laboratory features of dengue cases studied could be used for the early identification of patients at risk of severe dengue fever.

1. Introduction

Emerging viral infections have become a serious problem in recent years. Emergence or reemergence of severe arboviral hemorrhagic fevers caused by mosquito borne viruses, such as dengue virus (DENV) has been frequently reported in the Indian subcontinent in the past few years [1]. Dengue Virus, a member of the genus Flavivirus which belongs to the family Flaviviridae, is one of the most spreading pathogens which are classified into 4 serotypes DEN-1, DEN-2, DEN-3 and DEN-4 [2]. It is a viral infection spread between humans by mosquitoes in tropical and subtropical regions around the world [3, 4]. It is caused by a single-stranded RNA virus and its main vector is Aedes aegypti [5, 6]. Dengue viruses are transmitted in humans by female Aedes mosquitoes of the subgenus Stegomyia. Aedes aegypti has been the most important epidemic vector. Other species such as Aedes albopictus, Aedes polynesiensis, member of Aedes Scutellaris complex, and Aedes niveus have been found to play a role as secondary vectors [7].

Trends in recent decades include larger and more frequent epidemics of dengue including Dengue Fever (DF), Dengue Haemorrhagic Fever (DHF) and Dengue shock syndrome (DSS) and severe dengue (SD). Dengue virus causes symptomatic or asymptomatic infections. It has a

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Table 2: Distribution based on change in body temperature in dengue hospitalized patients in percentage:

Range	on day 1		on day 2		on day 3		on day 4		on day 5	
	In No	In %	In No	In %	In No	In %	In No	In %	In No	In %
Change in body temperature										
Normal (97.7°F - 99.5 °F)	38	66.66	28	49.12	39	68.42	33	57.89	55	96.49
Hypothermia (<97.7°F)	9	15.78	21	36.81	11	19.29	22	38.5	2	3.5
Hyperthermia (>99.5 °F)	10	17.54	8	14.03	7	12.28	2	3.50	0	0
Change in pulse rate										
Normal (60 -100 Bpm)	54	94.73	56	98.24	57	100	57	100	57	100
Bradycardia (< 60 Bpm)	0	0	0	0	0	0	0	0	0	0
Tachycardia (> 100 Bpm)	3	5.2	1	1.75	0	0	0	0	0	0
Change in respiratory rate										
Normal (12-20 Cpm)	43	75.43	51	89.47	53	92.98	47	82.45	43	75.43
Bradypnea < 12 Cpm)	0	0	0	0	0	0	0	0	0	0
Tachypnea > 20 Cpm)	14	24.56	6	10.52	4	7.01	10	17.54	14	24.56

wide clinical spectrum that includes both severe and non-severe clinical manifestations. Initial symptoms of the disease appear in about 5-7 days after the infected mosquito bites a healthy person. After the incubation period, the illness starts abruptly in patients with moderate to severe disease. It is followed by 3 phases namely febrile, critical and recovery phase. Suddenly, a patient typically develops a high-grade fever, this acute febrile phase usually lasts for 2-7 days and is often consists of symptoms like facial flushing, skin erythema, generalized body ache, arthralgia, myalgia, retro-orbital eye pain, Photophobia, rubeliform exanthema and headache, Mild haemorrhagic manifestations such as petechiae and mucosal bleeding may be seen.

Table 1: Gender & Age wise distribution based on percentage in hospitalized patients:

Particular	Number of patients	% of Patients
Gender		
Males	34	59.64
Females	23	40.35
Age group in years		
0 to 5	2	3.50
6 to10	1	1.75
11 to 15	3	5.26
16 to 20	7	12.28
21 to 25	8	14.03
26 to 30	18	31.57
31 to 35	9	15.78
36 to 40	7	12.20
41 to 45	2	3.50

The primary abnormality in the full blood count is a progressive decrease in the total white cell count. when the body temperature drops to 37.5-38 degree Celsius or less and remains below this level. Leucopenia, as well as a rapid decrease in the platelet count which usually promotes plasma leakage and increased levels of haematocrit can be seen as one of the additional signs. Plasma leakage usually lasts for about 24-48 hours clinically. Blood pressure and pulse volume are varied by increased haematocrit levels [8].

2. Methodology

Study design and site: It is a descriptive, observational, and interventional study which was conducted in an ESI hospital (Indiranagar, Bangalore).

Study sample: 57 inpatients are diagnosed with dengue and undergone medication therapy during the study period of six months from November 2019 to April 2020 and were included in this study.

Data collection: Suitably designed data collection forms were prepared to collect the details from the inpatients in ESI hospital. Case report forms of patients were collected from the concerned wards and laboratory data is collected from the labs and further required data is collected by the interaction among the doctors, nurses, and patients. Informed consent was taken from each patient, containing the necessary information regarding the study. The data collection includes patient details like demographics, signs and symptoms, type of infectious disease and treatment given to the patient. Discussions were done with respective physicians, guide, and nurses for elaboration of the study regarding concerned patient reports.

Case report forms, laboratory reports like complete blood count, biochemistry reports and complete urine analysis and other required tests of the patient were analysed. Various parameters during hospitalization were studied, and all required details like patient demographics, vitals, systemic examination, diagnosis, treatment (dose, date of drug started and stopped), drug interactions and adverse drug reactions were monitored. The incidence of drug interactions in patients is seen and they most often involve medications to treat comorbid conditions. Data collected was analysed and compared with available studies.

Ethics: All necessary approvals from the institutional ethical committee at Gautham College of pharmacy, Bangalore were obtained before beginning the study.

Statistical tools: The parameters monitored were entered in Microsoft excel 2016 and applied descriptive studies for each parameter included in the patients. The incidence rate was calculated as the change in variable in patients (numerator) per the total number of patients in disease condition (denominator). The tables and graphs were drawn for each strategies and calculated percentages for the same.

3. Results

Of the total 57 dengue cases, admitted to the ESI hospital in between November 2019 and April 2020 were enrolled in this study. The number of males and females are 34 (59.64 %) and 23 (40.35 %). Majority of cases were males than females [**Table 1**]. In this study population, 2 (3.50%) patients were in the age group of 0 to 5 years, 1(1.75%) patient was in the age group of 6 to 10 years, 3 (5.26%) patients were in the age group of 11 to 15 years, 7(12.28%) patients were in the age group of 16 to 20 years , 8 (14.03 %) patients were in the age group of 21 to 25 years, 18 (31.57%) patients were in the age

Table 3: systemic examination of Cardiovascular and respiratory system in dengue hospitalized patients:

System	S1S2+		Clear respiration		NAD		NVBS		Unclear observation	
	In No	In %	In No	In %	In No	In %	In No	In %	In No	In %
Cardiovascular	43	75.43							14	24.56
Respiratory			2	3.50	29	50.87	10	17.54	16	28.07

group of 26 to 30 years, 9 (15.78 %) patients were in the age group of 31 to 35 years, 7 (12.20%) patients were in the age group of 36 to 40 years. 2 (3.50%) patients were in the age group of 41 to 45 years. Maximum infected cases were in the age group of 26 to 35 years and minimum infected cases were in the age group of 0 to 15 years and 41 to 45 years [**Table 1].**

Table 4: Systemic examinations like presence of dehydration, soft abdomen, Epigastric tenderness, toxic tongue coat, Icterus in dengue hospitalized patients:

Parameters	**Present**		**Absent**		**Unclear observation**	
	No	**%**	**No**	**%**	**No**	**%**
Dehydration	5	8.77	52	91.22		
Soft abdomen	39	68.42			18	31.57
Epigastric tenderness	4	7.01	53	92.98		
Toxic tongue coat	4	7.01	53	92.98		
Icterus	6	10.52	51	89.47		

Vital signs are also called as vitals which are useful in detecting or monitoring medical problems and that indicate the status of body`s vital functions. Average duration of stay in hospital was 5 days. The normal body temperature is 97.7°F-99.5°F, less than 97.7°F is termed as hypothermia and more than 99.5°F is termed as hyperthermia. On day 1 of hospitalization, 38 (66.66 %) patients had normal body temperature (BT), 9 (15.78%) patients had hypothermia, 10 (17.54 %) Patients had hyperthermia. On day 2 of hospitalization, 28 (49.12%) patients had normal BT, 21 (36.81%) patients had hypothermia, 8 (14.03%) Patients had hyperthermia. On day 3 of hospitalization, 39(68.42%) patients had normal BT, 11(19.29%) patients had hypothermia, 7 (12.28%) Patients had hyperthermia. On day 4 of hospitalization, 33(57.89%) patients had normal BT, 22(38.5%) patients had hypothermia, 2 (3.50%) Patients had hyperthermia. On day 5 of hospitalization, 55 (96.49%) patients had normal BT, 2 (3.5%) patients had hypothermia and none of the Patients had hyperthermia.

Maximum number of patients gained normal body temperature on 5th day of hospitalization. Maximum patients had Hyperthermia on 1st day and none of the patients had hyperthermia on 5th day. Maximum patients had hypothermia on 4th day and minimum hypothermia was seen on 5th day [Table 2].

The normal pulse rate is 60 -100 beats per min (Bpm), less than 60 Bpm is termed as bradycardia and more than 100 Bpm is termed as tachycardia. Of the study population, on day 1 of hospitalization, 54 (94.73%) patients had a normal pulse rate (PR), 3 (5.2 %) Patients had tachycardia. On day 2 of hospitalization, 56 (98.24%) patients had a normal pulse rate (PR), 1 (1.75%) Patient had tachycardia. All patients achieved normal pulse rate on 3rd, 4th and 5th day of hospitalisation and tachycardia and bradycardia were Nil [Table 2].

The normal respiratory rate (RR) is 12-20 cycles per min (Cpm), less than 12cpm is termed as Bradypnea and more than 20cpm is termed as tachypnea. Of the study population, on day 1 of hospitalization, 43 (75.43 %) patients had normal RR and 14 (24.56) patients had tachypnea. On day 2 of hospitalization, 51 (89.47 %) patients had normal RR and 6 (10.52%) patients had tachypnea. On day 3 of hospitalization, 53 (92.98 %) patients had normal RR and 4 (7.01%) patients had tachypnea. On day 4 of hospitalization, 47 (82.45%) patients had normal RR and 10 (17.54 %) patients had tachypnea. On day 5 of hospitalization, 43 (75.43%) patients had normal RR and 14 (24.56%) patients had tachypnea and none of the patients had Bradypnea [Table 2].

In cardiovascular system examination, of the study population, 43 (75.43%) patients had S1S2 positive. Unclear observation was in 14 (24.56 %) patients. In respiratory system examination, 2 (3.50%) patients had clear respiration. No abnormalities detected (NAD) in 29 (50.87 %) patients and Non vesicular breath sound (NVBS) was in 10 (17.54 %) patients and Unclear observation was among 16 (28.07 %) patients [Table3]

Clinical assessment of dehydration determines the approach to management. 5 (8.77%) patients had dehydration. 39 (68.42 %) patients had soft abdomen and 18 (92.98%) patients had unclear observation in abdomen examination. Epigastric tenderness was present in 4 (7.01 %) patients; toxic tongue coat was present in 4 (7.01%) patients. Icterus was present in 6 (10.52 %) Patients [Table 4].

Table 5: Normal, lower & High of biochemistry report parameters in dengue hospitalized patients:

Biochemistry report parameters	Normal range		lower range		higher range		Reference Range		
	In No	In %	In No	In %	In No	In %	Normal range	Low	High
Total Bilirubin (TB)	56	98.24	0	0	1	1.75	upto 1.0 mg/dl	< 1.0 mg/ dl	> 1.0 mg/dl
Direct Bilirubin (DB)	56	98.24	0	0	1	1.75	upto 3.0 mg/dl	< 3.0 mg/ dl	> 3.0 mg/dl
SGOT	55	96.49	0	0	2	3.50	0-41 U/L	--	> 41 U/L
SGPT	56	98.24	0	0	1	1.75	0-37 U/L	--	> 37 U/L
Alkaline phosphatase (ALP)	56	98.24	0	0	1	1.75	98-279 U/L	< 98 U/L	> 279 U/L
Protein	54	94.73	3	5.26	0	0	6.5-8.8 gm/dl	< 6.5 gm/dl	> 8.8 gm/dl
Albumin	55	96.49	2	3.50	0	0	3.5 -5.2 gm/dl	< 3.5 gm/dl	> 5.2 gm/dl
Globulin	55	96.49	1	1.75	1	1.75	2.5 – 3.5mg/dl	< 2.5 mg/dl	> 3.5 mg/dl
Random blood sugar (RBS)	51	89.47	0	0	6	10.52	80-160mg/dl	< 80 mg/dl	> 160 mg/dl

Of the study population, 56 (98.24 %) patients had normal range of total and direct Bilirubin levels, 55 (96.49 %) patients had normal

Table 6: Normal range of haematological parameters in dengue hospitalized patients

Parameters	on day 1		on day 2		on day 3		on day 4		on day 5	
	In No	In %	In No	In %	In No	In %	In No	In %	In No	In %
WBC	23	40.35	31	54.38	33	57.89	39	68.42	55	96.49
RBC	54	94.73	53	92.98	57	100	57	100	57	100
Haemoglobin in males	32	94.11	32	94.11	33	97.05	34	100	34	100
Haemoglobin in females	13	56.52	17	73.91	16	69.56	18	78.26	18	78.26
MCV	57	100	57	100	56	98.24	57	100	57	100
MCH	51	89.47	56	98.24	48	84.21	53	92.98	54	94.73
MCHC	55	96.49	40	70.17	51	89.47	55	96.49	54	94.73
Platelet count	5	8.77	13	22.80	24	42.10	47	82.45	56	98.24
Neutrophils	40	70.17	44	77.19	43	75.43	42	73.68	57	100
Lymphocytes	25	43.85	48	84.21	42	73.68	39	68.42	54	94.73
Eosinophils	52	91.22	50	87.71	40	70.17	47	82.45	57	100
Monocytes	51	89.47	57	100	57	100	57	100	57	100

range of SGOT levels, 56 (98.24 %) patients had normal SGPT and alkaline phosphatase levels.54 (94.73%) patients had normal protein levels, 55 (96.49%) patients had normal albumin and globulin levels. Random blood sugar (RBS) test is the testing of the blood sugar level at any time or random time of the day and 51 (89.47%) patients had a normal range of random blood sugar levels. Maximum patients had normal range in total Bilirubin, direct Bilirubin, SGPT and alkaline Phosphatase levels [Table 5].

Table 7: Analysis of urine:

Parameter	Number of Patients	% of Patients
Colour of urine		
Yellow	22	38.59
Pale yellow	35	61.40
Appearance of urine		
Clear	52	91.22
Slightly turbid	5	8.77
Sugar in urine		
Sugar is present	5	8.77
Nil	52	91.22
pH of urine		
Normal (5.0-8.0)	57	100
Below (< 5.0)	0	0
Above (> 5.0)	0	0
Specific gravity		
Normal (1.005 - 1.030)	57	100
Below (< 1.005)	0	0
Above (> 1.030)	0	0
Bile salt / Bile pigments		
Present	5	8.77
Absent	52	91.22
Urobilinogen		
Present	5	8.77
Absent	52	91.22
Ketone bodies		
Present	0	0
Absent	57	100
Pus cells		
Normal (0-4 hpf)	57	100
Below (< 0 hpf)	0	0
Above (> 0 hpf)	0	0
Epithelial cells		
Normal (1-5 hpf)	44	77.19
Above (>5 hpf)	1	1.75
Not seen	4	7.01
Occasional	2	3.50
Nil	6	10.52

Among the study population, 3 (5.26 %) patients had low protein levels, 2 (3.50%) patients had low albumin levels and 1 (1.75%) patient had low globulin levels. Maximum patients had low level of proteins when compared to albumin and globulin [Table 5].

Of the study population, 1(1.75%) patient had high total and direct Bilirubin, 2 (3.50%) patients had high SGOT levels, 1 (1.75 %) patient had high SGPT and alkaline phosphatase levels.1 (1.75%) patient had high globulin levels and 6 (10.52%) patients had high random blood sugar levels. None of the patients had high protein and albumin levels. Maximum number of patients had high RBS levels [Table 5].

Among study population in urine analysis, 22 (38.59 %) patients had yellow colour urine and 35 (61.40%) patients had pale yellow [Table 7]. Clear urine was present in 52 (91.22%) patients and urine was slightly turbid in 5 (8.77 %) patients [Table 7]. Sugar was present in urine test among 5 (8.77%) patients and in remaining 52 (91.22%) patients was Nil [Table 7]. All the study population individuals had a normal range of pH of urine [Table 7]. Specific gravity was normal in 57 (100 %) patients [Table 7]. Bile salt /bile pigments and Urobilinogen are present in urine among 5 (8.77%) patients and same was absent in 52 (91.22 %) patients [Table 7]. Ketone bodies in the urine was absent among all the individuals enrolled in the study [Table7].Normal range of pus cells was present in all 57 (100%) patients [Table 7].Normal range of epithelial cells was present in 44 (77.19%) patients , more than normal range was present in 1 (1.75%) patient , epithelial cells are not seen in 4 (7.01%) patients, epithelial cells were found occasional in 2 (3.50%) patients and epithelial cells were found to be nil in 6 (10.52%) patients [Table7].

In dengue hospitalized patients, 23 (40.35%) patients on 1st day, 31 (54.38%) patients on 2nd day , 33 (57.89%) patients on 3rd day, 39 (68.42 %) patients on 4th day, 55 (100 %) patients on 5th day had normal range of WBC cells. 54 (94.73%) patients on 1st day, 53 (92.98%) patients on 2nd day, and 57 (100%) patients on 3rd day, 4th day and 5th day had normal range of RBC cells. In males, 32 (94.11%) patients on 1st day and 2nd day, 33 (97.05%) patients on 3rd day and 57 (100%) patients on 4th & 5th day had normal haemoglobin levels. In females, 13 (56.52 %) patients on 1st day, 17 (73.91%) patients on 2nd day , 16 (69.56%) patients on 3rd day and 18 (78.26%) patients on 4th and 5th day had normal haemoglobin levels. 57 (100%) patients on 1st, 2nd ,4th, 5th day and 56 (98.24%) patients on 3rd day had normal range of MCV. 51 (89.47%) patients on 1st day, 56 (98.24%) patients on 2nd day, 48 (84.21%) patients on 3rd day ,53 (92.98%) patients on 4th day and 54 (94.73%) patients on 5th day had normal range of MCH values.

Table 8: Conditions of Low range of haematological parameters in dengue hospitalized patients

Parameters	Patients having change in White blood cells									
	on day 1		on day 2		on day 3		on day 4		on day 5	
	In No	In %	In No	In %	In No	In %	In No	In %	In No	In %
Leukopenia	27	47.36	21	36.84	19	33.33	15	26.31	2	3.50
Anaemia	3	5.26	4	7.01	0	0	0	0	0	0
Low Hb in males	2	5.88	2	5.88	1	2.94	0	0	0	0
Low Hb in females	9	39.13	5	21.73	4	17.39	4	17.39	2	8.69
Low MCV	0	0	0	0	1	1.75	0	0	0	0
Low MCH	3	5.26	0	0	3	5.26	2	3.50	0	0
Low MCHC	0	0	0	0	0	0	0	0	0	0
Thrombocytopenia	52	91.22	44	77.19	33	57.89	10	17.54	1	1.75
Neutropenia	2	3.50	6	10.52	13	22.80	11	19.29	0	0
Lymphocytopenia	27	47.36	6	10.52	1	1.75	0	0	0	0
Eosinopenia	0	0	0	0	0	0	0	0	0	0
Monocytopenia	5	8.77	0	0	0	0	0	0	0	0

55 (96.49%) patients on 1st day, 40 (70.17%) patients on 2nd day, 51 (89.47%) patients on 3rd day, 55 (96.49 %) patients on 4th day and 54 (94.73%) patients on 5th day had normal range of MCHC values. 5 (8.77%) patients on 1st day, 13 (22.80%) patients on 2nd day, 24 (42.10%) patients on 3rd day,47 (82.45%) patients on 4th day, 56 (98.24%) patients on 5th day had normal range of platelets. 40 (70.17%) patients on 1st day, 44 (77.19 %) patients on 2nd day, 43 (75.43%) patients on 3rd day, 42 (73.68 %) patients on 4th day and 57 (100%) patients on 5th day had normal range of Neutrophils. 25 (43.85%) patients on 1st day, 48 (84.21%) patients on 2nd day, 42 (73.68 %) on patients on 3rd day, 39 (68.42%) on 4th day and 54 (94.73%) patients on 5th day had normal range of lymphocytes. 52 (91.22%) patients on 1st day, 50 (87.71%) on patients on 2nd day, 40 (70.17 %) patients on 3rd day, 47 (82.45%) on 4th day and 57 (100%) patients on 5th day had normal range of Eosinophils. 51 (89.47%) patients on 1st day, 57 (100%) on patients on 2nd , 3rd, 4th and 5th day had normal range of monocytes [Table 6].

In dengue hospitalized patients, 27 (47.36%) patients on 1st day , 21 (36.84%) patients on 2nd day , 19 (33.33%) patients on 3rd day, 15(26.31 %) patients on 4th day, 2 (3.50%) patients on 5th day had leukopenia. 3 (5.26%) patients on 1st day , 4 (7.01%) patients on 2nd day had anaemia condition. In males, 2 (5.88%) patients on 1st day and 2nd day, 1(2.94%) patient on 3rd day had low haemoglobin levels. In females, 9 (39.13%) patients on 1st day, 5 (21.73%) patients on 2nd day ,4 (17.39%) patients on 3rd and 4th day,2 (8.69%) patients on 5th day had low haemoglobin levels. Only on 3rd day, 1 (1 .75%) patient had low MCV. 3 (5.26%) patients on 1st day and 3rd day had low MCH. None of the patients had low MCHC.

52 (91.22%) patients on 1st day, 44 (77.19 %) patients on 2nd day, 33 (57.89%) patients on 3rd day,10 (17.54%) patients on 4th day, 1 (1.75.%) patient on 5th day had thrombocytopenia. 2(3.50%) patients on 1st day, 6 (10.52 %) patients on 2nd day, 13 (22.80%) patients on 3rd day, 11 (19.29%) patients on 4th day had neutropenia. 27 (47.36%) patients on 1st day, 6 (10.52%) patients on 2nd day, 1 (1.75%) patient on 3rd day, had lymphocytopenia. None of the patients had eosinopenia. 5 (8.77%) patients on 1st day had monocytopenia. Maximum numbers of patients are affected with thrombocytopenia, lymphocytopenia, and leukopenia. None of the patients are affected with Eosinopenia [Table 8].

In dengue hospitalized patients, 7 (12.28%) patients on 1st day, 5 (8.77%) patients on 2nd and 3rd day, 3 (5.26%) patients on 4th day had leukocytosis. None of the patients had Polycythemia. None of the males had high haemoglobin levels. In females, 1 (4.34 %) patient on 1st, 2nd &4th day, 3 (13.04%) patients on 3rd day & 5th day had more haemoglobin levels. None of the patients had high MCV. 3 (5.26%) patients on 1st & 5th day, 1(1.75%) patients on 2nd day,6 (10.52%)patients on 3rd day ,2 (3.50%)patients on 4th day had high MCH values. 2 (3.50%) patients on 1st day, 17 (29.82%) patients on 2nd day, 6 (10.52%) patients on 3rd day, 2(3.50 %) patients on 4th day and 3 (5.26%) patients on 5th day had high MCHC values. None of the patients had Thrombocytosis.

15 (26.31%) patients on 1st day, 7 (12.28 %) patients on 2nd day, 1 (1.75%) patient on 3rd day, 4 (7.01 %) patients on 4th day had Neutrophilia. 5 (8.77%) patients on 1st day, 3 (5.26%) patients on 2nd day, 14 (24.56%) on patients on 3rd day, 18 (31.57%) on 4th day and 3 (5.26%) patients on 5th day had Lymphocytosis. 5 (8.77%) patients on 1st day, 7 (12.28%) on patients on 2nd day, 17 (29.82 %) patients on 3rd day, 10 (17.54%) on 4th day had Eosinophilia. Only on 1st day, 1(1.75%) patient had Monocytosis. Maximum patients are affected with high MCHC levels, Neutrophilia, Lymphocytosis and Eosinophilia [Table 10].

Table 9: Reference range of Haematology reports with terms:

Parameters	Normal range	Low range	High range
WBC	5,000 - 10,000 cells/cumm	Leukocytopenia (< 5,000 cells/cumm)	Leukocytosis (> 10,000 cells/ cumm)
RBC	4.0-5.5 million/ cumm	Anaemia (< 4.0 million /cumm)	Polycythemia (> 5.5 million/ cumm)
Hb in males	12.0-17.0 gm %	Low Hb levels (< 12.0 gm %)	High Hb levels (> 17.0 gm %)
Hb in females	11.5-13.5 gm %	Low Hb levels (< 11.5gm %)	High Hb levels (> 13.5gm %)
MCV	6 - 96 fl	Low MCV (<76 fl)	High MCV (> 96 fl)
MCH	27-32 Pg	Low MCH (<32 Pg)	High MCH (> 32 Pg)
MCHC	30.0-35.0 g/l	Low MCHC (< 30.0 g/l)	High MCHC (> 35.0 g/l)
Platelet count	1.5-4.0 Lakhs/cumm	Thrombocytopenia (<1.5 Lakhs/cumm)	Thrombocytosis (> 4.0 Lakhs/cumm)
Neutrophils	50-75%)	Neutropenia (< 50 %)	Neutrophilia (> 75 %)
Lymphocytes	25- 40%	Leukopenia (<25 %)	Leukocytosis (>40 %)
Eosinophils	1-6%	Eosinopenia (<1 %)	Eosinophilia (>6%)
Monocytes	2-10%	Monocytopenia (< 2 %)	Monocytosis (>10%)

4. Discussion

Dengue is emerging as a major health problem in India, regular outbreaks of dengue infection have been occurring throughout India with a greater number of deaths. During the study period of 6 months, out of 57 dengue patients' males were 34 (59.64%) and female were 23 (40.35 %). This result shows that dengue was more prevalent in males than females. Similar pattern of male preponderance was found in previous studies conducted by parkash O et al [9], Maximum infected cases were in the age group of 26 to 35 years and minimum infected cases were in the age group of 0 to 15 years and 41 to 45 years. Dr.Shashwati Nema et al conducted a hospital based Study on Seroepidemiology and Gender Related Differences in Laboratory Characteristics of Dengue Virus Infection and reported maximum seropositivity was detected in 21-30 years [10].

In our study population, Fever was present in almost all the cases followed by headache, Myalgia, Arthralgia, vomiting and diarrhea, body pain, nausea, abdominal pain, skin rash and giddiness. Ashwini Kumar et al has conducted a study on clinical manifestations and trend of dengue cases admitted in tertiary care hospital and reported most common presentations like myalgia, vomiting, headache, and abdominal pain [11]. Fever associated with chills and rigors, body aches, bone pain, headache, myalgia, rash are the clinical presentations reported in a study conducted by Khan AH et al [12]. Usually, body temperature increases in dengue patients due to clinical presentation of fever.

Elevated levels of Total Bilirubin, Direct Bilirubin, Serum Glutamic Oxaloacetic transaminases, Serum glutamic pyruvic transaminases, alkaline phosphate, and Globulin and Random blood sugar were seen according to patient's co-morbid complications. More common changes are thrombocytopenia and leukopenia. Similarly, Leukopenia and thrombocytopenia are the constant hematological abnormalities which support the study done by srichaikul T et al in 2000 [13] and Muhammad Ayyub et al in 2006 [14] Thrombocytopenia is the major characteristic of Dengue fever and platelets were found to be predictive as well as recovery parameter [15].

5. Conclusion

Dengue is an acute viral infection with potential deadly complications transmitted by both Aedes aegypti and Aedes albopictus female mosquitoes and said to be a severe and increasing public health problem with 2.5 billion individuals at risk. WHO currently estimates that with around 24,000 fatalities, 50 million cases of dengue disease may occur globally once a year. In India, too, the condition is getting worse as morbidity and mortality rise. It is followed by 3 phases namely febrile, critical and recovery phase. The clinical symptoms in dengue are fever, headache, abdominal pain, diarrhea, bleeding, skin rash, pruritus, sore throat, and seizures. However, thrombocytopenia is a common condition in dengue. There is no antiviral drug for this treatment but can be treated by symptomatic and supportive care. The advantages of having a vaccine against dengue are immense, but progression in this regard is slow due to many technical difficulties.

Dengue has established its transmission in urban and semi-urban areas with predominantly affecting active population. Rapid increase in the dengue cases has become a major public health concern. The present study highlights the importance of dengue fever to clinicians in the areas of epidemiology, manifestations, complications, and outcome of the disease. Community awareness, early diagnosis and management and vector control measures need to be strengthened, during peri-monsoon period, in order to prevent the increasing number of dengue cases.

Classical cases have clinical symptoms of fever, headache, and body ache, myalgia, arthralgia, vomiting, nausea, diarrhea, abdominal pain, skin rash and giddiness. Continuous surveillance of dengue infection is essential for early diagnosis and management. Wide clinical spectrum of manifestations and complications makes it common differential diagnosis of acute febrile illnesses. Rise in hematocrit and fall in platelets are the first hematological abnormalities seen in patients. Periodic surveillance should be carried out to monitor the infection rate in a particular geographical area for timely initiation of preventive and control measures.

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Conflict of Interest

The author(s) confirm that this article content has no conflict of interest.

Table 10:Conditions of High range of haematological parameters in dengue hospitalized patients

Parameters	Patients having change in White blood cells on day									
	On day 1		On day 2		On day 3		On day 4		On day 5	
	In No	In %	In No	In %	In No	In %	In No	In %	In No	In %
Leukocytosis	7	12.28	5	8.77	5	8.77	3	5.26	0	0
Polycythemia	0	0	0	0	0	0	0	0	0	0
High Hb in males	0	0	0	0	0	0	0	0	0	0
High Hb females	1	4.34	1	4.34	3	13.04	1	4.34	3	13.04
High MCV	0	0	0	0	0	0	0	0	0	0
High MCH	3	5.26	1	1.75	6	10.52	2	3.50	3	5.26
High MCHC	2	3.50	17	29.82	6	10.52	2	3.50	3	5.26
Thrombocytosis	0	0	0	0	0	0	0	0	0	0
Neutrophilia	15	26.31	7	12.28	1	1.75	4	7.01	0	0
Lymphocytosis	5	8.77	3	5.26	14	24.56	18	31.57	3	5.26
Eosinophilia	5	8.77	7	12.28	17	29.82	10	17.54	0	0
Monocytosis	1	1.75	0	0	0	0	0	0	0	0

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