Epidemiological surveillance study on dengue outbreak in the tertiary care hospital

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Abstract

Background

As Telangana experienced a double-fold rise in rainfall this year in contrast to the regular pattern, the climatic fluctuations have increased the epidemic potential of Dengue.

Aims and Objectives

The study's primary goals are to examine the frequency of Dengue outbreaks and perform an examination of Dengue to monitor the disease's development. The study highlights the value of epidemiological surveillance to monitor the No. of incidences, evaluate the most prevalent clinical features, and determine how abnormalities in laboratory results help in figuring out the expansion of disease as the seasonal outbreak of endemic Dengue is observed.

Methodology

In 6-month surveillance research in a tertiary care hospital, data on 100 Dengue cases were gathered and evaluated

Results

Among 100 cases, 44 were women and 56 were men. Ages 21 to 40 were the most impacted (35%). NS1Ag was identified in 85 individuals, whereas Ig M was detected in 10 cases (or 10%). Only 5 patients (5%), a combination of NS1Ag and Ig M positive, were involved.

Within one to five days of fever onset, 69 people were hospitalized. Leucopenia was observed in 31 individuals (31%) and was more prevalent in ladies than gents (54.8% vs. 45.2%). The majority of observed clinical features (82%) involved thrombocytopenia. Females had a higher rate than men (56.1% vs. 43.9%). 9 individuals had hypoalbuminemia, while 7 patients had elevated A: G.

Conclusion

In this surveillance study, we conclude that the clinical examination of DF patients demonstrated the efficacy of surveillance systems in assisting and assessing the intensity of the infection.

Keywords: dengue, epidemiology, serological positive, thrombocytopenia, leukopenia, transaminases

Introduction

Dengue is the vector-borne virus disease that spreads fastest among humans and is transferred by mosquitoes with a 30-fold increase in global frequency over the past 50 years. Dengue was one among the 17 neglected tropical illnesses listed by the WHO (2010). Dengue cases reached a record high of 4,200,000 in 2019, the top notch ever. The patterns are concerning for both human health and the economy, even though the worldwide impact is still unknown. Dengue fever outbreaks have been reported repeatedly in several States and UTs in India. November is the dengue season. The disease follows a periodic pattern, with the peak of cases occurring after the monsoon and not being dispersed equally all through the year.

Worldwide, nearly 2.5 billion people continue to live at risk of contracting dengue infection. It is estimated that in 100 endemic countries, there will be 50 million cases and 24,000 deaths. The geographical spread, incidence and severity of Dengue Fever (DF), Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) are

increasing in central and South America, south-east Asia and the eastern Mediterranean and western Pacific countries.

Dengue infection causes various clinical features ranging from self-limiting to severe. The study's primary goal was to discover how frequently clinically suspicious patients had laboratory-confirmed Dengue infections. The secondary objective is how efficiently the epidemiological data is applicable to detect the seriousness of the infection by analyzing hematological reports and biochemical reports. Hence, our effort is to encourage citizens to adopt preventive control measures against the disease Cyclical epidemics of dengue have become more frequent over the past two decades [1]. Treated DHF/DSS is associated with a 5% mortality rate and in untreated cases the mortality rates escalates to 50%. Dengue is a flu-like severe illness with an incubation period of 4 days–10 days. Usually, symptoms last for 2 days–7 days. Dengue is classified into 2 major categories by WHO as dengue (with / without warning signs) and severe dengue. Dengue was confined to urban areas, but is now spreading to rural regions. Many factors contribute to spread of Dengue infection in India including changes in environmental factors, haphazard urbanization, host-pathogen interactions, and some immunological factors of population. Inadequate vector control measures have also created favorable conditions for dengue virus transmission and its mosquito vectors. Isolation of virus by cell culture and molecular detection techniques not only require costly laboratory setups but these techniques are time consuming and mostly available in research or reference laboratories. Detection of NS1 antigen and IgM/ IgG antibodies specific to Dengue virus by ELISA remains an important diagnostic tool in resource limited settings. The first confirmed report of dengue infection in India dates back to 1940s. Since then, more and more new states have reported cases of the disease, in both urban and rural environments, and have mostly struck in epidemic proportions inflicting heavy morbidity and mortality [2,3]. The present study was undertaken in order to analyse the trend of the disease over the years and the outcome of the cases admitted to a tertiary care hospital in southern India.

Among the principal elements of interest in infectious disease virology is the potential of the infectious disease to transmit across the population.

Dengue is an Arbovirus illness, family *Flaviviridae* under the genus *flavivirus*. Human-to- human DENV transference is passed by Anthropophilic Aedes mosquitoes, namely, *Aedes aegypti* and *A.albopictus* (Murray et al., 2013), consists of 4 subtypes DENVs [1- 4].

Recently the 5th serotype DENV 5 was discovered in 2013 in Bangkok. The main vector is *Aedes aegypti*, which prefers residing in dark areas of houses [4]. In greater than 100 nations, dengue is an endemic disease with 3.6 billion to 4.5 billion worldwide at risk, it is widespread in semitropical and tropical regions, particularly in urban and semi- urban regions [5]. Dengue infection is endemic in many regions of India for over 20 decades as a benign and self-limiting disease and outbreaks were being reported at regular intervals. Owing to the suitable climatic environment, India has several reports of Dengue outbreaks involving all serotypes [6]. Telangana, India has recorded 5369, 4572, 13331, 2173, and 7135 in the years 2017, 2018, 2019, 2020, and 2021 respectively[7].

Dengue infection causes various clinical features ranging from self-limiting to severe. The study's primary goal was to discover how frequently clinically suspicious patients had laboratory-confirmed Dengue infections. The secondary objective is how efficiently the epidemiological data is applicable to detect the seriousness of the infection by analyzing hematological reports and biochemical reports. Hence, our effort is to encourage citizens to adopt preventive control measures against the diseases[8]

Methodology

The observational study was performed in RVM Hospital, Laxamakkapally, Siddipet. The study site is a tertiary care hospital; people with undiagnosed fever come from nearby places. Patients having suggestive clinical features of Dengue fever were considered for the study. The research was organized for duration of 6 months.

Suggestive clinical features of Dengue are fever, chills and rigors, myalgia, arthralgia, vomiting, headache, rashes, and the presence of any bleeding manifestations.

The total sum of clinically probable Dengue cases collected was 469, among them 100 patients were confirmed positive for Dengue serologically[9].

Detailed history and clinical examinations were executed on the confirmed patients. Laboratory findings such as complete blood picture and liver function tests were performed during the hospital stay to check out the improvement in desired parameters such as platelet count, leucocytes, transaminase levels, albumin, and A:G ratio.

The above-mentioned desired parameters were

reviewed from time to time during the patient's hospital stay, as a notable decrease in the laboratory parameters indicates the seriousness of Dengue infection.

Serological investigations consisting of screening tests and confirmatory tests were carried out using the patient's blood serum. Screening test for Non-structural protein 1 (NS1) antigen and Immunoglobulin M was conducted using Dengue Day 1 Test Kit which is a rapid visual test for the identification of Dengue NS1 Antigen and differential detection of IgM/IgG antibodies [10].

ELISA was also done using the "Dengue NS1 Ag MICROLISA" kit for serological confirmation of NS1 Ag.

Inclusion Criteria

- Male and female patients of all age groups.
- Subjects suspected of Dengue.
- Subjects with confirmed Dengue antigen.
- Subjects undergoing treatment for Dengue.

Exclusion Criteria

- Subjects suspected of other vector-borne diseases.
- Subjects presenting co-morbid infections along with Dengue fever were excluded.
- Other causes for abnormalities found in platelets count, WBC, Transaminases, and Albumin were not involved.
- Pregnant women were not considered for the study.

Data Collection

- The information on reported Dengue cases was collected by using a predesigned proforma of patients.
- Demographics, clinical manifestations, and hematological, and biochemical parameters of the selected patients were collected.
- Serological reports of detected NS1 Ag, IgM, NS1Ag and IgM were collected directly from the serological laboratory and ELISA reports acquired from the Central laboratory in the hospital.

Statistical Analysis

Descriptive statistics and graphical representation of data analysis on "Epidemiological surveillance study on dengue outbreak in tertiary care hospital" values were stated as frequency, percentage, mean, and SD. Comparison of qualitative data and quantitative data was analyzed with a chi-square test and t-test respectively. For the comparison of multiple means between LFT parameters and different age groups, one-way ANOVA (CI 95%) was used. The continuous variables and categorical variables were analyzed considering p-value <0.05 as significant. All statistical analyses were done using IBM SPSS software version 26 [11].

Results

During our study period, the total number of screened cases was 469, among them, 100 were serologically confirmed Dengue-positive cases. The maximum number of cases being observed in the male population when compared with females (56% vs. 44%) with male to female ratio of 1.27: 1 **(TABLE 1 AND FIGURE 1).**

Out of 100 Dengue confirmed patients, 15% had Dengue without WS, and 82% had Dengue with WS. Among the Dengue patients with warning signs, only 4 patients had severe Dengue.

The mean age (SD) of Dengue patients was calculated as 24.69 (16.62) based on descriptive statistics **(TABLE 2).**

The maximum number of patients infected with Dengue were aged between 21years-40 years (35%)**(FIGURE 2 AND TABLES 2,3)**.

TABLE 1. Frequency and percentage of Dengue positive cases according to age, sex, and serological markers.

		No. Of cases	Percentage
Age	< = 10 years	22	22
	11 years-20 years	25	25
	21 years- 40 years	35	35
	41 years-60 years	14	14
	> 60 years	4	4
Sex	Male	56	56
	Female	44	44
Serological Markers	Ig M	10	10
	NS1Ag	85	85
	NS1Ag, Ig M	5	5
Total Positive Dengue Cases	100		

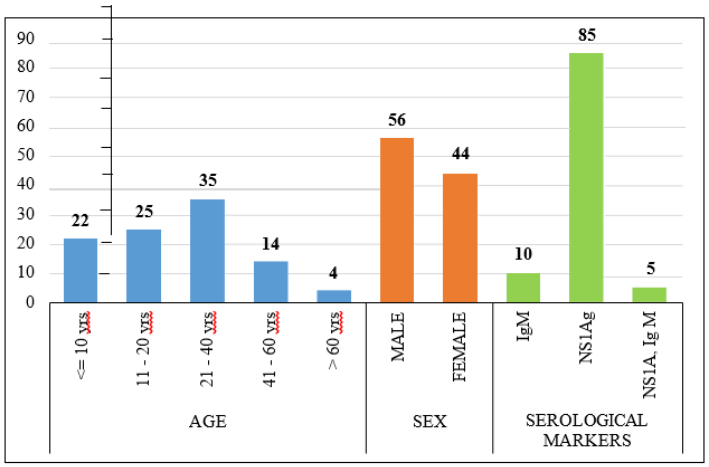

FIGURE 1. Graphical representation of dengue positive cases according to age groups, sex, and serological markers (N=100).

TABLE 2. Descriptive statistics of age.

	N	Minimum	Maximum	Mean	Std. Deviation
Age in Years	100	2	75	24.69	16.62

TABLE 3. Age and sex distribution of dengue cases.

		Sex						Chi-square	P value
		Male		Female		Total			
		No.	%	No.	%	No.	%		
Age	<= 10 years	11	50	11	50	22	100	1.078	0.898
	11 years-20 years	16	64	9	36	25	100		
	21 years-40 yrs	19	54.3	16	45.7	35	100		
	41 years-60 years	8	57.1	6	42.9	14	100		
	> 60 years	2	50	2	50	4	100		
Total		56	56	44	44	100	100		

Note: p-value statistically non-significant.

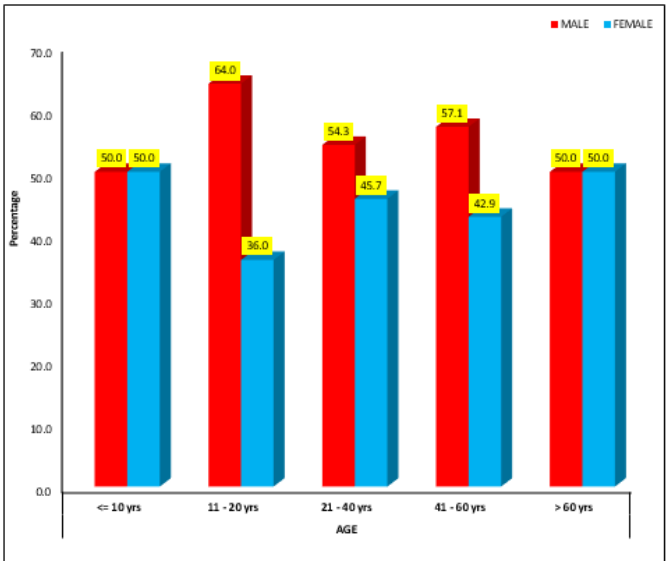

FIGURE 2. Percentage of Dengue positive cases in both male and female.

Among the male population, peaks were observed in 11 years-20 years of age group. Around 50% of the categorized age groups in the male population presented Dengue infection. Whereas in the female population, peaks were observed at <10 years.

The serologically confirmed Dengue patients had manifested the common clinical features as in **TABLE 4 AND FIGURE 3**.

Fever was the primary clinical characteristic observed (99%) followed by body pains, myalgia (77%), headache (31%), and rashes (4%)

TABLE 5 and **FIGURE 4** represented the days when patients were presented to the hospital with fever which was the primary clinical feature. Nearly 50% of the patients presented from and after 5 days of fever onset.

The most common serology recorded positive was NS1 Antigen (85%). 85 patients among the clinically classified Dengue patients were serologically positive for NS1 Ag whereas IgM antibodies positive percentage was 10% and both NS1 Ag and IgM were positive in 5% of the Dengue patients **(TABLE 1)**. The samples obtained from the screening test for NS1 Ag were also confirmed positive byELISA.

In October there were the most instances of dengue, considering the study period of 6 months from September to February **(TABLE 6 AND FIGURE 4)**.

From the obtained hematological and biochemical investigations, the desired parameter findings were taken into account and calculated to describe the progression of Dengue infection in the affected patients.

A decrease in leucocytes was observed at 31% and a decrease in platelet count was observed in 82% in accordance with the hematological parameters **(TABLE 7 AND FIGURE 5)**.

Leucopenia was high in females (54.8%) when compared to male (45.2%), Thrombocytopenia was high in male (56.1%) when compared to

TABLE 4. Frequency and percentage of dengue cases according to symptoms.

Symptoms	No. of cases	Percentage
Fever	99	99
Pain	77	77
Vomiting	24	24
Headache	31	31
Bleeding	1	1
Rashes	4	4

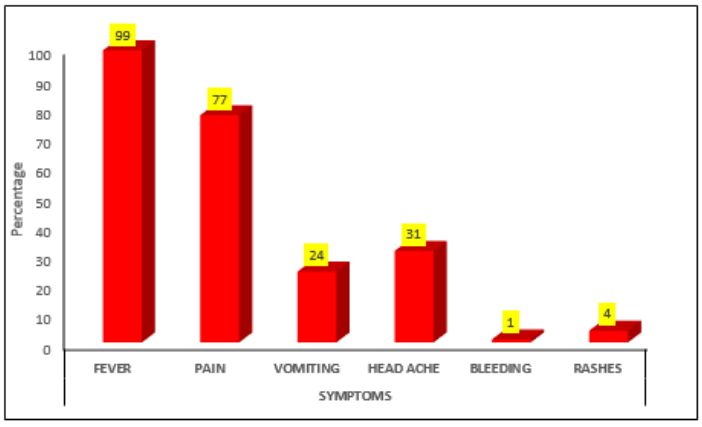

FIGURE 3. Percentage distribution of dengue cases according to symptoms.

TABLE 5. Patient distribution according to fever onset.

Days of fever	Number of patients	Percentage
1	19	19%
2	7	7%
3	12	12%
4	12	12%
5	19	19%
>5	30	30%
Total no. of cases	100	

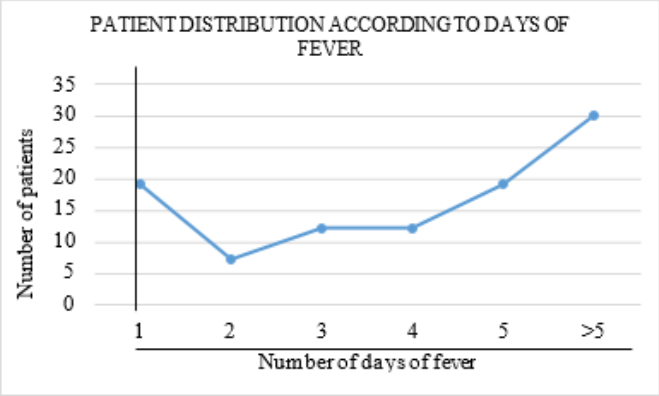

FIGURE 4. Graphical representation of patient distribution according to the days of fever.

TABLE 6. Number of cases in each month of the study period.

Months	No. of cases
September	21
October	39
November	26
December	10
January	4
Total collected dengue positive cases	100

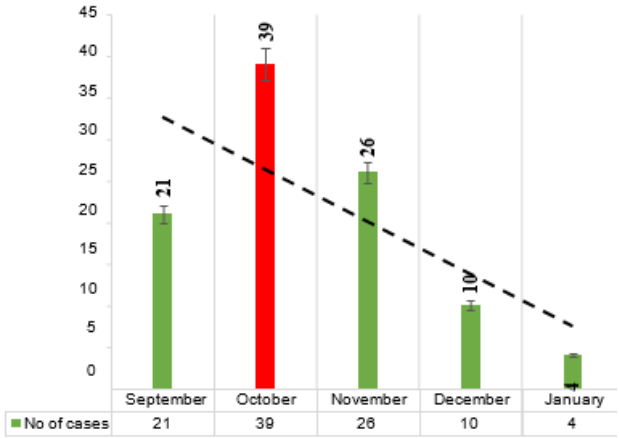

FIGURE 5. Graphical representation of no. of cases according to months.

TABLE 7. Frequency and percentage of Dengue patients according to hematological parameters.

Hematological parameters		No. of cases	Percentage
Leucocytes	Low	31	31
	Normal	69	69
Platelet levels	Low	82	82
	Normal	18	18

female (43.9%) **(TABLE 8 AND FIGURE 6)**.

Dengue seropositive patients presented with Dengue common clinical features showed an above 70% decrease in platelet count whereas 34% of them showed a decrease in leucocyte count **(TABLE 9 AND FIGURE 7)**.

The level of significance is 5% ($p<0.05$). Compared significance of vomiting with a decrease in leucocyte count is 0.005.

Association between hematological and serological parameters ($p<0.05$) **(TABLE 10 and FIGURES 8 AND 9).**

The level of significance assumed $p<0.05$. Compared p-value of the serological marker detected and platelet levels with a level of significance is 0.020.

Transaminases level distribution: Among the Dengue-infected patients 30% (n=30) had elevated SGOT levels above 4-fold whereas

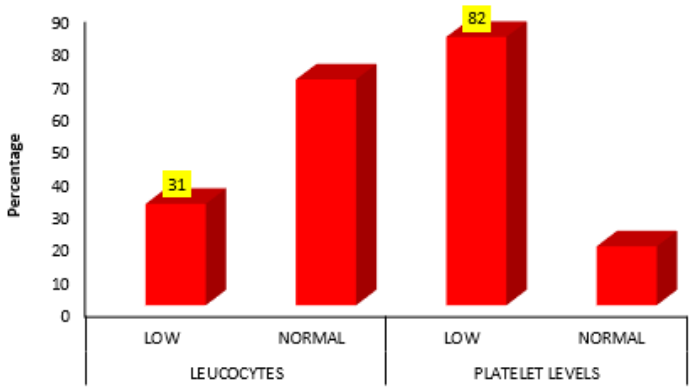

FIGURE 6. Graphical representation of hematological parameters.

TABLE 8. Statistical data for hematological data and both sexes.

Hematological parameters			Sex				Total		Chi- square	P-value
			Male		Female					
			No.	%	No.	%	No.	%		
1	Leucocytes	Low	14	45.2	17	54.8	31	100	2.142	0.143
		Normal	42	60.9	27	39.1	69	100		
2	Platelet levels	Low	46	56.1	36	43.9	82	100	0.002	0.967
		Normal	10	55.6	8	44.4	18	100		

Note: Level of significance 5% ($p<0.05$). p-value observed is statistically nonsignificant.

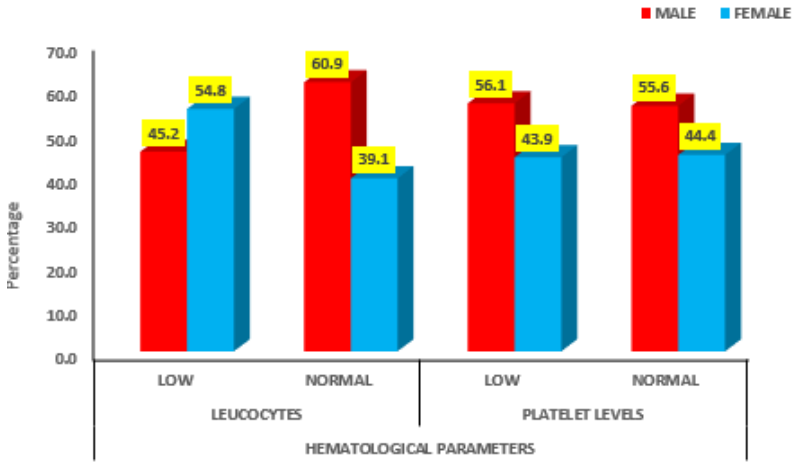

FIGURE 7. Male and female percentages in hematological parameters.

TABLE 9. Association of common clinical features with hematological parameters.

Symptoms		Leucocytes					Platelet levels				Total		P-value
		Low		Normal		P- Value	Low		Normal				
		No.	%	No.	%		No.	%	No.	%	No.	%	
Fever	Yes	30	30.3	69	69.7	0.134	81	81.8	18	18.2	99	100	0.638
	No	1	100	0	0		1	100	0	0	1	100	
Pain	Yes	24	31.2	53	68.8	0.947	66	85.7	11	14.3	77	100	0.077
	No	7	30.4	16	69.6		16	69.6	7	30.4	23	100	
Vomiting	Yes	13	54.2	11	45.8	0.005	22	91.7	2	8.3	24	100	0.157
	No	18	23.7	58	76.3		60	78.9	16	21.1	76	100	
Headache	Yes	13	41.9	18	58.1	0.113	27	87.1	4	12.9	31	100	0.374
	No	18	26.1	51	73.9		55	79.7	14	20.3	69	100	
Bleeding	Yes	0	0	1	100	0.501	1	100	0	0	1	100	0.638
	No	31	31.3	68	68.7		81	81.8	18	18.2	99	100	
Rashes	Yes	2	50	2	50	0.402	4	100	0	0	4	100	0.339
	No	29	30.2	67	69.8		78	81.3	18	18.8	96	100	

only 9% (n=9) had elevated SGPT levels above 4-fold thereby SGOT > SGPT **(TABLE 11, 12 and FIGURE 10, 11)**.

Considering above 4-fold rise in transaminases levels as severe Dengue, a number of patients who showed elevated SGOT levels were 14 and 16 patients in male and female respectively. Whereas a number of patients with elevated SGPT levels was 3 and 6 patients in males and females respectively **(TABLE 13 and FIGURE 12).**

- In the age group of 0-10 years, SGOT and SGPT levels were elevated to 4-fold.
- In the age group of 11 years-20 years, SGOT and SGPT levels were elevated to 3-fold and 4-fold respectively.
- In the age group of 21 years-40 years, SGOT and SGPT levels were elevated to 4-fold and

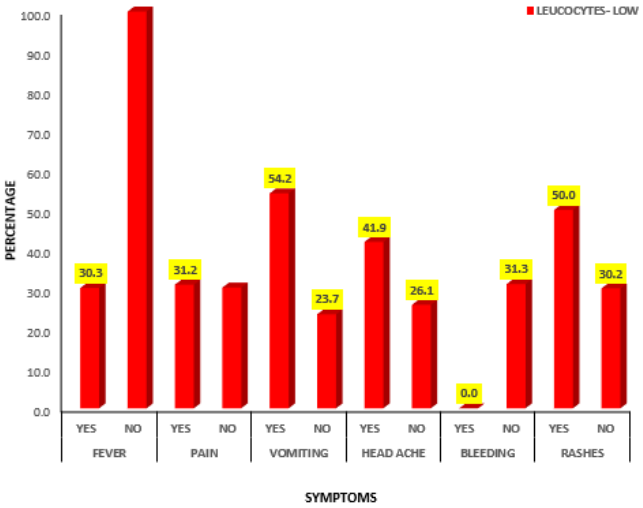

FIGURE 8. Percentage of symptoms with decreased leucocyte count.

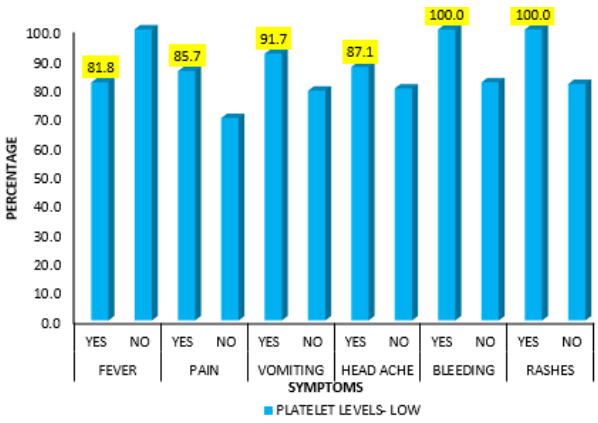

FIGURE 9. Percentage of symptoms with decreased platelet count.

TABLE 10. Association between antigen detected and hematological parameters.

Serological marker	Leucocytes				P-value	Platelet levels						P-value
	Low		Normal			Low		Normal		Total		
	No.	%	No.	%		No.	%	No.	%	No.	%	
Igm	1	10	9	90		5	50	5	50	10	100	
Ns1ag	28	32.9	57	67.1	0.301	73	85.9	12	14.1	85	100	0.02
Ns1ag, ig m	2	40	3	60		4	80	1	20	5	100	

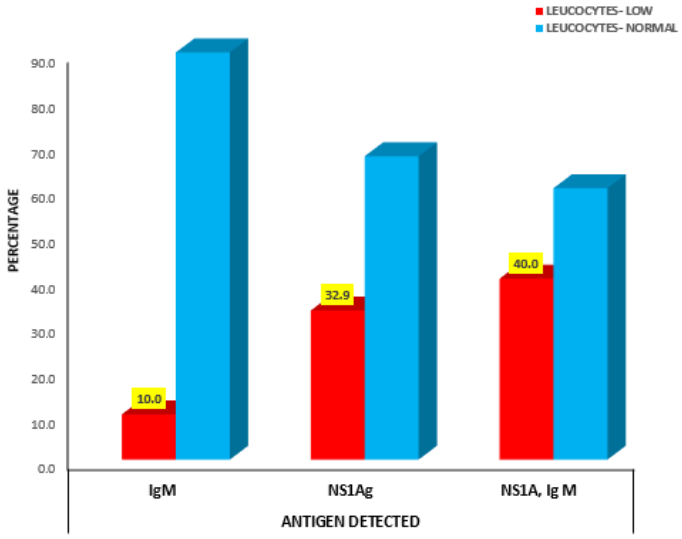

FIGURE 10. Percentage representation of low levels of leucocytes with serological markers.

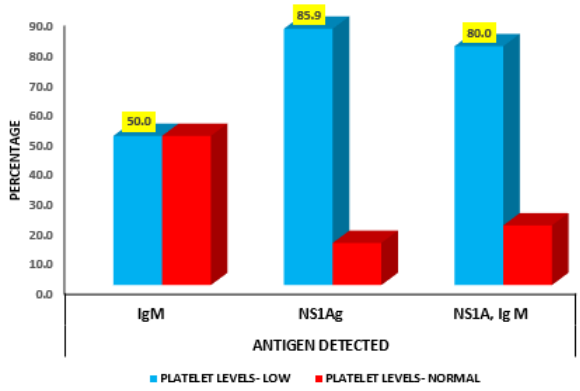

FIGURE 11. Percentage representation of low levels of platelets with serological markers.

TABLE 11. Frequency and percentage of SGOT and SGPT in dengue patients.

		No. Of cases	%
SGOT	Normal	45	45
	2-fold	10	10
	3-fold	7	7
	4-fold	8	8
	Above 4-fold	30	30
SGPT	Normal	63	63
	2-fold	12	12
	3-fold	8	8
	4-fold	8	8
	Above 4-fold	9	9

2-fold respectively.

- In the age group of 41 years-60 years, SGOT and SGPT levels were elevated above 4-fold and 3- fold respectively.
- In the age group of >60 years, SGOT and SGPT levels were elevated above 4-fold and 2-fold respectively. **(TABLE 14,15).**

Mean values of LFT parameters in both male and female were related using a t-test.

Using One-way ANOVA significant difference of p=0.04 in A: G ratio with age groups (F=4.199, p<0.05) **(TABLE 16 and FIGURE 13)**.

Discussion

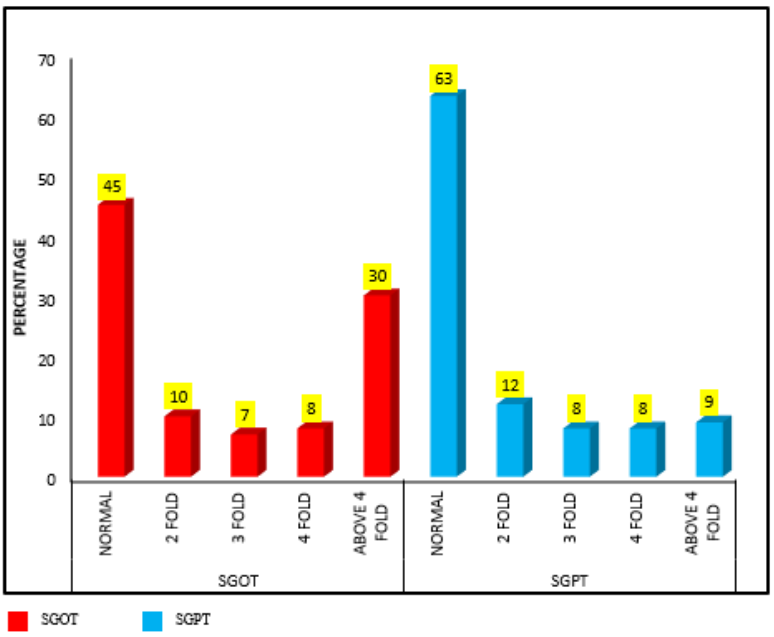

FIGURE 12. Percentage of SGPT and SGOT.

TABLE 12. Descriptive statistics of LFT which included SGOT, SGPT, Serum Albumin, and A: G ratio (P<0.05).

	Sex	N	Mean	Std. Deviation	Std. Error Mean	" t " test	p-value
SGOT (31	Male	56	86.5	102.702	13.724	1.878	0.063
U/l)	Female	44	148.05	216.419	32.626		
SGPT(34 u/l)	Male	56	53.91	72.685	9.713	0.852	0.396
	Female	44	68.66	100.308	15.122		
Serum	Male	56	3.9	0.532	0.071	0.707	0.481
Albumin	Female	44	3.82	0.583	0.088		
A:G ratio	Male	56	1.47	0.296	0.04	1.086	0.28
	Female	44	1.4	0.322	0.049		

Note: p-value statistically non-significant.

TABLE 13. Transaminases levels with a number of cases in both sexes.

			Sex				Total		Chi- Square	P Value
			Male		Female					
			No.	%	No.	%	No.	%		
SGOT	Normal	YES	27	60	18	40	45	100	0.531	0.466
		NO	29	52.7	26	47.3	55	100		
	2-FOLD	YES	7	70	3	30	10	100	0.884	0.347
		NO	49	54.4	41	45.6	90	100		
	3-FOLD	YES	2	28.6	5	71.4	7	100	2.298	0.13
		NO	54	58.1	39	41.9	93	100		
	4-FOLD	YES	6	75	2	25	8	100	1.274	0.259
		NO	50	54.3	42	45.7	92	100		
	ABOVE	YES	14	46.7	16	53.3	30	100	1.515	0.218
	4-FOLD	NO	42	60	28	40	70	100		
SGPT	NORMAL	YES	35	55.6	28	44.4	63	100	0.014	0.907
		NO	21	56.8	16	43.2	37	100		
	2-FOLD	YES	7	58.3	5	41.7	12	100	0.03	0.862
		NO	49	55.7	39	44.3	88	100		
	3-FOLD	YES	5	62.5	3	37.5	8	100	0.149	0.699
		NO	51	55.4	41	44.6	92	100		
	4-Fold	YES	6	75	2	25	8	100	1.274	0.259
		NO	50	54.3	42	45.7	92	100		
	Above	YES	3	33.3	6	66.7	9	100	2.062	0.151
	4-FOLD	NO	53	58.2	38	41.8	91	100		

Note: Level of significance 5% (p<0.05).

Dengue is a significant resurging viral infection. Epidemiology is the research of disease transmission and prevention using scientific methods. In the past years, Dengue cases have increased drastically. There has been a considerable increase in number of cases and severity of disease in the past few decades due to vast urbanization and environmental changes. The impact of the dengue spread at the beginning of the rainy season was highly covered by newspapers and media, stating that seasonal diseases would be a bigger concern because of dengue stalks. The cases recorded in 2020 and 2021 was 2173 and 7135 respectively, but in the year 2022 until 31st October itself, the recorded Dengue fever cases were 13091. Presence of a non- immune population becoming prey to the circulating serotype of dengue (NVBDCP). In Telangana state, when compared to the typical rainfall of 817 mm, the rainfall that is recorded in the year 2022-2023 up to 31st October 2022 was 1217 mm, which has increased 49%."Mulugu" has recorded the state's greatest seasonal cumulative rainfall of 1813 mm from 1st June to October 2,

TABLE 14. Distribution of transaminases with different age groups.

			Age											Total	Chi-Square	P-Value
			<= 10 yrs.		11 - 20 years		21 - 40 years		41 - 60 years		> 60 years					
			NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%		
SGOT	normal	yes	10	22.2	12	26.7	17	37.8	6	13.3	0	0	45	100	3.572	0.467
		no	12	21.8	13	23.6	18	32.7	8	14.5	4	7.3	55	100		
	2-fold	yes	3	30	2	20	2	20	2	20	1	10	10	100	2.434	0.656
		no	19	21.1	23	25.6	33	36.7	12	13.3	3	3.3	90	100		
	3-fold	yes	2	28.6	3	42.9	2	28.6	0	0	0	0	7	100	2.552	0.635
		no	20	21.5	22	23.7	33	35.5	14	15.1	4	4.3	93	100		
	4-fold	yes	3	37.5	1	12.5	4	50	0	0	0	0	8	100	3.617	0.46
		no	19	20.7	24	26.1	31	33.7	14	15.2	4	4.3	92	100		
	above	yes	4	13.3	7	23.3	10	33.3	6	20	3	10	30	100	6.504	0.165
	4-fold	no	18	25.7	18	25.7	25	35.7	8	11.4	1	1.4	70	100		
SGPT	normal	yes	18	28.6	16	25.4	20	31.7	6	9.5	3	4.8	63	100	6.552	0.162
		no	4	10.8	9	24.3	15	40.5	8	21.6	1	2.7	37	100		
	2-fold	yes	1	8.3	1	8.3	6	50	3	25	1	8.3	12	100	5.368	0.252
		no	21	23.9	24	27.3	29	33	11	12.5	3	3.4	88	100		
	3-fold	yes	1	12.5	1	12.5	3	37.5	3	37.5	0	0	8	100	4.694	0.32
		no	21	22.8	24	26.1	32	34.8	11	12	4	4.3	92	100		
	4-fold	yes	2	25	4	50	2	25	0	0	0	0	8	100	4.023	0.403
		no	20	21.7	21	22.8	33	35.9	14	15.2	4	4.3	92	100		
	above	yes	0	0	3	33.3	4	44.4	2	22.2	0	0	9	100	3.576	0.466
	4-fold	no	22	24.2	22	24.2	31	34.1	12	13.2	4	4.4	91	100		

Note: p-value significant at 0.05

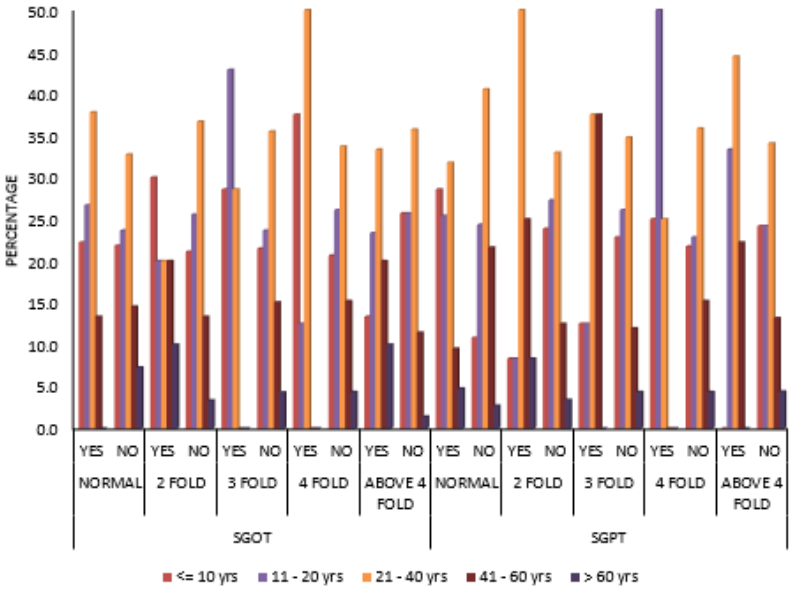

FIGURE 13. Graphical representation of SGOT and SGPT levels in different age groups.

TABLE 15. Mean and standard deviation values of LFT parameters with both males and females.

	Sex	N	Mean	Std. Deviation	Std. Error Mean	" t " Test	P Value
SGOT (31 U/L)	Male	56	86.5	102.702	13.724	1.878	0.063
	Female	44	148.05	216.419	32.626		
SGPT(34 U/L)	Male	56	53.91	72.685	9.713	0.852	0.396
	Female	44	68.66	100.308	15.122		
Serum Albumin	Male	56	3.9	0.532	0.071	0.707	0.481
	Female	44	3.82	0.583	0.088		
A:G Ratio	Male	56	1.47	0.296	0.04	1.086	0.28
	Female	44	1.4	0.322	0.049		

Level of significance 5% ($p<0.05$)

TABLE 16. Studies reported LFT parameters with age groups using one-way ANOVA

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max	F-Value	P-Value
						Lower Bound	Upper Bound				
SGOT (31 U/L)	<= 10 years	22	76.14	67.84948	14.46556	46.0536	106.2191	15	267	0.534	0.711
	11 - 20 years	25	118.76	172.78896	34.55779	47.4362	190.0838	7	650		
	21 - 40 years	35	116.94	197.14133	33.32297	49.2224	184.6633	11	1090		
	41 - 60 years	14	157.36	193.67761	51.76252	45.531	269.1833	14	617		
	> 60 years	4	104.5	45.20693	22.60347	32.5657	176.4343	40	142		
SGPT(34 U/L)	<= 10 years	22	32.68	32.02289	6.8273	18.4837	46.88	11	118	1.092	0.365
	11 - 20 years	25	78.6	112.62586	22.52517	32.1103	125.0897	10	423		
	21 - 40 years	35	62.66	86.88733	14.68664	32.8103	92.504	10	470		
	41 - 60 years	14	74.64	93.12408	24.88846	20.8746	128.4111	11	343		
	> 60 years	4	29.5	19.82423	9.91211	-2.0448	61.0448	17	59		
Serum Albumin	<= 10 years	22	3.85	0.59018	0.12583	3.5838	4.1071	2.7	4.8	0.405	0.804
	11 - 20 years	25	3.86	0.44053	0.08811	3.6822	4.0458	2.5	4.7		
	21 - 40 years	35	3.94	0.52875	0.08938	3.7612	4.1245	2.8	5		
	41 - 60 years	14	3.78	0.67503	0.18041	3.3888	4.1683	2.5	4.7		
	> 60 years	4	3.65	0.9037	0.45185	2.212	5.088	2.6	4.8		
A:G Ratio	<= 10 years	22	1.53	0.23981	0.05113	1.4255	1.6381	1.1	2	4.199	0.004
	11 - 20 years	25	1.5	0.24406	0.04881	1.4033	1.6047	0.8	1.9		
	21 - 40 years	35	1.35	0.33285	0.05626	1.2399	1.4686	0.6	1.9		
	41 - 60 years	14	1.52	0.33092	0.08844	1.3304	1.7125	0.9	1.9		
	> 60 years	4	1	0.23094	0.11547	0.6325	1.3675	0.8	1.2		

2022 [TSDPS]. Since RVM Hospital is situated in Mulugu, many patients reported with dengue feversymptoms.

As a consequence of climatic changes, the range of virus infectious diseases expanded. During the monsoons dengue has taken its toll. The reason behind the sudden shoot up in Dengue fever cases can be related to climatic factors like rainfall, temperature, and RH (Relative Humidity).

In our study, among the screened dengue subjects, 100 patients serologically tested positive for dengue serum markers (NS1 Ag, IgM). More cases were observed in the age group of 21 years-40 years (35%). This age group is a productive phase with a high predominance in the male population. Out of the total, 100 dengue- positive subjects, 56% were male and 44% were female with a ratio of 1.27: 1 respectively.

The most observed clinical feature presented

at the time of admission was fever accounting for 99%, followed by body pains at 77%. Less than 30% accounted for vomiting conflicting with the studies by Jayadas et al and Pandey et al., in which vomiting was the frequently seen symptom. Nearly 50% admitted patients have a fever 5 days prior to their admission.

We observed only one instance where the patient was treated with immediate therapy and was diagnosed with DSS.

The productiveness of epidemiological monitoring is determined by taking into account the clinical evaluation of dengue patients to observe the distribution of severity. Low platelet levels and transaminases levels were accompanied with Dengue.

The consistent dengue serum markers recorded positive was NS1Ag (85%). 85 patients among the clinically Dengue patients tested positive to NS1Ag, followed IgM in 10 patients (10%). A combination of NS1Ag and Ig M positivity was observed only in 5 patients (5%).

Since more patients (69 patients) were hospitalized within 1 days–5 days of pyrexia and that NS1Ag antigen can be detected within the first 2 days–7 days of DF disease, a higher NS1 positive was noted.

From the obtained hematological and biochemical investigations, the desired parameters findings were taken into account and calculated to describe the progression of infection in the affected patients. Leucopenia (<4000cells/cumm) was observed in 31 patients (31%).

Leucopenia was observed due to direct bone marrow repression by the virus. Leucopenia was high in females than males (54.8 %>45.2%).

Platelets are necessary for hemostasis, tissue repair, and infections. Thrombocytopenia (<1,50,000) was commonly observed clinical feature accounting 82% of the research population, similar to the study conducted by Jayadas et al. The attributing factors for such thrombocytopenia are bone marrow suppression, immune-mediated clearance, and aggregation of platelets. Thrombocytopenia was high in females than males (56.1%>43.9%). 81.8% of patients showed thrombocytopenia.

Comparison between serological labels and decreased platelets count showed a significance of 0.020 ($p<0.05$). The effects of DF on the liver range from an asymptomatic rise of transaminases to fatal hepatic failure. In our exploration, elevations in the nominal variable transaminases- SGOT and SGPT were created by using their upper limits as normal, 2 fold, 3 fold, 4 fold, and > 4 fold.

Liver transaminases were elevated in 32% of populace in our study. In contrast, more results were observed in the studies directed by Shreshta B et al. and Jayadas et al.

Direct virus attack on liver cells or an uncontrolled host defense mechanism against the virus can both lead to abnormal liver function in dengue infection. Above 4 fold rise in transaminases is considered to be one of the major signs of severe dengue. SGOT and SGPT levels elevated above 4 fold were 30% and 9% respectively (SGOT>SGPT).The severity of Dengue infection evidenced by the rise in transaminases levels above 4 fold is more predominant in female than compared with male (SGOT n=14 and n=16 for M and F respectively; SGPT n=3 and n=6 for M and F respectively).

Various additional researches have also mentioned that women experience severe progression of the disease which is explained by their preferable immunological responses, higher levels of cytokines production, and enhanced capillary bed permeability [6].

The highest value of SGOT recorded was 1090 IU/L which was 35 times the upper limit and the highest SGPT value recorded was 470 IU/L which was nearly 14 times the upper limit. It is therefore considered that the former patient had severe dengue.

A significant difference of p 0.04 was observed from one-way ANOVA analysis of specific LFT parameters considering CI 95% $p<0.05$. Elevated SGOT, SGPT, Hypoalbuminemia, andA: G ratio are markers of severe dengue infection. Hypoalbuminemia was noticed in a small number of dengue patients accounting 9 patients and A: G reversal was noticed in 7 patients. In contrast to our findings, Anusha Murthyunjaya Swamy et al have reported a higher percentage of hypoalbuminemia (17.5%). Hypoalbuminemia may be seen due to capillary leakage, A: G ratio reversal is caused as the albumin leaks out more easily than globulin due toits smaller molecular size in the initial stages of thedisease.

No mortality was noticed in our study similar to a study conducted by Khan et al. The overall fatality rate for dengue infection is low if treated properly and promptly, however, there may be high death rates due to DHF and DSS.

Conclusion

The primary public health issue currently is dengue as the incidences increase year

to year. Telangana state experienced a 49% more precipitation compared to its typical rainfall pattern, the underlying cause of the state's sharp surge in dengue cases. Clinical examination revealed the efficiency of epidemiological monitoring in aiding to evaluate the level of the dengue infection. In our study, thrombocytopenia which is the predominant feature in DF was observed in 82% of the survey participants indicating the disease progression. Serial monitoring was performed to check the patient's condition and prevented bleeding complications. Analysis of liver enzymes plays a crucial role in determining the intensity of the disease. In our research, we observed a small number of patients with increased liver enzymes who are categorized as severe dengue. Prolonged hospital stay was associated with raised liver enzymes in additional to abnormalities found in hematological parameters. Detailed serotype data is crucial to develop proactive laboratory-based survey systems that can foresee an upcoming dengue outbreak.

Understanding the rapidly evolving epidemiology of dengue and its clinical manifestations will have a significant impact on the diagnosis and therapeutic approach to be employed for dengue control. Currently, there are no authorized dengue vaccinations in the market and the ongoing clinical trials are still in progress. Additionally, there is no precise medicine available and supportive care is the only form of treatment. Therefore, death and morbidity rates of dengue viral infection may be lowered by early laboratory diagnosis, and by serial monitoring of hematological and biochemical profiles. Accordingly, a lot more remains to be achieved for creating an impact. It is necessary to implement a dengue health education program about dengue disease to enhance community awareness of the disease and encourage participation in vector prevention strategies to reverse the trend of dengue epidemics.

■ Limitations of study

1. The drawback was the unavailability of RT-PCR which is used for viral study. With this test, we might have identified the various serotypes and degree of different dengue virus strains.
2. The study sample is small; it may be statistically less reliable than studies involving bigger populations.
3. The medical patients were chosen from a single center for a time period of only September to January, the study's outcomes might not accurately reflect the population as a whole, and inclusion criteria limited to hospitalize cases we could not extrapolate our findings to all dengue cases.
4. Liver biopsy is an essential diagnostic procedure for dengue hepatitis was not performed.

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Ethical Approval

The ethical committee approval has been accepted by the institution.

Conflict of Interest

The authors declare that there is no conflict of interest.

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