

## AN OBSERVATIONAL STUDY OF CARDIOVASCULAR MANIFESTATIONS IN DIFFERENT STAGES OF DENGUE

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### Abstract

**Background:** Dengue viruses are flavivirus, which include four serotypes 1, 2, 3 and 4. Clinical expression of dengue virus infection vary from asymptomatic infection to severe manifestations, including endothelial dysfunction with increased capillary permeability, bleeding, hypovolemic shock which can lead to cardiovascular collapse and organ impairment. **Objective:** To study the frequency and pattern of cardiovascular manifestations with different stages of dengue fever. **Material & Methods:** An observational cross-sectional study done on patients admitted in hospitals attached to Mysore Medical College and Research Institute, Mysore, a tertiary care Hospital. Patients with Dengue NS1 Ag or IgM positive are included in the study after meeting inclusion and exclusion criteria. **Results:** Study enrolled 100 patients with confirmed Dengue virus infection, who were admitted to the hospital between November 2017 and May 2019. Out of 100 patients, 27 patients had dengue with warning signs and 10 patients developed Severe Dengue. ECG abnormalities were seen 25 patients, in which sinus tachycardia was most common finding seen in 17 patients, followed by sinus bradycardia which was seen in 6 patients. One patient had myocarditis with complete heart block and one patient had 2nd degree type 1 sino-atrial block (Wenckebach). **Conclusion:** Cardiovascular manifestations were present in 25 patients. Sinus tachycardia was most common ECG finding seen in 17 patients, followed by sinus bradycardia which was seen in 6 patients. 9 patients with cardiac manifestation had dengue fever with warning signs. 5 patients with cardiac manifestation had severe dengue.

## INTRODUCTION

Dengue is one of the most important emerging viral diseases globally. Most symptomatic infections have a relatively benign course. However, few patients develop severe manifestations, including endothelial dysfunction with increased capillary permeability, bleeding, hypovolemic shock which can lead to cardiovascular collapse and organ impairment.<sup>[1,2]</sup> There is an increasing evidence that dengue can also cause myocardial impairment, arrhythmias and occasionally fulminant myocarditis. Currently dengue is one of the most important emerging infectious diseases in the world. The dengue virus (DENV), a member of the genus *Flavivirus* in the family *Flaviviridae*, is a single-stranded enveloped RNA virus, which has four distinct, but related, serotypes (DENV1–4).<sup>[3]</sup>

Dengue is transmitted by mosquitoes of the genus *Aedes*, and is reported in more than 100 countries, with a high incidence across South and Southeast Asia and increasing number of cases reported from Latin America.<sup>[2]</sup> Previously dengue was classified into dengue fever (DF) and dengue hemorrhagic fever (DHF) grades I – IV; DHF grades III and IV together comprised dengue shock syndrome (DSS). In 2009, the WHO revised the classification system owing to difficulties in applying the old system in clinical situations and several reports of severe cases that did not fit the criteria for DHF. Patients are now classified as having dengue with or without warning signs, or severe dengue.<sup>[2]</sup>

Age seems to influence the clinical picture of dengue, with shock occurring more frequently in children, and bleeding and organ impairment being more common in adults.<sup>[4]</sup>

An increase in capillary permeability which may result in hypovolemia and shock, is the well-known cardiovascular complication associated with dengue. Several other specific cardiac manifestations have been described, ranging from functional myocardial impairment and arrhythmias to rare fulminant myocarditis.<sup>[5,6]</sup> Myocarditis has been included in the definition of severe dengue adopted in the 2009 WHO revised classification,<sup>2</sup> but the actual incidence of myocarditis is not known due to the lack of screening in most countries where dengue fever is endemic.

In the last two decades, the role of myocardial impairment in the development of septic shock has become clear, apart from cardiovascular compromise caused by reduced preload and systemic vascular resistance.<sup>[7]</sup> Circulating myocardial depressant factors may possibly mediate myocardial impairment.<sup>[8]</sup>

However, the contribution of cardiac dysfunction to hemodynamic compromise in DSS needs to be adequately defined. Hence this study was conducted to study the frequency and pattern of cardiovascular manifestations with different stages of dengue fever.

## MATERIALS AND METHODS

The study will be conducted in patients with Dengue Fever admitted in Hospitals attached to Bangalore Medical College & Research Institution during the study period of November 2017-May 2019.

Methods of collection of data (including sampling procedure, if any)

**Study Design:** Cross sectional study.

**Study Period:** November 2017 to May 2019

**Place of Study:** Hospitals attached to Mysore Medical College and Research Institute, Mysore

**Inclusion Criteria**

Patients aged 18 years and above

Confirmed dengue fever cases with Dengue NS1 Ag / IgM positive or both Fulfilling WHO Criteria for Dengue fever

**Exclusion Criteria**

Patients on medications affecting the Heart rate / rhythm Patients with history of preexisting heart disease

Patients with electrolyte abnormalities affecting the heart rate/rhythm Patients with history of Thyroid Disorders

**Sample Size of Estimation**

The sample size in our study is 100, assuming the anticipated prevalence of cardiac manifestations in dengue to be around 50%, assuming an error 5% ( $Z_a = 1.96$ ) and b error 20% ( $Z_b = 0.842$ ) and a power of 80%, with a precision of 5%, according to the following formula.

$$n = \frac{(Z_a + Z_b)^2 + p q}{d^2}$$

n = sample size

p = prevalence q = 1 - p

d = precision.

All adult patients admitted in Mysore Medical College and Research Institute, Mysore who are diagnosed with Dengue Fever will be studied.

**Assessment Tool**

Proforma for written informed consent

Study proforma

WHO Criteria for diagnosing Dengue fever

## RESULTS

Total of 100 patients were selected who were either IgM or NS1 positive. In this study majority of patients are in the age group of 18-30 years 54%, followed by 31-45 years age group which is 25% with the mean age group of 35.22 years. Male patients are more than Female patients. Out of 100 patients 63 patients had Dengue fever without warning signs, 27 had dengue fever with warning signs and 10 patients had Severe dengue.

**Table1: Distribution of the Subjects Based on WHO Criteria**

	Frequency	Percent
Dengue Fever without warning signs	63	63.0
Dengue Fever with warning signs	27	27.0
Severe Dengue	10	10.0
Total	100	100.0

**Table 2: Mean Pulse Rate of the Subjects Based on WHO Criteria**

	N	Minimum	Maximum	Mean	S.D.
Dengue Fever without warning signs	63	50	120	82.63	17.174
Dengue Fever with warning signs	27	44	140	83.78	25.184
Severe Dengue	10	30	140	82.20	31.048

In this study, ECG was normal in 75 patients, Sinus tachycardia was present in 17 patients followed by sinus bradycardia in 6 patients. One patient had complete heart block and one patient had second degree sinoatrial exit block. ECG changes were statistically significant with severity of Dengue fever (p value-0.007).

**Table 3: Distribution of The Subjects Based On ECG**

	Frequency	Percent
Complete heart block	1	1.0
Normal	75	75.0

SeconddegreeSAexitblockType1(Wenckebach)	1	1.0
Sinus bradycardia	6	60
Sinus tachycardia	17	17.0
Total	100	100.0

In our study most common presentation was fever which was present in all patients followed by myalgia (28%), vomiting (21%), Bleeding manifestations (20%).

**Table 4: Mean PCV of The Subjects Based on WHO Criteria**

	N	Minimum	Maximum	Mean	S.D
Dengue Fever without warning signs	63	28	56	40.83	6.239
Dengue Fever with warning signs	27	19	55	39.00	8.687
Severe Dengue	10	35	47	40.50	3.923

**Table 5: Mean Total Count of the Subjects Based on WHO Criteria**

	N	Minimum	Maximum	Mean	S.D
Dengue Fever	6	175	3049	595	.326
	3	0	15100	2.63	.326
Dengue Fever with warning signs	2	170	3034	616	.042
	7	0	13930	6.30	.042
Severe Dengue	1	290	7844	110	.881
	0	0	24100	52.00	.881

**Table 6: Mean Platelet Count of the Subjects Based on WHO Criteria**

	N	Minimum	Maximum	Mean	S.D
Dengue Fever	63	6000	90000	45026.53	26380.728
Dengue Fever with warning signs	27	6000	90000	31879.17	22889.393
Severe Dengue	10	8000	67000	32188.89	19951.720

## DISCUSSION

In the present study mean age of subjects studied was 35.22±14.75 years. The majority were in 18-30 years (54%). Age of youngest individual was 18 years and eldest being 81-year old. Study by Goutam Dutta and Pratik Mitra in 2016-17: The mean age group was 32 years. The youngest patient was 13 years old and the oldest patient was 74 years old which is comparable to our study.<sup>[9]</sup> Study by S Sheetal and Elizabeth Jacob: The mean age of our study group was 45 years. The youngest patient was 13 years old and the oldest patient was 87 years old.<sup>[10]</sup>

Out of 100, 74% of the subjects were males and 26% were females. Farhad F. Vasanwala, et al. Inv.<sup>[8]</sup>(2); 2014 Feb study,<sup>[11]</sup> of the 120 subject studied 104 (84%) were males and 16 (16%) were females. Our study is comparable with this study.<sup>[6]</sup> Nguyen ThiHanh Tien, et al study. – of the 465 subjects studied 300 (65%) were male and 165 (35%) were females. This study is also comparable with our study.<sup>[12]</sup>

The most common symptom in our study was Fever which was the presenting symptom in all patients (100%) followed by myalgia (28%) and vomiting (21%). Bleeding manifestation was present in 20 patients. 27 patients had warning signs and 10 patients had Severe Dengue. Persistent vomiting was most common warning sign present in 21 patients followed by pain abdomen. In a study done by Mohit Arora, Rekha S Patil, myalgia was presenting symptom (97.5%) followed by Fever (92.5%). In a study done by S Sheetal and Elizabeth Jacob, warning sign was present in 58 patients and

persistent vomiting was most common warning sign which was present in 58 patients followed by pain abdomen seen in 42 patients.<sup>[10]</sup> In a study done by Thein, et al on 108 patients persistent vomiting was seen in 39% and was the most common warning sign which was comparable to our study.<sup>[13]</sup>

## CONCLUSION

27 patients had one or the other warning signs and 10 patients had Severe Dengue. Cardiovascular manifestations were present in 25 patients. Sinus tachycardia was most common ECG finding seen in 17 patients, followed by sinus bradycardia which was seen in 6 patients. 9 patients with cardiac manifestation had dengue fever with warning signs. 5 patients with cardiac manifestation had severe dengue. One patient had myocarditis LV systolic dysfunction with EF-40% with global hypokinesia with complete heart block with heart rate of 30bpm, Temporary pacemaker was inserted, and patient improved in one week. One patient had 2nd degree type 1 sinoatrial exit block (Wenckebach) which resolved spontaneously in one day after admission.

### Limitations

Study was done in single center. Sample size was small.

ECG was done only at the time of admission for all patients except those with ECG abnormalities. Other cardiac biomarkers like CKMB was not included.

Cardiac MRI is the gold standard for diagnosing myocarditis which was not done.

## REFERENCES

1. Sophie Yacoub, and Bridget Wills, et al. Predicting outcome from dengue. *BMC Medicine* 2014, 12:147 10.1186/s12916-014-0147-9.
2. Dengue: guidelines for diagnosis, treatment, prevention and control. Geneva: World Health Organization; 2009.
3. Kuhn RJ, Zhang W, Rossmann MG, Pletnev SV, Corver J, Lenches E, et al. Structure of dengue virus: implications for flavivirus organization, maturation, and fusion [Internet]. Cell. U.S. National Library of Medicine; 2002 [cited 2019 Nov 23]. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4152842/>
4. The TD, Thu TLT, Minh DN, Van NT, Tinh HT, Vinh CNV, et al. Clinical Features of Dengue in a Large Vietnamese Cohort: Intrinsically Lower Platelet Counts and Greater Risk for Bleeding in Adults than Children. *PLoS Neglected Tropical Diseases*. 2012;6(6).
5. Lee CH, Teo C. & Low AF. Fulminant dengue myocarditis masquerading as acute myocardial infarction. *Int. J. Cardiol.* 136, e69–e71 (2009).
6. Yacoub S, Griffiths A, Chau T, Simmons C, Wills B, Hien T, et al. Cardiac function and haemodynamics in Vietnamese patients with different dengue severity grades. *International Journal of Infectious Diseases*. 2012;16.
7. Pulido JN, Afessa B, Masaki M, Yuasa T, Gillespie S, Herasevich V, et al. Clinical Spectrum, Frequency, and Significance of Myocardial Dysfunction in Severe Sepsis and Septic Shock. *Mayo Clinic Proceedings*. 2012;87(7):620–8.
8. Merx M, Weber C. Sepsis and the Heart. *Circulation*. 2007;116(7):793–802.
9. Datta G, Mitra P. A study on cardiac manifestations of Dengue. *JAPI*. 2019 July; 14-16.
10. Sheetal S, Jacob E: A Study on the Cardiac Manifestations of Dengue. *JAPI*. 2017 May; 64:30-34.
11. Salgado D, Zabaleta TE, Hatch S, Vega MR. & Rodriguez J. Use of pentoxifylline in treatment of children with dengue hemorrhagic fever. *Pediatr. Infect. Dis. J.* 31, 771–773 (2012).
12. Virk HU, Inayat F, Rahman ZU. Complete Heart Block in Association with Dengue Hemorrhagic Fever. *Korean Circ J.* 2016;46(6):866–869. doi:10.4070/kcj.2016.46.6.866.
13. Tricou V. et al. A randomized controlled trial of chloroquine for the treatment of dengue in Vietnamese adults. *PLoS Negl. Trop. Dis.* 4, e785 (2010).