

To Study the Incidence of Bradycardia and ECG Manifestations in Dengue Infection

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Abstract: *Background and Objectives:* Dengue is one of the most important mosquito-borne illnesses worldwide [1]. It is caused by a flavivirus with four distinct serotypes (DENV1, DENV2, DENV3, and DENV4). All the four serotypes of dengue virus are found in our country. Case fatality rates in endemic countries like India are 2.5%. During epidemics of dengue, attack rates among susceptible are 40-90%. Early recognition and prompt treatment are vital if disease related morbidity and mortality are to be limited. Clinical features that can be used in the initial assessment of febrile patients are essential tools for clinicians, especially in limited resource settings. Awareness of bradycardia as a clinical finding, could help in the early recognition of dengue and potentially reduce complications and death. The present study was conducted to study the incidence of bradycardia and ECG rhythm changes in Dengue fever. *Materials and Methods:* It was a hospital based observational descriptive study. 149 eligible dengue fever cases were selected for the study. Appropriate investigations were done. *Results:* A total of 149 patients of Dengue fever were analyzed. The most common age group affected in our study was 20-39 years (53%). The clinical spectrum of cases included 22% cases of Dengue fever (DF), 72% cases of Dengue Hemorrhagic fever (DHF), 5% cases of Dengue Shock Syndrome (DSS). Clinical pulse rate distribution amongst cases showed 26% with bradycardia, 64% with relative bradycardia, and 8% with tachycardia. Electrocardiographic changes in our study showed 37% with sinus bradycardia, 48% with normal sinus rhythm, 1% with first degree heart block, and 14% with sinus tachycardia. *Conclusion:* Bradycardia was a predominant occurrence amongst total of 149 cases of Dengue fever analyzed. 90% of the cases had bradycardia. (64% had relative bradycardia and 26% bradycardia. Majority of the patients on ECG showed sinus bradycardia (37%) and normal sinus rhythm (48%). Hence, awareness of bradycardia as a clinical finding, can help in the early recognition of dengue and potentially reduce complications and death associated with dengue virus infection.

Keywords: Bradycardia, dengue fever

1. Background

Dengue is one of the most important mosquito-borne illnesses worldwide [1]. It is caused by a flavivirus with four distinct serotypes (DENV1, DENV2, DENV3, and DENV4). Current estimates project that 390 million infections occur annually, in over 100 countries, of which 96 million result in clinical disease with a case fatality rate of around 1% [2]. Infection with one of the serotypes is thought to result in lifelong serotype-specific immunity. Serious disease is thought to occur mainly, though not exclusively, as a result of a second infection by a different serotype [3]. The mechanisms that result in the development of the severe, life-threatening dengue shock syndrome remain an enigma. The primary pathophysiological phenomenon of the disease that occurs is acute vascular leakage, which lasts for 24–48 hours after its onset.

Despite being traditionally considered a disease of children, dengue is now known to affect individuals of any age, and results in significant economic impact. Dengue infection is difficult to control; no specific treatment or vaccine is available, and vector control is fraught with difficulties. There is no specific treatment for dengue [4].

The natural history of dengue infection usually follows a clear pattern. The majority of infections are asymptomatic and subclinical. Symptomatic disease follows an incubation period of four to seven days, and begins as an acute febrile illness with high temperature, malaise, retro-orbital headache, myalgia, backache, nausea, loss of appetite, and vomiting [5]. For management purposes, clinical illness is divided into three phases: the febrile phase, the critical phase, and the recovery phase. Around the third to seventh day of illness, the critical phase, which is associated with a

dropping platelet count, recovery of leukopenia, and defervescence, may begin. The critical phase is defined by the occurrence of features of plasma leakage: rising hematocrit, clinical or radiological evidence of third-space fluid leakage, and, in some cases, hypotension. A proportion of patients develop severe clinical shock, of which a minority proceed to develop relentless severe intractable shock, coagulopathy with bleeding, and multi-organ failure, which can culminate in death [6].

From being a sporadic illness, epidemics of dengue have become a common occurrence worldwide. Dengue fever and dengue hemorrhagic fever is endemic in certain areas of South East Asia like Bangladesh, India, Indonesia, Maldives, Myanmar, Sri Lanka and Thailand. Dengue is a major cause of hospitalization and death, especially among children in these regions.

India is endemic for DF and DHF. All the four serotypes are found in the country. Case fatality rates in endemic countries are 2.5%. During epidemics of dengue, attack rates among susceptible are 40-90%. Early recognition and prompt treatment are vital if disease related morbidity and mortality are to be limited.[7]

The incidence of dengue and global distribution of dengue have greatly increased in recent years. An increased disease burden has been linked to the resurgence of mosquito vector *Aedes aegypti*, overcrowding, urbanization and increasing travel. Despite its significant health and economic impacts, as of yet there is no specific treatment or therapy for dengue infection and the outcome depends on medical care provided by the doctor to the patient.

Aims & Objectives

To study the incidence of bradycardia and ECG rhythm changes in Dengue Infection.

2. Materials & Methods

This study was conducted in the RajaRajeshwari Medical College & Hospital, Mysore road, Bengaluru. It was a hospital based observational descriptive study and was carried out from April 2017 to September 2017. 149 successive dengue fever cases fulfilling inclusion criteria were included after beginning of the study.

Inclusion Criteria:

- a) All patients coming with history of fever with one or more of the following symptoms (1) vomiting, (2) joint pain, (3) diarrhea, (4) abdominal pain, (5) headache, amongst others.
- b) Both primary dengue (NS-1 antigen or IgM or both positive) and secondary (NS-1 antigen or IgM and IgG antibody positive) dengue cases were included.

Exclusion Criteria:

- a) All patients with fever who are Dengue IgM/NS1 Ag negative.
- b) Patients who had any known cardiac disease, chronic kidney disease, diabetes mellitus, hypertension were excluded.

The following parameters were recorded in all patients: Age, gender, Pulse/Heart rate, Blood Pressure, Respiratory rate, Temperature, JVP, Icterus, Hepatosplenomegaly, Heart sounds, Breath sounds, Petechial rash.

All patients underwent the following investigations: ECG, Chest X-ray, USG Abdomen, Serial Platelet counts, Total counts, Blood urea, Serum Creatinine, 2D Echocardiography, Dengue IgM/NS1 testing. Blood samples of probable dengue patients were tested for NS1 antigen using ELISA technique from the kit supplied by TMB – J MITRA & Co. Pvt., Dengue IgM antibody MAC ELISA kit supplied by TMB – J MITRA & Co. Pvt. IgG ELISA by rapid test kit supplied by TMB – J MITRA & Co. Pvt.

3. Results

Age Wise Distribution of Cases

Table 1

Age (Yrs)	No. of Cases	Percentage %
<20	39	26.17
21-29	45	30.21
30-39	34	22.82
40-49	12	08.05
50-59	12	08.05
>59	07	04.70

Gender Wise Distribution of Cases

Table 2

Gender	No. of Cases	Percentage %
Male	78	52.34
Female	71	47.66

Geographical Distribution of Cases

Table 3

Address	Cases	Percentage%
Ramnagar	68	46
Channpatna	38	26
Bidadi	21	14
Kumbalgowdu	11	8
Kambipur	07	4
Kangeri	04	2

Analysis of Various Symptoms

Table 4

Symptoms	Cases	Percentage%
Fever	148	99.3
Vomiting	63	42.28
Headache	27	18.12
Abdominal pain	27	18.12
Bodyache	19	12.75
Joint pain	17	11.40
Malaise	15	10.06
Diarrhoea	12	8.05
Rashes	03	2.01
Chest pain	02	1.34
Dyspnea	00	00

Pulse Rate Distribution among Cases

Table 5

Pulse rate	Cases	Percentage %
<40	02	1.34
41-60	39	26.17
61-100	96	64.42
>100	12	8.05

Distribution of Platelet Counts among Cases

Table 6

Platelet count	Cases	Percentage %
<50000/ μ L	48	32.23
50000-100000/ μ L	53	35.57
100000-150000/ μ L	17	11.40
>150000/ μ L	31	20.80

Clinical Spectrum of Cases

Table 7

Clinical Spectrum	Cases	Percentage%
Dengue Fever	33	22.16
DHF	108	72.48
DSS	08	05.36

Electrocardiographic Changes among Cases

Table 8

ECG	Cases	Percentage %
Sinus Rhythm	72	48.32
Sinus Bradycardia	55	36.91
Sinus Tachycardia	21	14.10
First Degree Heart Block	01	0.67

4. Discussion

Dengue virus infection was first reported in India from Chennai in 1780. Today dengue virus and all its clinical forms are documented in almost all parts of India. Dengue epidemics have been affecting the tropics and our country has also seen a major outbreak over last couple of years. Over the time, involvement of various organs has been observed. In the present study, a total of 149 patients of Dengue fever were analyzed. The most common age group affected in our study was 20-39 years (53%).

Table 9

S.No.	Author	Year	Place	Age (yrs)
1.	Baruah J	2002	Manipal	5-20
2.	Dash PK et al	2003	Gwalior	<15
3.	Neeraja M	2004	Hyderabad	20-39
4.	Present study	2017	RRMCH, Mysore road	20-39

This is comparable to the study done by Neeraja et al in 2004, in Hyderabad.[8]

Table 11

SI No.	Study	Fever %	Vomiting %	Headache %	Bodyache %	Malaise %	Hepatosplenomegaly %	Splenomegaly %	Pleural effusion %	Ascites %	Rashes %
1.	Dash Pk et .al2003	100	-	86	50	70	-	-	-	-	56
2.	Neeraja et.al 2003	100	-	74	-	53	80	-	-	-	41
3.	Gupta et al2008	92	-	-	-	-	-	-	-	-	82
4.	Present study	99	42	18	12	10	10	10	4	2	2

The clinical spectrum of cases in our study included 22% cases of Dengue fever (DF), 72% cases of Dengue Hemorrhagic fever (DHF), 6% cases of Dengue Shock Syndrome (DSS).

Table 12

SI No.	Study	Year	Clinical Spectrum
1.	Neeraja M et.al	2004	DF 85%,DHF 5%, DSS10%
2.	Gupta et.al	2008	DHF 72%, DSS28%
3.	Present study	2017	DF 22%,DHF 72%,DSS 6%

In our study Clinical pulse rate distribution amongst cases showed 26% with bradycardia, 64% with relative bradycardia, and 8% with tachycardia. This is comparable to study done by Gupta et al in 2008 9; 18% with bradycardia, 64% with relative bradycardia, 18% with tachycardia. In our study, 78% cases had thrombocytopenia, 22% had normal platelet counts.

Electrocardiographic changes in our study showed 37% with sinus bradycardia, 48% with normal sinus rhythm, 1% with first degree heart block, and 14% with sinus tachycardia. In the study done by Gupta et al in 2008, 11% had sinus tachycardia, 77% had normal sinus rhythm, and 12% had sinus tachycardia. However, in the study done by Gupta et al, only 28 patients were studied retrospectively, but our study was an observational study involving 100 patients.[9]

The mean age in the present study is 30.45 years. This is comparable to the study done by Gupta et al (30.15 years) in 2008, in New Delhi.[9] In our study, the incidence among males and females is almost equal. This is comparable to the study done by Dash P K et al in 2003, in Gwalior.[10]

Table 10

S.No.	Author	Year	Place	M:F Ratio
1.	Dash PK et al	2003	Gwalior	1.28:1
2.	Neeraja M	2004	Hyderabad	2:1
3.	Gupta et al	2008	New Delhi	1.8:1
4.	Present study	2017	RRMCH, Mysore road	1.09:1

Amongst the cases in our study, 46% cases were from Ramnagara, 26% cases were from Channpatna, 14% cases from Bidadi, 8% cases from Kumbalgowdu, 4% from Kambipura & 2% case from Kangeri. The various clinical features in our study included fever (99%), vomiting(42%), headache (18%), abdominal pain (18%), bodyache(12%), joint pain (11%), malaise (10%), diarrhea(8%), rashes(2%); hepatomegaly (10%), splenomegaly (10%), pleural effusion (4%), ascites (2%); chest pain (1.34%), breathlessness was not seen among any of the patients.

5. Conclusion

Bradycardia was a predominant ECG abnormality amongst total of 149 cases of Dengue fever analyzed. 90% of the cases had bradycardia. (64% had relative bradycardia and 26% bradycardia. Majority of the patients on ECG showed sinus bradycardia (37%) and normal sinus rhythm (48%). Hence, awareness of bradycardia as a clinical finding, can help in the early recognition of dengue and potentially reduce complications and death associated with dengue virus infection.

References

- [1] Raheel U, Faheem M, Riaz MN, Kanwal N, Javed F, Zaidi N, Qadri I (2011) Dengue fever in the Indian Subcontinent: an overview. *J Infect Dev Ctries* 5: 239-247. doi:10.3855/jidc.1017.
- [2] Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL, Drake JM, Brownstein JS, Hoen AG, Sankoh O, Myers MF, George DB, Jaenisch T, Wint GR, Simmons CP, Scott TW, Farrar JJ, Hay SI (2013) The global distribution and burden of dengue. *Nature* 496: 504-507.
- [3] Halstead SB (1988) Pathogenesis of dengue: challenges to molecular biology. *Science* 239: 476-481.
- [4] Rajapakse S, Rodrigo C, Rajapakse A (2012) Treatment of dengue fever. *Infect Drug Resist* 5: 103-112.

- [5] World Health Organization (2009) Dengue: Guidelines for Diagnosis, Treatment, Prevention & Control. Available: http://whqlibdoc.who.int/publications/2009/9789241547871_eng.pdf. Accessed 20 December 2014.
- [6] Sam SS, Omar SF, Teoh BT, Abd-Jamil J, AbuBakar S (2013) Review of Dengue hemorrhagic fever fatal cases seen among adults: a retrospective study. *PLoS Negl Trop Dis* 7: e2194.
- [7] Malavige GN, Fernando S, Fernando DJ, Seneviratne SL. Dengue viral infections. *Postgrad Med J* 2004; 80: 588-601.
- [8] Neeraja M, Lakshmi V, Teja VD, Umabala P and Subbalakshmi MV. Serodiagnosis of dengue virus infection in patients presenting to a tertiary care hospital. *Indian J Med Microbiol* 2006; 24: 280-2.
- [9] Vishal Kumar Gupta, AK Gadpayle. Subclinical Cardiac Involvement in Dengue Hemorrhagic Fever. *JACM* 2010; 11(2): 107-11.
- [10] Dash PK, Saxena P, Abhavankar A, Bhargava R and Jana AM. Emergence of dengue virus type 3 in Northern India. *Southeast Asian J Trop Med Public Health* 2005; 36: 370-7.