

A Study of Serum Electrolyte and Troponin T Levels in Children With Dengue Fever

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Abstract

Context: Kalaburgi is an endemic area of dengue virus infection. **Aims:** To study levels and to establish correlation between severity of DVI with serum electrolyte and troponin T. **Design:** Hospital based prospective study. **Methods and materials:** Children between 1 month to 18 years with ELISA IgM positive dengue cases. **Statistical analysis used:** Data was entered in Microsoft excel sheet and SPSS 20.0 software was used for analysis. **Results:** Mean age group was 1-5 years (31.9%). 55.55% were male and 44.44% were female. 30 (41.7%) were DF, 14 (19.4%) were DHF and 28 (38.9%) were among DSS group. Fever was the most consistent complaint. Ascites (26.4%), pleural effusion (25%) and cold peripheries (25%) were most common signs. Mean serum sodium was 134.8mEq/L. Mean serum potassium was 3.73mEq/L. Elevated cTnT levels were present in 27.7% cases. Mortality rate was 17.8%. **Conclusion:** Mild hyponatremia and hypokalemia were common electrolyte disturbances. There was statistically very significant difference in mean serum sodium and serum potassium levels between DF and DSS (p value < 0.001), with decreasing serum sodium levels there was an increasingly associated complications. Level of cTnT was highest among DSS followed by DHF and it was within the normal limits among DF cases. There were highest number of mortality among DSS group followed by DHF group and no mortality among DF group.

Keywords: cTnT; DF; DHF and DSS.

Introduction

The relationship of dengue with India has been long and intense. The first recorded epidemic of clinically dengue like illness occurred in Madras (Chennai) in 1780 and the dengue virus was isolated for the 1st time almost simultaneously in Japan and Calcutta in 1943-44. Dengue being the most frequent arboviral infection with more than 100 million infection throughout the world annually involving 2,50,000-5,00,000 cases of DHF and 24,000

deaths. It is geographically a fast-spreading disease (WHO 2012) with a diverse clinical spectrum.³

The presentation of dengue infection ranges from non-specific febrile illness to DHF or DSS. Many of the studies conducted earlier states that significant electrolyte derangement occurs commonly in dengue patients presenting mainly with 3rd space loss and peripheral circulatory shock. The virus can infect many cell types and cause diverse clinical and pathological effects with cardiac involvement being documented as early as 1973 which was referred as

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“arboviral heart disease”.¹ Cardiac manifestation in dengue fever presents most commonly as myocarditis which is reflected by elevated levels of troponin-T which is more specific and sensitive test for myocardium abnormalities as troponin-T is a regulator protein that acts in myocardial contraction^{2,3}.

Kalaburagi is declared as an endemic area of dengue virus. Hence, here I intend to make an attempt to do a study on Serum Electrolyte and Troponin T levels in IgM ELISA positive dengue cases admitted in 2 hospitals attached to M.R.Medical College, Kalaburagi during October 2017–April 2019.

Aims and Objectives

1. To study serum electrolyte and troponin T levels in DVI.
2. To establish correlation between severity of DVI with serum electrolyte and troponin T levels.

Materials and Methods

All cases of ELISA IgM positive dengue fever admitted in pediatric department during October 2017 to March 2019 were considered for the study and were classified according to WHO criteria⁴ as follows,

Dengue Fever (DF): dengue seropositive without bleed.

Dengue Hemorrhagic Fever (DHF): dengue seropositive with bleeds with evidence of plasma leakage.

Dengue Shock Syndrome (DSS): DHF with evidence of peripheral circulatory failure.

Inclusion Criteria: IgM ELISA positive alone or both IgM and IgG positive dengue fever cases.

Exclusion Criteria: IgM negative Dengue like illness cases

Statistical Method

Data was analyzed by using SPSS 20.0 software.

For the qualitative data analysis we used chi square and Mann-Whitney Test.

Quantitative data analysis was done by percentages and epidemiological values.

Variables used in the study were as defined:

AGE: In months from date of birth.

SEX: Male or Female

HYPONATREMIA- Serum sodium level less than 135mEq/L

- MILD HYPONATREMIA- between 130-135mEq/L;
- MODERATE HYPONATREMIA- between 125-130mEq/L;
- SEVERE HYPONATREMIA- less than 125mEq/L
- HYPOKALEMIA- Serum potassium level less than 3.50 mEq/L.
- MILD HYPOKALEMIA-between 3.00 to 3.50 mEq/L;
- MODERATE HYPOKALEMIA- between 2.50 to 3.0 mEq/L;
- SEVERE HYPOKALEMIA- less than 2.50 mEq/l

RESULTS

In the present study a total of 72 IgM ELISA positive cases were studied.

Discussion

In the present study, the mean age of male child was 5.24+/- 4.66 and female child was 6.89+/- 4.30. Current study observes that, maximum number of patients 23 (31.9%) were belonging to the age group of 1-5 years, followed by 22 (30.6%) and 14 (19.4%) were belonging to the age group of 6-11 years and less than 1 year respectively. In the present study, out of 72 sero positive cases admitted during

Table 1: Clinical Classification of Cases. [N=72].

Classification of Dengue	Number Of Patients	Percentage
Dengue Fever (DF)	30	41.7
Dengue Hemorrhagic Fever (DHF)	14	19.4
Dengue Shock Syndrome (DSS)	28	38.9
Total	72	100.0

In the present study of 72 cases- 41.7% cases belongs to DF, 19.4% cases belongs to DHF and 38.9% cases belongs to DSS group.

Table 2: Serum Sodium Level in Dengue Patients.

Serum Sodium Levels	Number Of Patients	Percentage
Normal (135-145)	39	54.2
Mild (130-135)	23	31.9
Moderate (125-130)	9	12.5
Severe (<125)	1	1.4
Total	72	100.0
Mean \pm SD	134.86 \pm 4.20	

Table 3: Comparison of Serum Sodium among DF, DHF AND DSS.

Severity of dengue	No. of cases	Serum Sodium	Unpaired t-test & P-value, Significance
		Mean \pm SD	
Dengue Fever (DF)	30	138.27 \pm 2.58	Comparison bet. DF & DHF t = 4.169, P= 0.000, VHS
Dengue Hemorrhagic Fever (DHF)	14	134.41 \pm 3.21	Comparison bet. DF & DSS t = 9.22, P= 0.000, VHS
Dengue Shock Syndrome (DSS)	28	131.43 \pm 2.96	Comparison bet. DHF & DSS t = 2.562, P= 0.012, S
ANOVA test value	--	F = 39.77	----
P-value& significance		P = 0.000, VHS	

Table 4: Serum Potassium Level In Dengue Patients.

Serum Sodium Levels	Number Of Patients	Percentage
Normal (3.5–5.0)	37	51.4
Mild (3.0–3.5)	25	34.7
Moderate (2.5–3.0)	3	4.2
Severe (<2.5)	7	9.7
Total	72	100.0
Mean \pm SD	3.739 \pm 0.757	

Table 5: Comparison of Serum Potassium among DF, DHF and DSS.

Severity of dengue	No. of cases	Serum potassium	Unpaired t-test & P-value, Significance
		Mean \pm SD	
Dengue Fever (DF)	30	4.08 \pm 0.33	Comparison bet. DF & DHF t = 2.52, P= 0.016, S
Dengue Hemorrhagic Fever (DHF)	14	3.65 \pm 0.76	Comparison bet. DF & DSS t = 2.835, P= 0.006, HS
Dengue Shock Syndrome (DSS)	28	3.63 \pm 0.77	Comparison bet. DHF & DSS t = 0.547, P= 0.857, NS
ANOVA test value	--	F = 4.148	----
P-value& significance		P = 0.020, S	

Table 6: Comparison of Troponin T Among DF, DHF and DSS.

Severity of dengue	No. of cases	Troponin T	Unpaired t-test & P-value, Significance
		Mean \pm SD	
Dengue Fever (DF)	30	9.14 \pm 2.77	Comparison bet. DF & DHF t = 2.131, P= 0.039, S
Dengue Hemorrhagic Fever (DHF)	14	17.70 \pm 19.25	Comparison bet. DF & DSS t = 3.932, P= 0.000, VHS
Dengue Shock Syndrome (DSS)	28	26.02 \pm 22.51	Comparison bet. DHF & DSS t = 1.228, P= 0.227, NS
ANOVA test value	--	F = 7.038	----
P-value& significance		P = 0.007, HS	

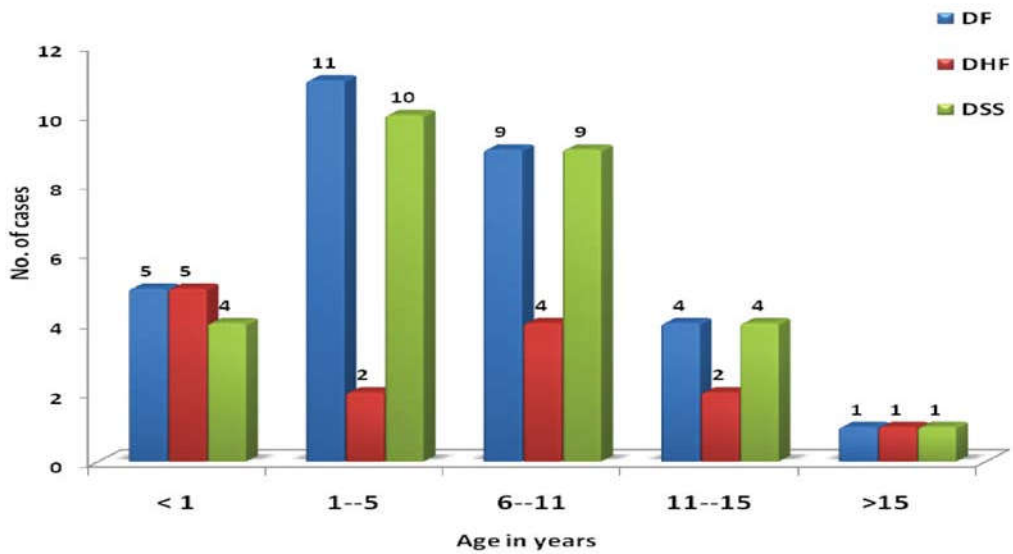


Fig. 1: Multiple bar diagram represents comparison of age with DF, DHF and DSS.

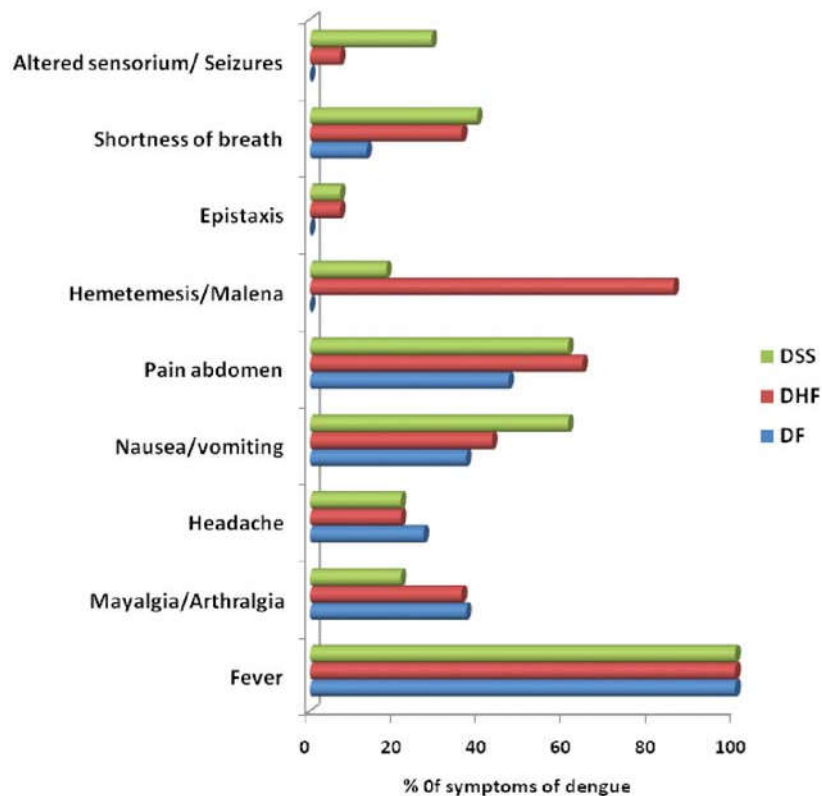


Fig. 2: Multiple bar diagram representing comparison of symptoms among DF, DHF and DSS.

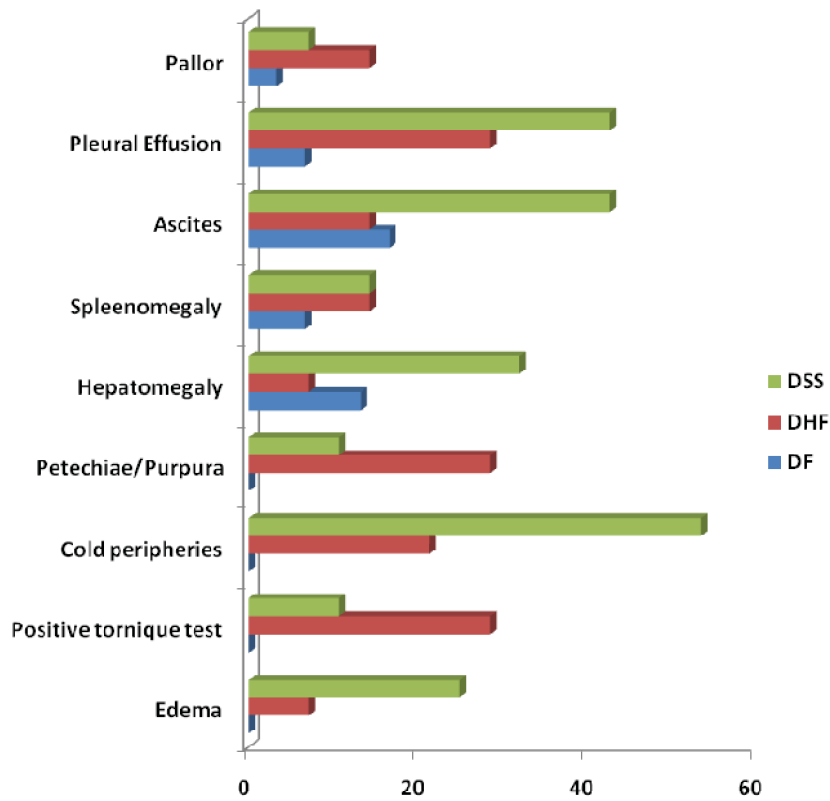


Fig. 3: Multiple bar diagram representing comparison of signs among DF, DHF and DSS.

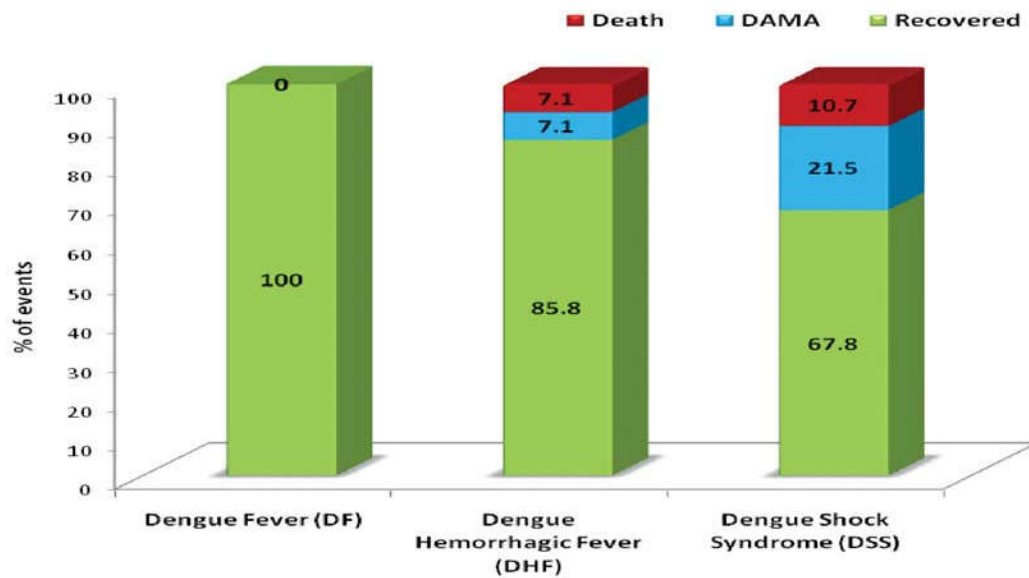


Fig. 4: Sub divided bar diagram representing patient's treatment outcome.

study period 30 belongs to DF group with hospital incidence of 41.7%. Of those 72 cases, 12 children had some evidence of hemorrhagic tendencies hence hospital incidence of DHF was 19.4% and 28 children had signs of 3rd space loss and shock and hence hospital incidence of DSS was 38.9%.

Fever (100%), pain abdomen (55.6%), nausea/vomiting (47.2%), myalgia/arthralgia (30.5) and headache (23.6%) were most common symptoms. Ascites (26.4%), pleural effusion (25%), cold peripheries (25%) and hepatomegaly (19.4%) were most common signs. Bleeding manifestations in the form of hematemesis and malena were present in 23.6%. Petechiae/purpura and positive tourniquet test were more common in children with DHF compared to DF.

In our study out of 72 seropositive dengue cases 39 cases had Sr sodium level within normal limit, 23 cases had mild hyponatremia, 9 cases had moderate hyponatremia and 1 case had severe hyponatremia. The mean Sr Sodium in present study was 134.86mEq/L, which is consistent with other studies.

Vinay et al. ⁸	3.62mEq/L
Rathod N et al. ⁹	4.1mEq/L
Arun Gogna et al. ¹⁰	4.0mEq/L

There was statistically very highly significant difference in mean serum sodium level between DSS and DF (P=0.000) also, the mean serum sodium level was significantly low in DSS as compared to DHF (P=0.012). From the observation made in present study it was evident that the mean serum sodium level was significantly low in shock patients when compared with non-shock patients with other complications and with decreasing serum sodium levels there was an increasing associated complication.

Out of 72 seropositive dengue cases, 37 cases had serum potassium level within normal limit, 25 cases had mild hypokalaemia, 3 cases had moderate hypokalaemia and 7 cases had severe hypokalaemia. The mean serum potassium in present study was 3.73mEq/L which is consistent with other studies.

Vinay et al. ⁸	3.62mEq/L
Rathod N et al. ⁹	4.1mEq/L
Arun Gogna et al. ¹⁰	4.0mEq/L

There was statistically significant difference in mean serum potassium level between DF and DHF (P<0.05), mean serum potassium level was significantly low in DHF as compared to DF. Also there was statistically very highly significant

difference in mean serum potassium level between DF and DSS (P<0.001), mean serum potassium level was significantly low in DSS as compared to DF but there was no statistical significant difference in mean serum potassium level between DHF and DSS.

The incidence of elevated cTnT levels in the present study was 27.77%. There was statistically significant difference in mean troponin T level between the DF and DHF (P<0.05), mean troponin T level was significantly high in DHF as compared to DF. Also there was statistically very highly significant difference in mean troponin T level between the DF and DSS (P<0.001), mean troponin T level was significantly high in DSS as compared to DF. Whereas, the level of Troponin T was slightly higher in DSS group than in DHF without shock group. But this difference is statistically insignificant. Similar results were also observed in Burhanuddin Iskandar et al.¹¹

Conclusion

Mild hyponatremia and hypokalemia were common electrolyte disturbance in patients with dengue virus infection. There was statistically very highly significant difference in mean serum sodium levels between DF and DSS (p value<0.001), with decreasing serum sodium levels there was an increasingly associated complications.

There was statistically very high significant difference in mean serum potassium levels between dengue fever and DSS (p value < 0.001). Mean serum potassium level was significantly low in DSS compared to DF cases.

27.77% of cases had elevated cTnT levels. Level of cTnT was highest in DSS followed by DHF and it is within normal limits among DF cases.

The present study found a highly significant association between risk of death and levels of circulating cTnT.

A focused history, detailed clinical examination and appropriate relevant investigations will aid for early diagnosis. The treatment of dengue is mainly supportive, but early institution and meticulous monitoring are the corner stone for positive outcome.

Early recognition, precise assessment and appropriate treatment have reduced the mortality.

Parental health education about the fever defervescence and early referral may prevent deaths due to dengue viral infection.

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