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Original Research Article

Dyselectrolemia in patients with dengue fever in tertiary care hospital

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ABSTRACT

Background: Dengue is a mosquito borne acute febrile illness caused by viruses belonging to group flaviviridea. Primarily this disease is transmitted by Aedes aegypti and Aedes albopictus. There are 4 serotypes of dengue virus i.e. DENV 1, 2, 3, and 4. According to World Health Organization (WHO) report in 2009, globally around 2.5 billion people live in dengue endemic areas and more than 50 million people are infected with dengue fever annually. Dyselectrolemia is very common among dengue patients. Many studies found that hyponatremia is common in Dengue, DHF and especially in dengue shock patients. The purpose of this study was to evaluate serum sodium as the predictor of prognosis in dengue fever.
Methods: Present study was longitudinal in nature conducted on 100 dengue patients. All patients fulfilling inclusion criteria and exclusion criteria were taken up for the study. Study was carried from August to October 2020. Serum electrolyte kit was used to analyze electrolytes.
Results: Majority (39%) of the dengue patients was in the age group of 18-35 years and most of them were male. Fever was the most common complaint, present in all (100%) the patients followed by myalgia (96%), headache (89%), retro-orbital pain (88%), rash (73%) and joint pain (71%). Hyponatremia was the chief electrolyte abnormality, present among 61% dengue patients and it was associated with poor prognosis.
Conclusions: We have found that hyponatremia was the chief electrolyte abnormality among dengue patients and prognosis was inversely related to hyponatremia.

Keywords: Dyselectrolemia, Hyponatremia, Dengue

INTRODUCTION

Dengue is a mosquito borne acute febrile illness caused by viruses belonging to group flaviviridea. As per the clinical case definition of CDC, dengue fever (DF) is mostly an acute febrile illness characterized by the presence of fever and two or more of the following; headache, retro-orbital or ocular pain, rash, arthralgia, leukopenia, myalgia, or hemorrhagic manifestations (example- positive tourniquet test, ecchymosis petechiae; purpura; epistaxis; gum bleeding; blood in vomitus, urine, or stool; or vaginal bleeding) but not meeting the case definition of dengue hemorrhagic fever. Anorexia, nausea, abdominal pain, and persistent vomiting may also occur but are not case-defining criteria for DF.

Primarily this disease is transmitted by Aedes aegypti and Aedes albopictus. There are 4 serotypes of dengue virus i.e. DENV 1, 2, 3, and 4. According to WHO report in 2009, globally around 2.5 billion people live in dengue endemic areas and more than 50 million people are infected with dengue fever annually.[1] Primary infection is often asymptomatic but may result in dengue fever (DF). However, secondary infection can lead to life-threatening dengue hemorrhagic fever (DHF)/dengue shock syndrome.[2] Dengue hemorrhagic fever (DHF) is more serious than dengue fever (DF) due to capillary leakage. Electrolyte disturbances are very common among dengue patients. Many studies found that hyponatremia is common in Dengue, DHF and especially in dengue shock syndrome patients.[3,4] The purpose of this study is to

evaluate serum sodium as the predictor of prognosis in dengue fever.

Objectives

To study the common dyselectrolemia like Na+ and k+ in patients with dengue fever. To correlate the prognosis of dengue fever patients with hyponatremia.

METHODS

The protocol of this longitudinal study was approved by the Institutional Ethical committee of the medical college. Written informed consent was taken from all study subjects before collection of data, and they were informed about complete right to withdraw from the study at any time without disadvantage. In case any participant who was not literate verbal consent was obtained after reading out the consent form to him and his verbal agreement was recorded by the interviewer in front of a witness.

All patients fulfilling inclusion criteria and exclusion criteria admitted in general medicine ward of Dr. PDMMC and tertiary care hospital were taken up for the study until fulfilling the required sample size. Study was carried out over a period of three months from August to October 2020.

Inclusion Criteria includes patients >18yrs of age and positive for dengue fever (NS1, IgM or IgG positive). Exclusion criteria were patients aged < 18 years, patients with previous cardiovascular pathology (Hypertension, CAD, IHD, RHD with valvular heart disease), patients with Chronic Kidney Disease, patients with altered sensorium, patients with dual infection (like Dengue and malaria, Dengue and typhoid fever, Dengue and leptospirosis etc) and patients with pre-existing renal and hepatic dysfunction.

Sample size was calculated with using OPENEPI software version 3.

$$n = [DEFF \times Np(1-p)] \div [(d^2 \div Z21-\alpha \div 2 \times (N-1) + p \times (1-p)]$$

Khandelwal Vinay G et al5 in their study of electrolyte disturbance among dengue patients found prevalence of hyponatremia was 59.91%. Considering this prevalence, with 95% confidence interval and absolute precision of 10%, sample size came out to be 93 but for convenience of calculations, we have decided to round up the figure to 100.

Operational definitions

Hyponatremia is defined as a serum Sodium< 135 mEq/L. Serum potassium concentration <3.50 mmol/L establishes the diagnosis of Hypokalemia. The potassium level of 2.50 to 3.0 mEq/L was moderate hypokalemia. Severe hypokalemia was present when its levels are <2.50 meq/L.[11]

Normal level of Hb for males is 12-15 (g/dl) and 11-13 (g/dl) for females.

Normal platelet count is 1.5 to 4.5 lacs/µl.

Normal WBC counts are 7000 to 11000/ µl.

Normal hematocrit is 40 to 45% for females and 50 to 55% for males.

Normal urine output, stabilization of hematocrit and return of normal pulse are labeled as signs of good prognosis.

Decreased urine output, high hematocrit value and feeble pulse are labeled as signs of poor prognosis.

Method of assessment

Pre-validated, pretested, semi structured questionnaire was used as data collection tool. Thorough systemic and general examination was done for clinical evaluation. Investigation like Dengue fever profile including serum electrolytes, CBC, KFT and blood pressure were carried out on dengue patients using standard protocol within 24 hour of admission. Serum electrolytes were measured by electrolyte kit method using semi auto analyzer.

Data was entered in Microsoft Excel and analyzed using SPSS Software and chi square and Mcnemar's test were used to tests of significance.

RESULTS

In the present prospective study there was no lost to follow up and we have analyzed 100 patients at the end, so the response rate was 100%. Majority i.e. 39% of the patients were in the younger age group of 18-35 years followed by 33% from the age group of 36-53 years and most (61%) of the patients were male. Majority (58%) of the patients were from urban area. (Table 1)

Table 1: Distribution of dengue patients according to baseline characteristics.

Baseline characteristic		Frequency (no.)	Percentage (%)
Age groups	18-35	39	39
	36-53	33	33
	≥54	28	28
Gender	Male	61	61
	Female	39	39
Address	Urban	58	58
	Rural	42	42
Prognosis	Good	34	34
	Poor	66	66

Fever was the most common complaint, present in all (100%) the patients followed by myalgia (96%), headache (89%), retro-orbital pain (88%), rash (73%) and joint pain (71%). Other less frequent complaints were anorexia, nausea, vomiting, hemorrhagic manifestations and abdominal pain (Figure 1).

Dengue profile of study participants have revealed that common finding of thrombocytopenia, leukopenia and increased hematocrit which may be because of plasma leakage and bleeding manifestations (Figure 2).

Table 2: Serum electrolytes levels among dengue patients.[6,7]

Serum electrolytes levels (Meq/L)	No. (%)	P value
Normal sodium level (>135)	39 (39)	0.002
Mild hyponatremia (130-134)	51 (51)	<0.001
Moderate hyponatremia (125-129)	08 (08)	
Severe hyponatremia (<125)	02 (02)	
Mean±SD (Na^+)	130.2±4.81 (meq/L)	-
Normal potassium level (>3.5)	53 (53)	0.40
Mild hypokalemia (3-3.5)	27 (27)	<0.001
Moderate hypokalemia (2.5-3)	14 (14)	
Severe hypokalemia (<2.5)	06 (06)	
Mean ± SD (K^+)	3.29±0.41 (meq/L)	-

Table 3: Association between hyponatremia and prognosis.

Hyponatremia	Prognosis		Total
	Good	Poor	
Present	02	59	61
Absent	32	07	39
Total	34	66	100

Mcnemar's $\chi 2$ = 7.43; p=0.006; odd's ratio= 0.542 (0.34-0.85).

In this study, hyponatremia and hypokalemia were the important electrolyte abnormalities we have found. 61% dengue patients were suffering from hyponatremia, out of which 51% suffering from mild, 8% from moderate and 2% from severe hyponatremia. There was significant difference between the patients having normal Na+ level and those having hyponatremia (p<0.05). Also, we have found significant difference in various grades of hyponatremia (p<0.05) Mean serum Na+ concentration among dengue patients was 130.2±4.81 (meq/l). 47% dengue patients were suffering from hypokalemia, out of which 27% suffering from mild, 14% from moderate and 6% from severe hypokalemia. Though we have found significant difference in various grades of hypokalemia, there was no significant difference between the patients having normal K+ level and those having hypokalemia (p>0.05) Mean serum K+ concentration among dengue patients was 3.29±0.41 (meq/l) (Table 2).[6,7]

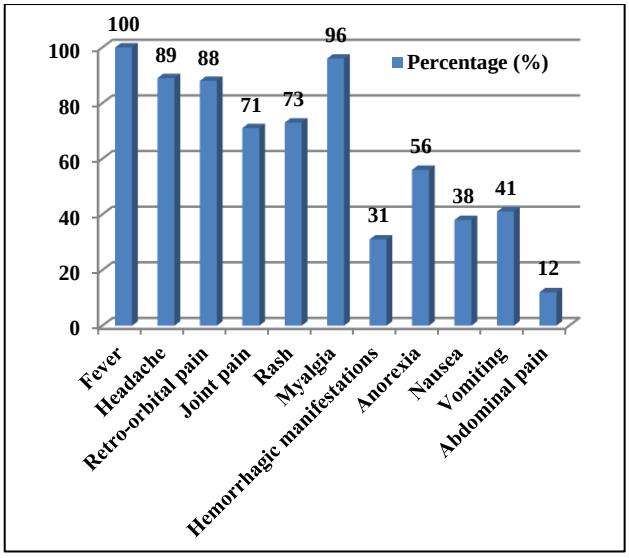

Figure 1: Presenting complaints of dengue patients.

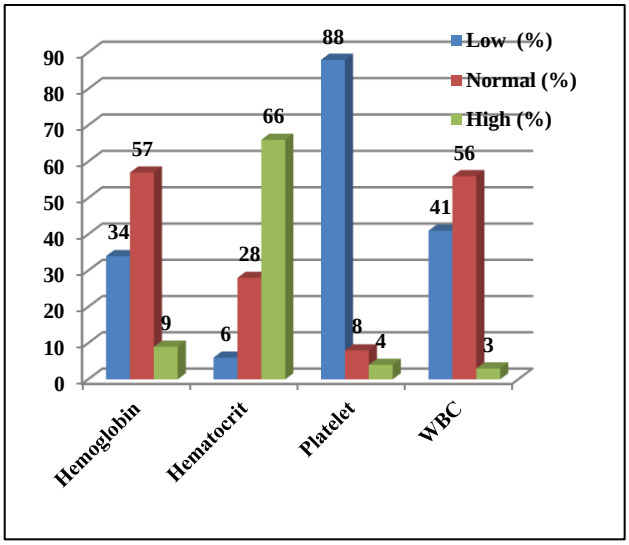

Figure 2: Dengue profile of study participants.

In our study, correlation of hyponatremia and prognosis has shown that presence of hyponatremia is associated with poor prognosis and absence of it, is associated with good prognosis. {Mcnemar's $\chi 2$= 7.43; p=0.006; odd's ratio= 0.542 (0.34-0.85)} (Table 3).

DISCUSSION

In the current prospective study on dengue patients, most were males in young productive age group and majority of them from urban area. Similar findings are reported by Bhagyamma et al who found that mean age of the dengue patients was 24.4±13.7 years and most of the patients were males (69.3%), Relwani et al noted majority patients were between the age group of 18-30 years and Vinay, et al who in their study had reported that most of the dengue patients were males and were in the age group of 18-25 years.[5,8,9]

Fever (100%), myalgia (96%), headache (89%), retro-orbital pain (88%), rash (73%) and joint pain (71%) were the major presenting complaints. Other less frequent complaints were anorexia, nausea, vomiting, hemorrhagic manifestations and abdominal pain. This finding is in line with the Vinay et al who had found that Fever was the most common clinical presentation in 195 patients (96.53%) followed by myalgia in 159 patients (78.71%), headache in 127 patients (62.87%) and skin rash in 87 patients (43.06%) and Relwani et al who has reported that fever in 98.66%, retro-orbital headache in 86.66%, lethargy in 76.66%, joint pains in 69% and vomiting in 56% patients.[5,9]

Dengue profile of study participants have revealed that common finding of thrombocytopenia, leukopenia and increased hematocrit which may be because of plasma leakage and bleeding manifestations. Similar finding was noted by Relwani et al who reported that thrombocytopenia in 83.33%, leukopenia in 36.66% patients but raised hematocrit noted among 1.33% patients only.[9]

In our study, among dengue patient's hyponatremia and hypokalemia were the important electrolyte abnormalities. 61% dengue patients were suffering from hyponatremia, amongst them 51% suffering from mild, 8% from moderate and 2% from severe hyponatremia. Mean serum Na+ concentration among dengue patients was 130.2±4.81 (meq/l). 47% dengue patients were suffering from hypokalemia, amongst them, 27% suffering from mild, 14% from moderate and 6% from severe hypokalemia. Mean serum K+ concentration among dengue patients was 3.29±0.41 (meq/l). In our study we have found significance for hyponatremia but did not find significance for hypokalemia. Findings are consistent with Deepa et al who in their study reported that the prevalence of hyponatremia among dengue fever patients was 61% and 72% among DHF cases, Bhagyamma et al who had reported that mean Na+ concentration was130.6±3.2 meq/L and mean serum K+ concentration among dengue patients was 3.17±0.3 meq/L, Shankar et al who reported hyponatremia among 48% dengue patients and hypokalemia among 40% patients and Vinay et al who reported the mean value of serum sodium was 133.92 mEq/L and of serum potassium was 3.62 mEq/L, 54.45% had mild hyponatremia, 40.09% patients were having serum sodium levels within normal limits, 2.47% patients had moderate hyponatremia and 2.97% patients had severe hyponatremia.[5,8,10,19] Contrast finding was noted by Sarfraz et al who in their study reported that though the hyponatremia was common finding among dengue fever and DHF patients, grades of hyponatremia were not associated with dengue fever or DHF.[11]

In the present study, correlation of hyponatremia and prognosis has shown that presence of hyponatremia is associated with poor prognosis with odd's ratio = 0.542 (0.34-0.85).

Limitations

We could not study whole range of electrolyte abnormalities among dengue patients due to constraint of time and resources.

CONCLUSION

Thrombocytopenia, leukopenia and increased hematocrit were the common laboratory abnormalities among dengue patients. Hyponatremia and hypokalemia were the common electrolyte abnormalities among dengue patients but the statistical significance is reached only for hyponatremia and hyponatremia is inversely related to the prognosis.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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