

Electrolyte Disturbances in Patients with Dengue Fever

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Abstract

Background: To determine the electrolyte disturbances in patients of dengue fever and dengue hemorrhagic fever.

Methods: In this cross sectional study 110 patients, with dengue fever, were included. Serum electrolytes levels were measured at fifth and sixth day of fever irrespective of stage of dengue infection (DF/DHF). Dengue was confirmed by NS1 or IgM/IgG positivity. DHF was labeled as per WHO criteria of Dengue Hemorrhagic fever. Dengue fever was confirmed in 110 patients by NS1 antigen and IgM/IgG positivity by ELISA. Serum sodium, potassium and chloride concentrations were measured by standard protocols.

Results: Average age of patients was 34.02 years with majority of males (63.6%). Seventy (63.6%) patients were diagnosed as case of dengue fever (DF) and 40 (34.4%) patients were diagnosed as case of dengue hemorrhagic fever (DHF). Out of total, 82 (74.5%) patients had NS1 positive, 54 (49.1%) patients had IgG positive and 33 (30%) patients had IgM positive. Although serum electrolytes were higher among patients with DHF as compared to DF but the association was insignificant.

Conclusion: Hyponatremia was the most common disturbance in patients with Dengue fever as well as in patients of dengue hemorrhagic fever. No significant association was found in electrolyte disturbances between patients of dengue fever and dengue hemorrhagic fever.

Key Words: Electrolyte disturbances, Dengue fever, Dengue haemorrhagic fever

Introduction

Dengue is a mosquito borne disease of significant morbidity and mortality. It is transmitted by *Aedes aegypti* and *Aedes albopictus*, it has 4 genotypes. DEN 1, 2, 3, and 4. Globally about 2.5 billion people live in dengue endemic areas, and according to WHO report in 2009, more than 50 million people are infected with dengue fever annually.^{1,2} Dengue has emerged as major health problem in Pakistan. Initial dengue cases were reported in 1985 but in past 6 years there has

been dramatic increase in the magnitude of the disease.³

Dengue Fever (DF) is characterized by high grade fever, with headache, myalgias, arthralgia, vomiting, retroorbital pain, along with pain abdomen and sometimes rash.^{4,20} Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) are severe forms of dengue infection, characterized by evidence of plasma leakage.⁴⁻⁶

Dengue viral infection has been shown to be associated with electrolyte abnormalities and renal dysfunction due to several proposed mechanisms, one among which is direct action of immune complexes on glomeruli leading to AKI and deranged electrolytes.⁷⁻⁹ Electrolyte abnormalities can predispose to seizures.¹⁰⁻¹⁴

Among electrolyte disturbances, few studies have suggested that decrease in serum sodium levels is most common electrolyte abnormality in DF and DHF.^{8,9,10} A study conducted on DF patients has reported that hyponatremia was found to be in 58% cases with DF and DHF.¹⁰

Low potassium levels has also been reported in few studies on DF.

The rationale of present study was to determine the type and prevalence of electrolyte disturbances in cases of DF and DHF, and to compare whether there is significant difference in electrolyte abnormalities in patients with DHF as compared to patients with DF.

Patients and Methods

This cross-sectional descriptive study was carried in Dengue ward Benazir Bhutto Hospital from 1st September to 31st October 2016. All patients admitted in dengue ward with age between 14 to 90 years, with confirmed dengue infection (either NS1, IgM or IgG positive) were included in this study. Patients who were dengue serology negative or case of any other febrile illness were excluded. Patients fulfilling the inclusion criteria were included in the study through convenience sampling after informed consent. Total 110 patients were included in study. Serum electrolytes levels were measured at fifth and sixth day of fever irrespective of stage of dengue infection

(DF/DHF). Dengue was confirmed by NS1 or IgM/IgG positivity. DHF was labeled as per WHO criteria of DHF. Serum sodium, potassium and chloride were estimated by Electrolyte Kit method by using semi-auto analyser. Hyponatremia was defined as a serum sodium <135 mEq. Hyponatremia was graded as Mild (serum sodium range of 130-135mEq/L), Moderate (120-129mEq/L) and severe (less than 120mEq/L).^{12,13,14} Hypokalemia is defined as a serum concentration of potassium <3.5 mEq/L. It can be classified as follows^[15]; mild - 3.1-3.5 mEq/L, moderate - 2.5-3.0 mEq/L and severe - <2.5 mEq/L. Normal range of chloride was 96-105 mEq/L. Descriptive statistics were used to describe the results. Chi-square test was used to compare the frequency of electrolyte disturbances between patients with DF and DHF. A p-value <0.05 was considered statistically significant.

Results

Average age of patients was 34.02 years (SE = 1.525) with majority of males (63.6%). Seventy (63.6%) patients were diagnosed as case of DF and 40 (34.4%) patients were diagnosed as case of DHF (Figure-1). Among DHF patients, six patients developed DSS. Out of total, 82 (74.5%) patients had NS1 positive, 54 (49.1%) patients had IgG positive and 33 (30%) patients had IgM positive.

Table-1: Association of hyponatremia, hypokalemia & chloride with Dengue Fever

Serum Electrolytes	Dengue Fever	Dengue Haemorrhagic Fever	p-value
Hyponatremia			
Yes	28 (40%)	18 (45%)	0.609 *
No	42 (60%)	22 (55%)	
Hypokalemia			
Yes	17 (24.3%)	8 (20%)	0.606 *
No	53 (75.7%)	32 (80%)	
Chloride Level (mEq/L)			
Abnormal	33 (47.1%)	12 (30%)	0.079 *
Normal	37 (52.9%)	28 (70%)	

*NS = Insignificant

Average serum sodium level was 134.64 mEq/l (SE = 0.421), average potassium level was 3.76 mEq/l (SE = 0.042) and average chloride level was 99.65 mEq/l (SE

= 0.551). Although serum electrolytes were higher among patients with DHF as compared to DF but the association was insignificant (Table 1). Similarly insignificant association of grades of hyponatremia and grades of hypokalemia with dengue fever was observed (Table-2).

Table-2: Association of grades of hyponatremia and hypokalemia with Dengue Fever

Serum Electrolytes	Dengue Fever	Dengue Hemorrhagic Fever	p-value
Grades of Hyponatremia			
Moderate	11 (15.7%)	8 (20%)	0.825 *
Mild	17 (24.3%)	10 (25%)	
Normal	42 (60%)	22 (55%)	
Grades of Hypokalemia			
Severe	0 (0%)	1 (2.5%)	0.082*
Moderate	1 (1.4%)	3 (7.5%)	
Mild	16 (22.9%)	4 (10%)	
Normal	53 (75.7%)	32 (80%)	

*NS = Insignificant

Discussion

Mild Hyponatremia (Na levels less than 135 mEq/L) was found to be present in significant number of patients with DF and DHF. The mean value of Na in the population studied was calculated to be 134 mEq/L . In previous studies mean value of sodium was 129.38meq/l ¹¹ Whereas in study done in 2005 by Mekmullicaet al., mean Na levels were found to be 132.⁹ It was 133 mEq/L in study done by Lumpaopong et al., in Thailand in 2010.⁸

The prevalence of Hyponatremia was 54.5 % in all patients of DF and DHF included in study, among which mild (Na levels 131-135 mEq/L) was present in 33.6% of patients, making mild hyponatremia a significant electrolyte abnormality. In previous studies on this topic , prevalence of hyponatremia was 58%¹¹ and 61 %.⁸ The prevalence of hyponatremia was 56 % in patients with DF and 55 % in patients with DHF, no significant difference is present in terms of hyponatremia in DF and DHF. Although it was more common in ages between 14-24 years of ages. All six patients of DSS in our study were observed to have moderate to severe hyponatremia (serum Na levels < 130 mEq/L).The reason of hyponatremia in dengue can be attributed to impaired renal excretion and

function, increased salt and water depletion and excessive water and fluid intake.^{23,24} Transient inappropriate antidiuretic hormone or the influx of sodium into the cells as a result of dysfunction of sodium potassium pump.^{11,17} This study did not evaluate whether hyponatremia corrects on its own or needs treatment.

Hypokalemia is expected in patients of DF secondary to decreased oral intake, and K loss due to renin angiotensin aldosterone system activation.^{18,25,26} Lumpaopong A, Kaewplang P, et al. reported hypokalemia in study conducted in dengue patients⁸. In our current study mean potassium levels were found to be 3.76 mEq/L. Mild hypokalemia was observed in 28.1% of population under study. Mean chloride levels were found to be 100.4 mEq/dL in present study.

Conclusion

Mild hyponatremia and abnormal chloride levels are most common electrolyte disturbance observed in Dengue Fever and Dengue Hemorrhagic fever.

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