Original Article

Study on Pattern of Electrolyte Changes in Dengue Syndrome Patients in a Tertiary Level Hospital

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Abstract

Background: *Dengue is an acute systemic viral disease that has established itself globally in both endemic and epidemic transmission cycles. The disease is spread by the bite of an* Aedes *mosquito. Electrolyte disturbances is a major complication in dengue infection. In present study serum sodium, potassium & chloride level was estimated to find the electrolyte abnormality in dengue patients.*

Material & Methods: *This prospective cross sectional study was done on 121 adult patients of "Shaheed Suhrawardy Medical College, Hospital" from August 2019 to April 2020 who were tested positive by NS1 or IgM for dengue.*

Result: *Mean age of dengue patients was 31.17 ± 11.8 yrs. Higher percentage (57.85%) of dengue patients were observed in young age group (i.e. 18-30 yrs.) than any other age group. Mean value of serum electrolytes was 139.34±3.76 meq/L, 4.48±.74 meq/L & 101.1±3.55 meq/L for sodium, potassium & chloride respectively. Mean value of all electrolytes are higher in dengue fever than dengue hemorrhagic fever though there was no significant statistical difference. Among all the dengue patients 10.7% had hyponatremia, 4.1% had hypernatremia and 85.1% had normal serum sodium. Regarding serum potassium status 9.92% had hypokalemia, 17.36% % had hyperkalemia and 72.72% had normal serum potassium.*

Conclusions: *Young male population aged 18-30 yrs is more prone to dengue infection. Common electrolyte disturbances in dengue infection are hyponatremia and hyperkalemia.*

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Key Words:
Dengue, Electrolyte disturbances, Hyponatremia, Hyperkalemia

Introduction:

Dengue infection is a systemic and dynamic disease. It has a wide clinical spectrum that includes both severe and non-severe clinical manifestations[1]. After the incubation period, the illness begins abruptly and is followed by the three phases — febrile, critical and recovery phase. The disease has a wide spectrum of clinical presentations, often with unpredictable clinical evolution and outcome. While most patients recover following a self-limiting non-severe clinical course, a small proportion progress to severe disease [2]. Dengue patients also present with different types of electrolyte disturbances-commonly hyponatremia and hypokalemia[3]. All these have made this disease a concern for the physicians as well as for the general people. The lifelong immunity developed after infection with one of the four virus types is type-specific, and progression to more serious disease is frequently, but not exclusively, associated with secondary infection by heterologous types[2].

The disease is spread by the bite of an *Aedes* mosquito which transmits the disease by biting an infected person and then biting someone else[3]. So, treating the patients along with control of vectors simultaneously is important in controlling the disease as well as reduce the economical burden of the country.

Dengue inflicts a significant health, economic and social burden on the populations of endemic areas. Cases are increasing every year and more complications lead to

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increased mortality. Along with other complications of dengue fever, electrolyte imbalance is a major complication which makes the patients complicated. For some patients, dengue is a life-threatening illness and substantial vector control efforts have not stopped its rapid emergence and global spread.

This study will help us to know the pattern of electrolyte imbalance associated with dengue fever and to correlate the abnormality with severity of disease in our country and thus help the clinicians in prompt diagnosis and management of complication and thereby decrease mortality caused by the disease.

Methodology:

This prospective cross sectional study was done on 121 patients suffering from dengue fever attending OPD or IPD of "Shaheed Suhrawardy Medical College, Hospital" from August 2019 to April 2020. The study protocol was approved by the Institutional Ethical Review Committee of Shaheed Suhrawardy Medical College & Hospital. Patients were selected by purposive sampling. Study population was selected from adults of 18 yrs. & above who were diagnosed as dengue fever & dengue hemorrhagic fever. Diagnosis was done by NS1 or IgM for dengue.

Patients having dual infection, pre-existing renal or hepatic dysfunction, in a steroid dose of >40mg/day for over 7 days, malignancy and pregnancy were excluded. After enrollment, purpose and procedure of the study was explained in details and informed written consent was taken from all study subjects. Other relevant data was collected from hospital records.

Serum samples were used for direct measurements of sodium & potassium using electrolyte kit method by ion selective electrode by auto analyzer.

Working Definitions: Hyponatremia- Serum sodium levels less than 135meq/L; Mild Hyponatremia- between 125-135 meq/L; Moderate Hyponatremia- between 120-125 meq/L; Severe Hyponatremia- less than 120 meq/L; Hypokalemia- Serum potassium levels less than 3.50 meq/L; Mild Hypokalemia- between 3.00 to 3.50meq/L; Moderate Hypokalemia: between 2.50 to 3.0 meq/L; Severe Hypokalemia- less than 2.50 meq/l and Hyperkalemia: Serum potassium level more than 5.0 meq/L[3].

Statistical analysis: The collected data was entered with the help of SPSS 15. Descriptive analysis (Frequency distribution) was done using tables and charts. Continuous data was expressed in terms of mean ± SD. Study population was categorized into two groups and result was expressed in percentage.

Result:

Among 121 patients 67(55.37%) were male & 54(44.63%) were female. Mean age of patients was 31.17 ± 11.8 yrs, ranging from 18-72 yrs. Mean age of female was higher than that of male. (33.3 vs 29.46 yrs.) Among the patients 116 were suffering from dengue fever & 5 were suffering from dengue hemorrhagic fever. It is observed that higher percentage (57.85%) of patients of dengue were observed in young age group (i.e. 18-30 yrs.) than any other age group (M vs F was 62.69% vs 51.85%). Age & sex distribution of the dengue patients is shown in table I

Mean value of electrolyte was 139.34±3.76 meq/L, 4.48±.74 meq/L & 101.1±3.55 meq/L for sodium, potassium & chloride respectively. Mean value of all electrolytes are higher in dengue fever than dengue hemorrhagic fever though there was no significant statistical difference. Mean value of the electrolytes in dengue fever & dengue hemorrhagic fever is shown in table II.

Among all the dengue patients 10.7% had hyponatremia, 4.1% had hypernatremia and 85.1% had normal serum sodium. Among the dengue fever 10.35% had hyponatremia, 4.31% had hypernatremia. While among the dengue hemorrhagic fever 20% had hyponatremia. Table III shows the distribution of patients according to the serum sodium status.

Among all 9.92% had hypokalemia, 17.36% % had hyperkalemia and 72.72% had normal serum potassium. Among the patients of dengue fever 8.62% had hypokalemia, 17.24% had hyperkalemia. While among the dengue hemorrhagic fever 40% had hypokalemia & 20% hyperkalemia. The difference was statistically not significant. Table IV shows distribution of patients according to the serum potassium status.

Table-I

Age & sex distribution of the patients

Age group (yrs.)	Male	%	Female	%	Total (N)	%
18-30	42	62.69	28	51.85	70	57.85
31-45	19	28.36	20	37.04	39	32.23
46-60	4	5.97	5	9.26	9	7.44
>60	2	2.98	1	1.85	3	2.48
Total	67	100	54	100	121	100

Table II

Pattern of serum electrolytes in dengue patients

Electrolytes	Dengue fever (Mean ±SD) N=116	Dengue hemorrhagic fever (Mean ±SD) N=05
Sodium (meq/L)	139.4±3.73	137.8±4.6
Potassium (meq/L)	4.49±.73	4.2±.86
Chloride (meq/L)	101.21±3.45	98.5±5.02

Table III

Distribution of patients according to the serum sodium status

Sodium status	Dengue fever	Dengue hemorrhagic fever	Total
Hyponatremia(125-135 meq/L)	12(10.35%)	1(20%)	13(10.7%)
Normonatremia (135-145 meq/L)	99(85.34%)	4(80%)	103(85.1%)
Hypernatremia(145-150 meq/L)	5(4.31%)	0(0%)	5(4.1%)
Total	116 (100%)	5 (100%)	121(100%)

Table IV

Distribution of patients according to the serum potassium status

Potassium status	Dengue fever	Dengue hemorrhagic fever	Total
Hypokalemia(2-3.5 meq/L)	10(8.62%)	2 (40%)	12(9.92%)
Normokalemia (3.5-5 meq/L)	86(74.14)	2(40%)	88(72.72%)
Hyperkalemia>5 meq/L)	20(17.24%)	1(20%)	21(17.36%)
Total	116 (100%)	5(100%)	121(100%)

Discussion:

In the present study demographic characteristics of the population shows that majority of the patients were male. (55.37% vs 44.63%)Most common age group to be affected in both sex was 18-30 yrs. Among the affected 62.69% of males & 57.85% of females fall in this age group. Mean age of patients was 31.17 ± 11.8 yrs, ranging from 18-72 yrs. Mean age of the affected female was higher than that of male. (33.3 vs 29.46 yrs.). Study conducted by Khandelwal Vinay G and others also showed that majority (67.32%) of the affected were males while 32.67% were female[3]. He also found that the age group mostly affected was in 18-25years age group with male 42.64% and and females 45.45%. Mean age of the female was lower than the male (35.61±12.93yrs vs 33.25 ±15.12yrs). Muhammad Sarfraz in 2018 had similar findings. He found that the male was more (63.6%) affected than female & mean age of the affected was 34.02 yrs.[4] Sandinti Deepa in 2019 also found that dengue commonly affects young population.[5]

In our study mean concentration of serum Na was found 139.34±3.76 meq/L. 85.12% of dengue patients had normal serum sodium, 10.74% had hypo- & 4.13% had hypernatremia. Patient with DHF had slightly lower concentration (139.4±3.73vs137.8±4.6) though the difference is not significant. 20% of DHF patients had hyponatremia in contrast to 10.35% in patients of dengue fever. Khandelwal Vinay G found lower mean value (133.92 meq/L).[3] Majority (59.82%) of their patients had hyponatremia while only 40.09% had normal serum sodium which is inconsistent with our study. Relwani PR in 2019 found that mean value of sodium was 136.01±5.10 in DF which is consistent with our study.[6] They also found that 45.33% of them had hyponatremia which is higher than our findings. Study conducted by Bhagyamma SN at 2015 revealed lower mean Na+ (130.7±3.4 meq/L)[7] which is inconsistent with our study. MR Rajalekshmy & M Vadivelan in 2017 found that mean serum sodium level of dengue patients was 135.92 ±5.53 mEq/l[8] which is

consistent with our study. They also found that almost two-third of the patients (64 %) had normal serum sodium level & 36 % had hyponatraemia which differs from our findings. Praveen Naik and others in 2019 found that mean sodium level in the dengue patients was 137.04±6.31meq/L.[9] They found 22% of the dengue patients had hyponatremia. Reddy AA in 2017 concluded that the lower the serum sodium levels the higher is the incidence of complications associated with dengue fever.[10] The reason for hyponatremia in dengue fever is uncertain. It might be the consequences of salt depletion, excess water from increased metabolism, decreased water excretion through kidney, transient inappropriate antidiuretic hormone or the influx of sodium into the cells as a result of dysfunction of sodium potassium pump.

In our study mean serum potassium was found 4.48±.74meq/L. Among all the patients 72.72% had normokalemia, 9.92% had hypokalemia and 17.36% % had hyperkalemia. Among the dengue fever 8.62% had hypokalemia, 17.24% had hyperkalemia. On the other hand Caroline Rose and others in 2014 found that mean serum K+ level in adult was 5.62±1.9mEq/L[11] which is significantly higher than the control group. MR Rajalekshmy & M Vadivelan found that mean serum potassium among the dengue patients was 3.84 ± 0.55 mEq/L, 66% of their study subjects had normal serum potassium, while hypokalaemia was found in 34%.[8] They did not find any case with hyperkalemia which is inconsistent with our study. Hypokalemia in dengue can be due to decreased oral intake of potassium and potassium loss due to decreased renin angiotensin aldosterone system activation.[7] In our study the patients having hyperkalemia may be explained by severe hemolysis, rhabdomyolysis and renal dysfunction in secondary dengue patients.[9]

Conclusion:

Young male population aged 18-30 yrs is more prone to dengue infection. In most of the patients electrolyte status is normal. Common electrolyte disturbances are hyponatremia and hyperkalemia. Patients are subjected to necessary lab investigations during management, so that early detection and management of any abnormalities can be addressed.

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