# Electrolyte disturbance in dengue infected patients: A hospital based study

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**Abstract:**

Dengue  infection  is one of the most common mosquito-borne infections caused by Flaviridae. Dengue hemorrhagic fever (DHF) is more serious than dengue fever (DF) due to capillary leakage. The World Health Organization has reported 2.5 billion people live in areas where dengue viruses can be transmitted (WHO, 2009). The  aim  of our study is  is to evaluate  electrolyte disturbances  in patients with Dengue infection .In this  study we include total of 88  clinically diagnosed  and serologically  confirmed  age  and sex matched Dengue  cases. Serum electrolytes [Sodium, Potassium & Chloride] were measured by electrolyte kit method by using  Semi- auto analyser. The  mean age of the study  group  was $24.4\pm13.7$ in which 70.4 % were adults and 29.5% were children .69.3%  of the patients  are males ,30.6% are females. The  amounts of Sodium ($p<0.0001$)., Potassium ($p<0.0001$)  and Chlorides ($p<0.0001$) were varied  significantly between  the control and the  patients  samples. The study revealed  mild  hyponatremia  and hypokalemia in Dengue confirmed  patients  and  it  was  analysed that mild hyponatremia  is a common  electrolyte disturbance and renal involvement is mild in patients  with  DF Patients.

**Key words:** electrolyte disturbance, hyponatremia, hypokalemia, dengue, renal involvement.

## Introduction:

Dengue  infection  is one of the most common  mosquito-borne  infections  caused  by Flaviridae. Dengue hemorrhagic fever (DHF) is more  serious  than  dengue  fever  (DF)  due to capillary  leakage [1]. The  World  Health  Organization  has  reported  2.5  billion  people live  in  areas  where  dengue virus  can  be  transmitted (WHO, 2009) [2]. Electrolyte disturbances and renal dysfunction have been reported in dengue infection .Hyponatremia  is common  in  DHF,  especially  in  shock  patients (Varavithya et al ,1973 )[3]. To date, there have been  few  studies  comparing electrolyte disturbances  and  renal  dysfunction between   patients  with  DF and  DHF(Futrakul et al,1973) [4].

Dengue infection is characterized by increase in  temperature,  headache,  nausea,  vomiting, abdominal pain, arthralgia,  and  myalgia, and also

develops rashes at times [5]. Decrease in sodium is a common problem in serum of dengue infected patients. In the present study serum Sodium, Potassium, and Chloride were estimated to asses the electrolyte disturbances which are responsible for the Complications in Dengue Fever.

Symptoms of dengue infection in humans include, a mild flu like illness, the conversational " break –bone " fever and dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS).Dengue fever advances to DHF and DSS generally after a second infection with a dissimilar serotype, which is notified as antibody-dependent enhancement (ADE) of infection , Capillary leakage in dengue hemorrhagic fever makes it more severe than dengue fever [6].

Electrolyte disturbances takes place in dengue infection .Sodium is an essential nutrient in humans; regulate blood volume, blood pressure, Osmotic equilibrium and PH. Hyponatremia is defined as a serum Sodium level < 130 mEq/l. Hyponatremia is frequent in DHF , especially in shock patients [7].

Dengue viral infection led to acute neuromuscular weakness due to hypokalemia . In dengue fever along with other infectious disorders, cause of hypokalemia is inadequate dietary intake and breakdown of tissues releases Potassium into the extra cellular Compartment [8].

## Material and Methods

The study was carried out by collecting samples from Govt. Medical college and General hospital, Anantapuramu, Andhra Pradesh. The study group included individuals from age group of 5 years to 55 years, who were diagnosed with Dengue fever or Dengue Hemorrhagic fever. A total 246 Dengue suspected samples were taken , and Out of 246 suspected samples 88 were found to have lgM antibodies against Dengue virus and remaining 158 were lgM negative.

Dengue specific lgM antibody was detected by NIV Dengue IgM Capture ELISA KIT (Version 2.4)[9] .Serum samples were used for further estimation of Sodium, Potassium, and Chloride. Sodium , potassium and Chloride were estimated by Electrolyte Kit method by using semi-auto analyser [10]. p Value was calculated by using Graph Pad Soft ware, Inc, California. A p- Value < 0.05 was considered statistically significant. 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].

## Result

A total number of 88 cases were confirmed to have dengue during the study period . The mean age of the study group was 24.4±13.7 in which 70.4 % were adults and 29.5% were children .69.3% of the patients are males 30.6% are females. Comparison of values of all age group in dengue confirmed group is given in Table-1. Comparison of Values of parameters in different study group is given in Table-2 .mean level of parameters in dengue confirmed Children and adults, males and females is given in table-3. There is no significant difference in the level of the parameters within different age group which gave a clear idea that the alteration in the levels of electrolytes in Viral infection and other febrile illness is not influenced by age.

**Table 1: Comparison of values of all age group in dengue confirmed group**

| S.No | Parameters | 5-14yrs(Mean) | 15-29yrs(Mean) | 30-44yrs(Mean) | 45-55yrs(Mean) |
|---|---|---|---|---|---|
| 1 | Sodium | 130.3±2.6 | 130.7±3.2 | 131.05±3.7 | 130.58±3.65 |
| 2 | Potassium | 2.9±0.3 | 3.1±0.3 | 3.18±0.32 | 3.14±0.3 |
| 3 | Chloride | 70.7±2.26 | 105.2±3.3 | 104.8±2.49 | 105.3±2.2 |

**Table 2: Comparison of Values of parameters in different study group**

| S.No | Parameters | Confirmed Dengue cases (Mean) | Control | P-Value | t-Value |
|------|------------|-------------------------------|---------|---------|---------|
| 1 | Sodium | 130.6±3.2 | 139.2 ± 2.3 | < 0.0001* | 21.9 |
| 2 | Potassium | 3.17±0.3 | 4.6 ± 0.5 | <0.0001 * | 23.0 |
| 3 | Chloride | 105.7±28 | 100.05 ±2.6 | <0.0001 * | 13.8 |

**\*Significant**

**Table 3: Mean level of parameters in dengue confirmed Children and adults, males and females**

| Parameters | Mean values of parameters | | | | | |
|------------|---------------|-------------|---------|------------|------------------|---------|
|  | Children(N=26) | Adult(N=62) | P-Value | Males(N=62) | Females (N=26) | P-Value |
| Sodium | 130.3±2.6 | 130.7±3.4 | 0.59# | 130.7±3.4 | 130.4±2.6 | 0.68(ns) |
| Potassium | 2.9±0.3 | 3.17±0.33 | 0.002 * | 3.08±0.3 | 3.07±0.28 | 0.8(ns) |
| Chloride | 107.1±2.26 | 105.1±2.9 | 0.002 * | 104.3±13.6 | 105.2±2.6 | 0.73(ns) |

**# = Not significant        * Significant**

## Discussion

Hyponatremia (serum sodium level < 130 meq/L) is commonly found in dengue patients which causes Convulsions [1] . In the present study the mean sodium level of the study population was measured. The mean sodium level of dengue confirmed patients in the present study was found to be 130.6meq/L. Similarly Mekmullica et al., (2005) found 132[12]. Lumpaoponget al.,(2010) also found that serum sodium level in dengue patients in Thailand was 133meq/L[7]. There was a significant decrease in the mean value of sodium in dengue confirmed patients when compared either to the control group.

Sodium is the important mineral in neuron function and Osmoregulation between cells and the extra cellular fluid .The distrubution of sodium ions are mediated in all animals by Na / K+ - ATP ase [13].

The reason for hyponatremia in classic dengue fever patients was uncertain .However , it might be the consequence of salt depletion , excess water from increased metabolism , decreased renal excretion , transient inappropriate antidiuretic hormone or the influx of sodium in the cells as a result of dysfunction of sodium potassium pump.

In general , dengue infection leads to mild hypokalemia due to poor intake and an increase in renal excretion due to activation of rennin-angiotensin and aldosterone system secondary to volume depletion . Mild hypokalemia (serum potassium less than 3.5 meq/L) in DF patients was reported by previous researcher [7]. However in the present study hypokalemia was observed Mean value of Potassium in dengue confirmed patients were 3.07 meq/L.

The pattern of Chloride levels in the serum of healthy controls and in serum of dengue fever patients were not same . Statistical analysis demonstrate that levels of Chloride in serum of dengue patients increased significantly (P= < 0.0001) as Compared to that of healthy individuals (Control group).

## Conclusion

Mild hyponatremia and hypokalemia is a common electrolyte disturbance and renal involvement is mild in patients with DF . Careful monitoring of electrolytes, acid –base status and renal function are necessary . Future studies should include more severe cases , evaluate other

electrolyte abnormalities such as Calcium, Magnesium and Phosphorous , to assess the renal tubular function and to evaluate the quantity of Proteinuria to asses renal function and the aetiology of the electrolyte disturbance.

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