

Original Research Article

Study of electrolytes in patients of Dengue in a tertiary care hospital in India

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ABSTRACT

Background: Dengue is a mosquito borne viral infection. It is the most common arboviral disease globally. In the year 2017, India had 1,53,635 cases of dengue with 226 deaths. Electrolyte disturbances reported in dengue infection are hyponatremia, hypokalaemia and hyperchloremia. Considering the serious nature of effects of dyselectrolytemias and high incidence of dengue in India, it is necessary to have a thorough understanding about electrolyte disturbances in Dengue, so as to predict, diagnose and treat them accordingly.

Methods: This study was performed in a tertiary care centre in Mumbai, India. The study was a prospective observational cross-sectional study. 150 Patients diagnosed with Dengue were enrolled for the study. Patients' demographic data, clinical history, examination findings and investigations including electrolyte values were recorded and analysed.

Results: A higher incidence of dengue was seen in young age group among admitted patients (74%). Hyponatremia (45.33%) and Hypokalaemia (10.60%) were more commonly observed than hypernatremia (3.33%) and hyperkalaemia (3.33%). Hypochloreaemia (6.66%) was seen slightly more than hyperchloreaemia (6.00%). Fever was Present in 98.66%, retro orbital headache in 86.66%, vomiting in 56.00%, joint pain in 69.00%, lethargy in 70.66%, breathlessness in 36.00%, bleeding in 8.66%, abdominal pain /tenderness in 18.00%. 85.00% had low platelet count, 30.66% had low hemoglobin and 36.66% had leucopenia. Haematocrit was found to be less in 27.33% and high in 1.33%.

Conclusions: From the above results we concluded that, there is a need to have a degree of suspicion about dyselectrolytemias while managing patients with Dengue. Also, patients need to be subjected to necessary lab investigations early during management so that if abnormalities are found, they can be promptly and appropriately managed as some of these abnormalities may lead to increased severity as well as mortality.

Keywords: Dengue, Electrolyte, Investigations in dengue, Severe dengue, Symptoms of dengue, Warning signs

INTRODUCTION

Dengue is an acute febrile disease of viral aetiology (Flaviviridae). It is a mosquito-borne infection. It is the most common cause of arboviral disease globally. About 1.8 billion (more than 70%) of the population at the risk for dengue (2.5 billion) worldwide live in member states of the WHO South-East Asia region and Western Pacific

region, which bear nearly 75% of the current global disease burden due to dengue.¹

The disease burden of dengue in India in the year 2017 as follows:

- Number of cases reported - 188401
- Number of deaths - 325.²

Dengue infection is characterized by increase in temperature, headache, nausea, vomiting, abdominal pain, arthralgia, and myalgia, and also rashes at times.³ Symptoms of dengue infection in humans include, a mild flu like illness, the “break-bone fever”, dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS). Dengue fever advances to DHF and DSS generally after a second infection with a dissimilar serotype, capillary leakage in dengue haemorrhagic fever makes it more severe than dengue fever.⁴ Electrolyte disturbances and renal dysfunction have been reported in dengue infection.⁵ Sodium is an essential nutrient in humans; regulates blood volume, blood pressure, osmotic equilibrium and pH. Hyponatremia is defined as a serum Sodium level <135 mEq/l. Hyponatremia is frequent in dengue, which can cause central nervous system dysfunction.⁶ Hypokalaemia is also common in Dengue which can lead to acute neuromuscular weakness including respiratory muscle paralysis Levels of chloride in serum of patients of dengue fever are raised significantly.^{7,8}

Considering the variations in serum electrolyte levels in patients of dengue and high incidence of dengue in India, it is necessary to have a degree of suspicion in patients of dengue about electrolyte disturbances and treat them accordingly.

METHODS

The study was a prospective observational cross-sectional study performed at the Department of Medicine in a tertiary care hospital in Mumbai, India. Approval for it was obtained from institutional ethics committee.

Each participant was explained about the study and their written informed consent was obtained in the language best understood by them. 150 Patients aged 18 years and above and diagnosed with dengue by NS1 or IgM Elisa were included in the study.

Duration of the study was 6 months. Patients of dengue haemorrhagic fever and dengue shock syndrome and patients having deranged serum creatinine and blood urea nitrogen level were excluded. Patients’ demographic details (name, gender, age, address) and clinical history, i.e. symptoms including Fever, retro-orbital headache, vomiting, joint pain, lethargy, breathlessness, bleeding, abdominal pain was recorded. Examinations included Vitals (pulse, blood pressure, respiratory rate) and systemic examination (cardiovascular system, respiratory system, central nervous system, gastrointestinal system).

Investigations (hemoglobin, white blood cell count, platelet count, hematocrit value, blood urea nitrogen, serum creatinine, serum level of sodium, potassium, chloride) were recorded. Relevant data was entered and analysed. Descriptive statistics were expressed in terms of actual numbers, and percentage.

RESULTS

From demographic profile, it was observed that, a higher percentage of patients of dengue were from a young age group i.e. 18-30 years (74%) as compared to any other age group. Age distribution of patients is shown in Figure 1.

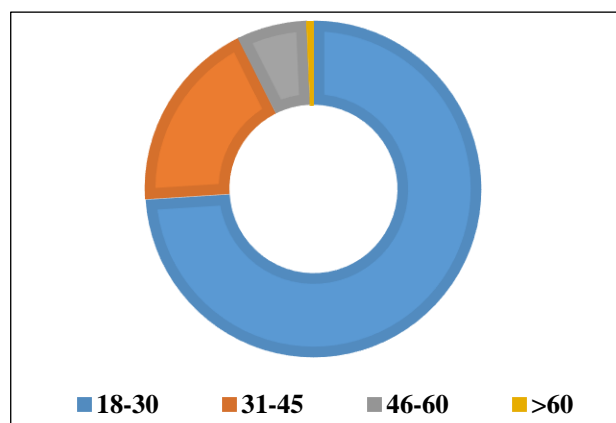


Figure 1: Age distribution (in years) of patients.

Table 1: Age (in years) distribution.

Age	No of patient
18-30	111
31-45	28
46-60	10
>60	1

In the assessment of electrolytes, mean value of sodium was 136±5.10. Hyponatremia (45.33%) was more commonly observed than hypernatremia (3.33%). Mean value of potassium was 3.91±0.48. Hypokalaemia (10.60%) was more commonly observed than hyperkalaemia (3.33%). Mean value of chloride was 105+/-2.42. hypochloraemia (6.66%) was seen slightly more than hyperchloremia (6.00%) (Table 2, Figure 2).

Table 2: Mean and S.D of Electrolytes.

Electrolytes	Mean±S. D.
Sodium	136.01±5.10
Potassium	3.91±0.48
Chloride	105.34±2.42

Among the symptoms associated with dengue, fever is present in 148 (98.66%), retro orbital headache is seen in 130 (86.66%), vomiting is present in 84 (56.00%) and joint pain is present in 104 (69.00%) (Figure 3).

Among symptoms that are warning signs for severe dengue, lethargy is the commonest, being present in 106 (70.66%) followed by breathlessness in 54 (36.00%), abdominal pain /tenderness in 27 (18.00%) and bleeding in 13 (8.66%) (Figure 4).

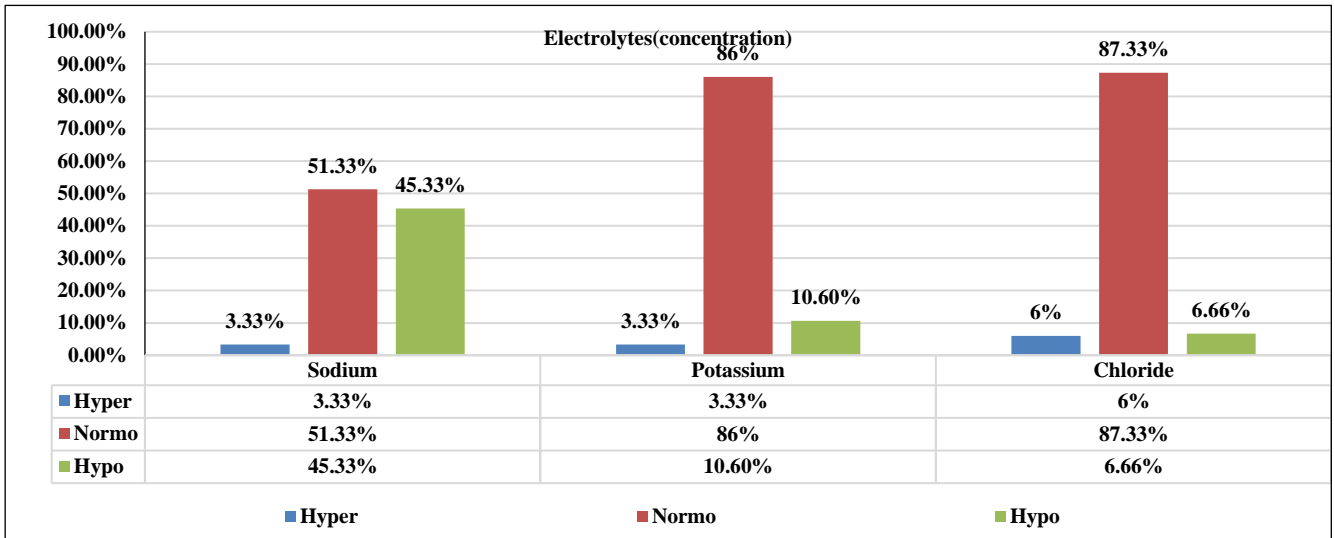


Figure 2: Percentage deranged electrolytes in patients of dengue fever.

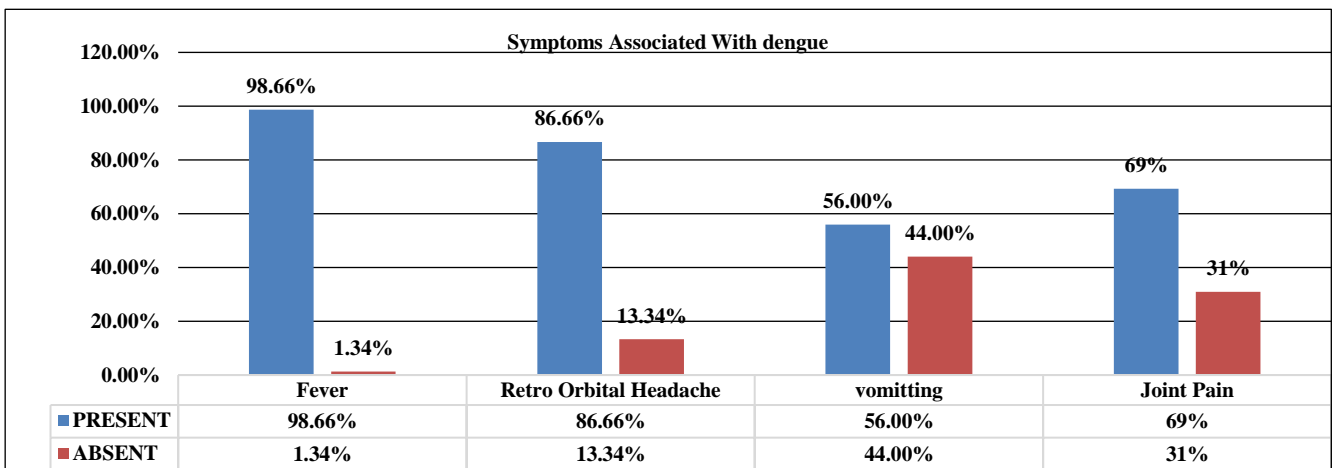


Figure 3: Percentage symptoms associated with dengue.

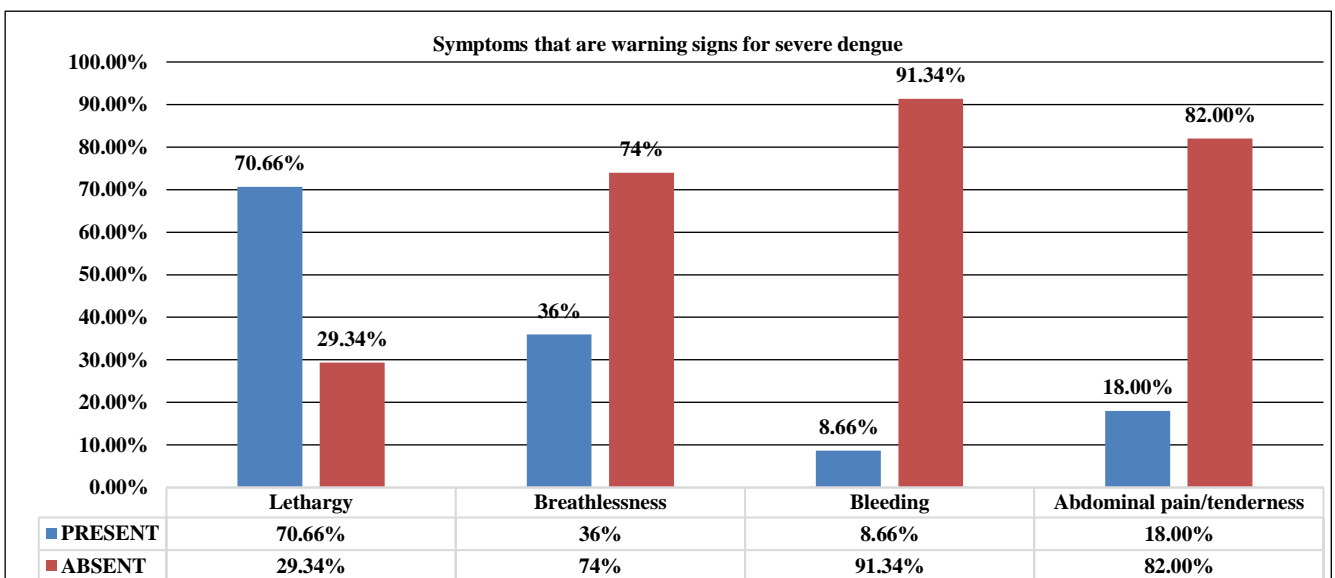


Figure 4: Symptoms that are warning Signs for severe dengue.

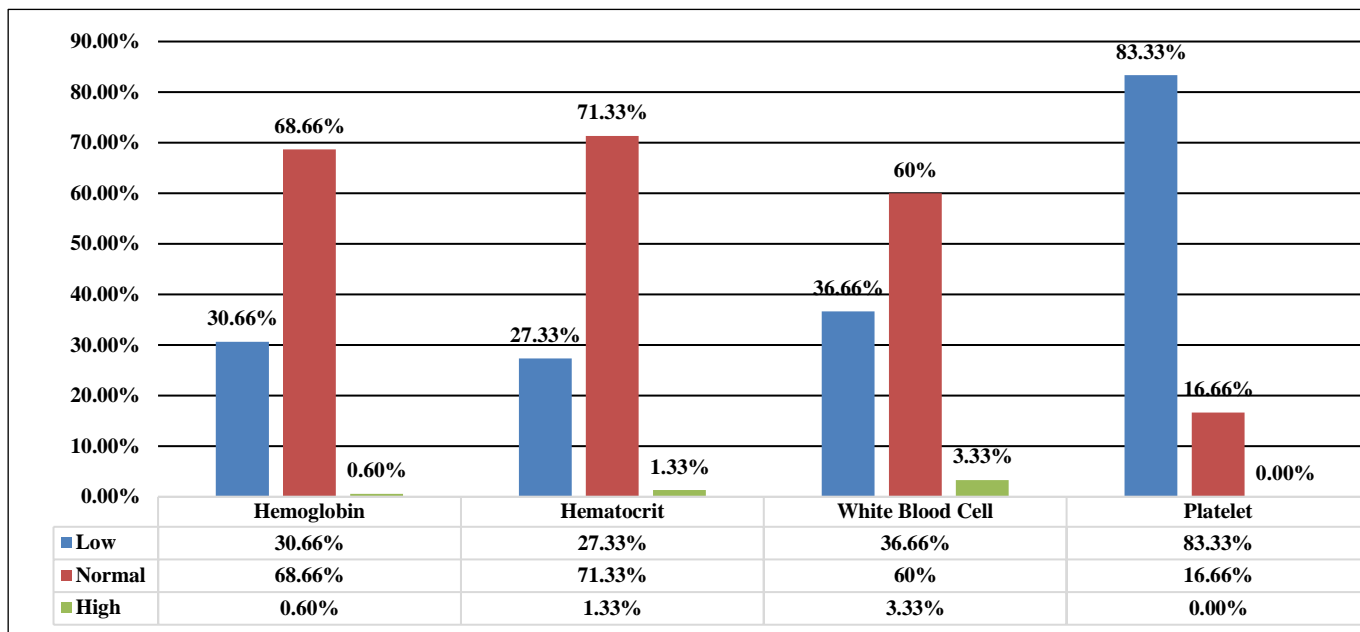


Figure 5: Reports of dengue patient.

DISCUSSION

In the present study, the mean sodium level of the study population was measured. The mean sodium level was found to be 136.01meq/L. Similarly, Mekmullica J et al, (2005) found it to be 132.76. The prevalence of dengue patients with hyponatremia was 45.33 % in the present study. This value was much higher than the value (18.4 %) obtained by, Mekmullica J et al,⁶ but slightly less than the results obtained by Caroline R et al, who found that it was 58 %.^{6,9} 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 secretion or the influx of sodium into the cells as a result of dysfunction of sodium potassium pump. Hypernatremia was 3.33%, the co-relation of which was not analysed in the above studies.

In the present study the mean potassium level of the study population was measured. The mean potassium level was found to be 3.91 meq/L, whereas, Lumpaopong A et al, found mild hypokalaemia i.e. 3.33. and significant hypokalaemia was obtained by Bhagyamma SN et al, i.e. 3.07 meq/L.^{10,11} The prevalence of dengue patients with hypokalaemia was 10.66% in the present study. This value was slightly less than the value (14 %) obtained by Lumpaopong et al.¹⁰ In general, dengue infection leads to mild hypokalaemia due to poor intake and an increase in renal excretion due to activation of rennin angiotensin and aldosterone system secondary to volume depletion. Hyperkalaemia was 3.33%, the co-relation of which was not analysed in the above studies.

In the present study the chloride level of the study population was measured. The mean chloride level was found to be 105.34 meq/L. In another study conducted by Bhagyamma SN et al, found mean chloride level almost similar 105.01.¹¹ Also, they found increased chloride in their study to be significant which in our study was 6% of the total subjects.¹¹

In the Present study, fever was associated with 98.66% of patients. Similarly, a study done by Narayanan M et al, found that fever is one of the common features associated with dengue (98.3%).¹²

In the Present study, Retro orbital headache is associated with 86.66% classical dengue patient, but study done by Narayanan M et al., found that headache in around 30% of patients.¹²

In the present study vomiting is associated with 56.00% which slightly higher compared to a study conducted by Vuong NL et al, who found that vomiting is associated with 44.00%.¹³

In the present study joint pain is associated with 69.00%. The exact pathogenesis of joint pain in dengue infection is not precisely known.

In the present study lethargy is associated with 70.66% but slightly less was found by Kumar A et al, i.e. 64.66%.¹⁴ The exact pathogenesis of lethargy in dengue infection is not precisely known but it is one of the warning signs.

In the Present study, breathlessness is associated with 36.00% which is similar to a study conducted by Kumar A et al, which found that 33.33% have breathlessness.¹⁴ It could be due to Pleural effusion, acute lung injury or bleeding causing anaemia.

In the present study 8.66% had bleeding complication but a higher percentage was observed in study conducted by Kumar A et al, i.e. 44.00%.¹⁴ Bleeding is associated with thrombocytopenia.

In the present study Abdominal Pain/Tenderness is associated with 18% but a higher number was observed by. Kumar A et al, i.e. 37.66%.¹⁴

In the present study platelets less than <150000 is observed in 83.33% but only 25.00% observed in a study conducted by Jahnavi K et al.¹⁵

In the present study leucopenia is seen in 36.6% whereas slightly less was observed in a study conducted by Chaloe Wong J et al, i.e. 30.8%.¹⁶

In the present study low haemoglobin seen in 30.66% and high haemoglobin in 0.66% but another study done by Chaloe Wong J et al, found association of raised haemoglobin significantly in dengue fever/DHF.¹⁶

In the present study low haematocrit seen in 27.33% and high haematocrit in 1.33% but another study done by Juthatip C found association of raised haematocrit significantly in dengue fever/DHF.¹⁶ In our patients, low haemoglobin and haematocrit may be due to high incidence of nutritional (iron deficiency) anaemia in the community. Also, we didn't include patients of dengue hemorrhagic fever and dengue shock syndrome in our studies.

CONCLUSION

The objective of our study was to study the electrolyte changes in patients of dengue fever. while conducting present study author also noted the patient's symptoms, clinical signs and other laboratory investigations.

Authors have found that the patients of dengue fever admitted were of a younger age group. The electrolyte disturbances more commonly seen were hyponatremia, hypokalemia and hypochloremia. Fever, retro orbital headache, vomiting and joint pain were symptoms commonly associated with dengue. Among the warning signs, lethargy and breathlessness were much more common as compared to bleeding and abdominal pain/tenderness. In the investigations, anaemia, leucopenia, thrombocytopenia and low haematocrit were seen.

Hence, there is a need to have a degree of suspicion about the above conditions while managing patients with dengue especially those that have warning signs that

indicate increased severity of dengue. Also, patients need to be subjected to necessary lab investigations early during management so that if abnormalities are found, they can be appropriately managed as some of these abnormalities may lead to increased severity as well as mortality.

Also, there is need for more research in this subject due to higher incidence of dengue in India, due to increased urbanization and overcrowding. Also, studies with dedicated control groups will provide more statistically relevant results which was one of the limitations of our study.

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Conflict of interest: None declared

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

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