



Assessment of Serum Electrolytes in Japanese Encephalitis Patients

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Abstract

Introduction: Japanese encephalitis (JE) is a common mosquito borne viral encephalitis. Most infections of JE are asymptomatic but if clinical illness develops, it causes significant morbidity and mortality.

Aims and Objectives: To assess the serum electrolytes (Na^+ and K^+) in diagnosed cases of Japanese Encephalitis.

Materials and Methods: The study was carried out in Gauhati Medical College and Hospital, Guwahati, India between January, 2014 and July, 2015. Serum sodium and potassium levels in 100 diagnosed patients of Japanese Encephalitis was assayed in Vitros 5600 Analyser of Ortho Clinical Laboratories by the slide method that uses direct potentiometry for analysis of the ions. Equal number of age and sex matched healthy individuals were taken as control group.

Results and Observations: The present study shows that there is highly significant decrease in the serum sodium levels in the study group as compared to the control group (** $p < 0.001$). On the other hand, there is no significant difference in potassium levels between the study group and the control group ($p > 0.05$).

Discussion: There is highly significant decrease in the values of serum sodium levels in cases of Japanese Encephalitis, which may occur as a consequence of SIADH.

The findings of the present study thus have an impact in the treatment protocol, as hyponatremia impairs cerebrovascular reactivity. Maintenance of serum sodium level at the ideal level will lead to a significant decrease in both mortality and morbidity.

Keywords: Hyponatremia, Japanese Encephalitis, Serum potassium, Serum sodium.

Introduction

Japanese encephalitis (JE) is a common mosquito borne viral encephalitis found in Asia.¹ Most infections of JE are asymptomatic but if clinical illness develops, it causes significant morbidity and mortality. It is numerically one of the most

important causes of Acute encephalitis syndrome (AES) not only in Asia but also all over the world.² It has been controlled effectively through national vaccination programs in several countries like Japan, Korea, China and Thailand.³⁻⁵ JE is endemic in Assam (India) with outbreaks every year during the

monsoons.^{6,7} There is significant morbidity and mortality due to JE in Assam with as many as 1343 cases and 229 AES-related deaths in 2012.⁸

Japanese encephalitis virus (JEV) belongs to the genus *Flavivirus* in the family *Flaviviridae*.⁹ JEV particles are small particles (-50 nm), in which a glycoprotein-containing lipid envelope surrounds the capsid, which has a single-stranded positive-sense 11-kb RNA genome. The viral RNA carries a single open reading frame with genes for three structural proteins, i.e., capsid (C), premembrane (prM), and envelope (E), and seven nonstructural (NS) proteins, i.e., NS1, NS2a, NS2b, NS3, NS4a, NS4b, and NS5.¹⁰ It is maintained in a zoonotic cycle involving pigs, ardeid birds and *Culex* species of mosquitoes. Humans are accidental/dead end hosts of JEV infection because they cannot sustain high viral titers.¹¹

Japanese B encephalitis (JBE) is an acute encephalomyelitis.¹² The manifestations of the disease depend on which part of the nervous system is affected. The course of the disease can be divided into three stages: (i) a prodromal stage preceding CNS features, (ii) an encephalitis stage marked by CNS symptomatology, and (iii) a late stage noticeable by recovery or persistence of signs of CNS injury. Prodromal symptoms consist of nonspecific febrile illness like fever, myalgia, diarrhea etc. It is followed by early CNS symptoms such as reduced levels of consciousness, seizures, headache, photophobia, and vomiting. Symptoms in the later CNS stage include poliomyelitis-like flaccid paralysis and parkinsonian syndrome, which manifests the classic description of JE—dull, flat, mask-like face with wide, unblinking eyes; tremor; generalized hypertonia; cogwheel rigidity; and other abnormalities in movement.^{13,14} Severe encephalitis is associated with a higher frequency of seizures.¹⁵ In fatal cases, patients ultimately slip into an acute coma. The failure of the host to produce antibodies against the virus is associated with an increased likelihood of the disease to turn lethal.¹⁶ Many survivors of JE acquire neuropsychiatric sequelae with cognitive and language impairment, in which case the disease presents itself not only as a killer

but also as a cause of an immense social and financial burden, especially for a developing country^{17,18} Thus, any addition or change in existing treatment protocol that reduces the disease burden is of significant importance. Studies have shown that fluid and electrolyte imbalance significantly increased the morbidity and mortality in critically ill patients.^{19,20} Hence, in this study we assessed serum electrolytes (Na⁺ and K⁺) in diagnosed cases of Japanese Encephalitis to determine if there exists any electrolyte imbalance in such cases, as its correction would significantly bring down the disease morbidity and mortality.

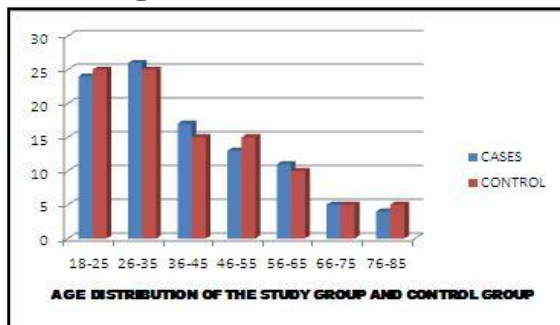
Materials and Methods

The study was carried out between January, 2014 and July, 2015. Serum sodium and potassium levels in 100 diagnosed patients of Japanese Encephalitis was assayed in Vitros 5600 Analyser of Ortho Clinical Laboratories by the slide method that uses direct potentiometry for analysis of the ions. Only records of sodium and potassium values done within 7 days of onset of encephalopathy were included in the study. Normal sodium level is taken as 137 - 145 mmol/L and potassium level is taken as 3.5 - 5 mmol/L when tests are done in VITROS 5600 autoanalyser. Only patients more than 18 yrs of age, from either sex were included in the study. Patients having h/o renal disease, diarrhoea, diabetes mellitus, neoplasia and any other such disease/condition that have a proven effect on electrolyte levels were excluded from the study. Equal number of age and sex matched healthy individuals were taken as control group.

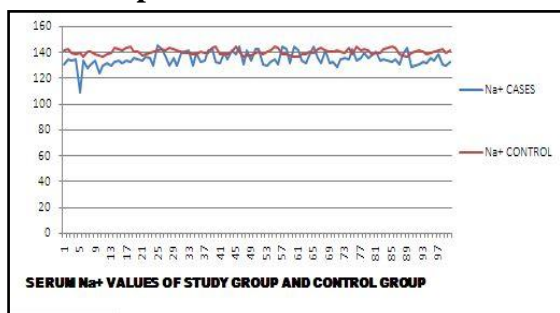
Results and Observations

100 diagnosed cases of Japanese encephalitis were included in the study after evaluation with the inclusion and exclusion criteria. Of these, 32 were female and 68 male patients. 40 female and 60 male persons were included in the control group.

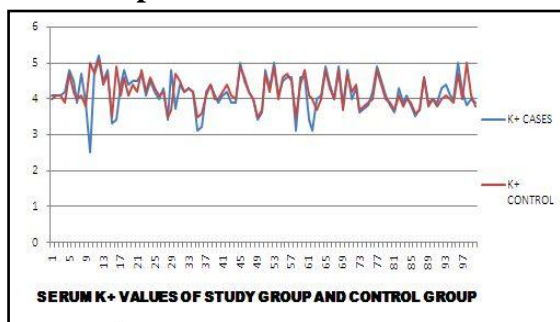
Age Distribution of the Study Group and Control Group



Serum Sodium Values of Study Group and Control Group



Serum Potassium Values of Study Group and Control Group



Students’ unpaired ‘t’ test was done for statistical analysis of significance in Serum sodium (Na⁺) and Serum potassium (K⁺) levels in study group and control group.=

	Na+ Study Group	Na+ Control Group	K+ Study Group	K+ Control Group
Mean	135.25	140.86	4.154	4.192
Standard Deviation	5.435	2.151	0.4951	0.3992
Std. Error of Mean(SEM)	0.5435	0.2151	0.04951	0.03992
Lower 95% Confidence Limit	134.17	140.43	4.056	4.113
Upper 95% Confidence Limit	136.33	141.29	4.252	4.271
Minimum	109	137	2.5	3.5
Median (50th Percentile)	134	141	4.15	4.1
Maximum	146	145	5.2	5.1
p value	<0.001		>0.05	
Significance	HS		NS	

Discussion

About 30% of patients admitted to hospital with Japanese encephalitis die, and around half of the survivors have severe neurological sequelae. In this study, there was male predominance in the occurrence of the disease within both the groups. Previous studies also has similar finding.^{21,22}. It might be due to the fact that men-folk remain outdoors more, making them more vulnerable to mosquito bites. In respect to the sodium and potassium levels, the present study showed that there is highly significant decrease in the serum sodium levels in the study group as compared to the control group (p<0.001). On the other hand, there is no significant difference in potassium levels between the study group and the control group (p>0.05).

Conclusion

The highly significant decrease in serum sodium levels in JE cases may occur as a consequence of inappropriate antidiuretic hormone secretion (SIADH). The findings of the present study, thus, have an impact on the treatment protocol in Japanese Encephalitis as hyponatremia impairs cerebrovascular reactivity. Serum sodium level should ideally be maintained above 140 mmol/L. Thus, maintenance of serum sodium level at the ideal level will lead to a significant decrease in both mortality and morbidity. Future scope of the study lies in doing a multi-centric study for a longer period of time.

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