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Serum Electrolyte Levels (Sodium and Potassium) in Cerebrovascular Accidents at a Tertiary Care Hospital - A Case Control Study

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Abstract

Aim: To study serum electrolyte levels in cerebrovascular accidents (cerebral infarct and cerebral haemorrhage) **Material and Methods:** In this retrospective case control study, we compared serum electrolyte results of 70 diagnosed patients of cerebrovascular accidents (cerebral infarct and cerebral haemorrhage) within 24 hours of admission from the onset of the event with the 70 age and sex matched controls. **Statistical analysis:** Statistical analysis was done by z test using SPSS 16 which showed statistically significant difference in serum sodium levels while serum potassium levels showed no significant difference. **Conclusion:** Electrolytes disturbance may contribute to the prognosis of cerebrovascular accidents and early correction of this electrolyte imbalance can lead to better prognosis and may avoid complications.

Keywords: Cerebrovascular Accidents (CVA), Electrolytes, Potassium, Sodium

1. Introduction

Cerebrovascular diseases include some of the most common and devastating disorders like ischemic stroke, hemorrhagic stroke and cerebrovascular anomalies such as intracranial aneurysms and arteriovenous malformations.

A stroke or Cerebrovascular Accident (CVA) is defined as abrupt onset of a neurologic deficit that is attributable to a focal vascular cause[1]. There are two main types of cerebrovascular accidents. An ischemic stroke or infarct caused by a blockage and a hemorrhagic stroke (intracranial bleed) caused by a breakage in a blood vessel[2]. In these types, the release of osmotically active substances like arachidonic acid, electrolytes, lactic acid from the brain tissue causes cerebral oedema followed by vascular injury and electrolyte imbalance[3]. This electrolyte imbalance may be accompanied by the shift of extracellular fluid into intracellular fluid, ultimately causing brain oedema[4].

These changes in water and electrolytes concentration can land up in severe cerebrovascular complications. Hence if they are estimated and corrected in early phase of cerebrovascular accidents can improve the prognosis of the patient.

2. Material and Methods

This was a retrospective case control study planned at a tertiary care centre. Prior permission for data collection as well as local ethical committee clearance was obtained.

In case group we included 70 patients of CVA

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(diagnosed clinically as well as radiologically) in age group of 35 to 85 years. The samples were collected within 24 hours of the onset of the event. While patients with previous history of CVA as well as patients admitted after 24 hours of onset of the event were excluded.

Control group consist of 70 healthy individuals with age and gender matched. Serum electrolytes levels(sodium and potassium) within 24 hours of the event was analyzed in central clinical laboratory using electrolyte analyzer (acculite 3P) which is based on the principles of potentiometer. (Ion selective electrodes).For this sample was collected in plain bulb and allowed to coagulate. Then serum was separated by centrifugation for 15 minutes.

Results were analyzed using SPSS-16 software and appropriate statistical test was applied.

3. Results

Table 1. Distribution of serum sodium among case and control group

Group	N	Mean± SD
Case	70	137.8 ± 7.22*
Control	70	140.9 ± 3.92

P=0.002 (significant).

There is statistical significant difference for serum sodium levels between case and control group. Cases have significant hyponatremia compared to control group (Table 1).

Table 2. Distribution of serum potassium among case and control group

Group	N	Mean± SD
Case	70	4.2 ± 0.61
Control	70	4.3 ± 0.50

P=0.33 (not significant).

There is no statistical difference between case and control groups (Table 2).

4. Discussion

Sodium being the chief cation of extracellular fluid, maintains the osmotic pressure, fluid balance and cell permeability.

Potassium being the chief cation of intracellular fluid, also participates in regulation of water electrolyte balance and osmotic pressure[5].

Any disturbance in the normal levels of sodium and potassium will lead to fluid exchange, oedema and will affect the normal physiological function of the brain in terms of accumulation of fluid and exchange of other substances like lactic acid and arachidonic acid. The injury due to these consequences will either have decreased blood flow to the brain or there will be rupture of vessels due to pressure changes.

These changes studied by Alam M N et al[6] showed that hyponatremia is more common in cerebrovascular accidents, both in ischemic and hemorrhagic stroke. Kusuda K et al[7] also showed hyponatremia, hypernatremia, hypokalemia and hyperkalemia in CVA. He also stated that hypernatremia is very common in hemorrhagic stroke and 57% patients with hypernatremia in his study died within one month of admission stating the importance of electrolyte balance in these patients. Watanabe O et al[8], Guo Z et al[9] and Bremer AM et al[10] also showed the disturbances of electrolyte levels in cerebrovascular accidents.

In our study, we found the presence of hyponatremia more commonly in CVA while serum potassium levels remain unchanged. The studies done uptill now have showed that the electrolyte imbalance caused due to cerebrovascular accidents has severe effect on the brain functioning. This may lead to severe complications like organ failures and ultimately can lead to death.

We propose that if the patients of cerebrovascular accidents are assessed for electrolyte disturbance as early as possible, it can help the clinician for better prognosis and avoid complications. Further we propose that more elaborative study is required for confirmation of these findings. Also comparative study between ischemic and hemorrhagic stroke is required to confirm the type of electrolyte disturbance.

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