



STUDY OF HYPONATREMIA IN THE PROGNOSTIC OUTCOME OF ACUTE ISCHEMIC AND HEMORRHAGIC STROKE.

General Medicine

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ABSTRACT

Background: Hyponatremia is the most common electrolyte imbalance seen in critically ill neurologic patients. The causes of hyponatremia in neurologically ill patients is most commonly attributed to Syndrome of Inappropriate Anti-diuresis and Cerebral Salt Wasting. SIADH is a sub clinically volume expanded state needing fluid restriction as treatment, whereas Cerebral Salt wasting is a volume depleted state requiring aggressive fluid replacement. **Objectives:** 1) To find out the relative incidence of hyponatremia in acute ischemic and acute hemorrhagic stroke. 2) To find out the effect of hyponatremia on the duration of hospital stay in patients with acute ischemic and hemorrhagic stroke. 3) Association of hyponatremia with early mortality in acute ischemic and hemorrhagic stroke patients. **Methods:** The study shall be conducted among the patients being admitted to AL AMEEN MEDICAL COLLEGE from JAN 2021 TO DEC 2022 diagnosed as stroke. The sample size is of 50 patients diagnosed with stroke. **Results:** The incidence of ischemic stroke was 70% of the total stroke patients in which the incidence of SIADH was 51.4% and incidence of CSWS was 31.4% in ischemic stroke patients. The incidence of haemorrhagic stroke was 30% of the total stroke patients in which the incidence of SIADH was 33.7% and incidence of CSWS was 27% in haemorrhagic stroke patients. **Conclusion:** Cerebral Salt wasting has a poorer short term outcome than SIADH. Hyponatremia and especially, cerebral salt wasting predisposes to a longer duration of hospital stay and poorer discharge disposition. SIADH has a higher prevalence than Cerebral Salt Wasting. Thus, a clear distinction between the two entities ought to be made and the appropriate treatment be carried out, to reduce the morbidity, short and long term mortality in acute stroke patients with hyponatremia.

KEYWORDS

Stroke, Hyponatremia, SIADH, CSWS.

INTRODUCTION

Stroke was defined by World Health Organization criteria as rapidly developing clinical signs of focal, at times, global disturbance of cerebral function lasting for more than 24 hours or leading to death with no apparent cause other than vascular origin.

Hyponatremia is the most common electrolyte imbalance which is readily observed in patients of neurological disorders such as stroke. Hyponatremia is defined as plasma Na^+ concentration $<135 \text{ mmol/L}$ [1].

In stroke, hyponatremia is mostly hypoosmolar and may be caused by either syndrome of inappropriate anti-diuretic hormone (SIADH) or cerebral salt wasting syndrome (CSWS). SIADH is more common than CSWS [2]. It may also be due to dietary restriction of sodium as a measure to control hypertension, use of anti-hypertensive medicine such as diuretics, and secondary infections. It results in altered sensorium in these patients and may also predispose the patients to seizures.

In SIADH, there is an unchecked secretion of anti-diuretic hormone (ADH), from the posterior pituitary gland in response to stimulation from the hypothalamus. It causes body fluid hypotonicity and increased blood volume [2].

In CSWS, large quantities of sodium are lost in the urine [3]. The rate of mortality in hyponatraemic stroke patients has been reported to be as high as 60% [4]. Even though the SIADH and CSWS patients had decreased serum sodium level, the pathophysiology and treatment of these two entities are different.

Hyponatremia due to CSWS improves with fluid replacement and treatment with Fludrocortisone, but hyponatremia due to SIADH improves with fluid restriction and vasopressin-2 receptor antagonists.

Thus, the exact etiology of hyponatremia must be identified before starting appropriate therapy. Hyponatremia should be suspected to any stroke patients admitted in the Intensive care unit in order to achieve prompt diagnosis, to provide appropriate treatment, to reduce the hospital stay and to reduce the mortality. Thus, laboratory estimation of serum sodium levels must be done to all stroke patients. Studies have shown that patients with hyponatremia have worse National Institute of health stroke scale (NIHSS) scores on admission and their NIHSS Score worsens during hospitalization.

Thus an effort has been made to study the effect of hyponatremia in the prognostic outcome of patients with acute ischemic and hemorrhagic stroke, its effect on the duration of hospital stay and early mortality.

METHODOLOGY

Study Design:

Hospital based Cross-sectional Study.

Source Of Data

The study shall be conducted among the patients being admitted to AL AMEEN MEDICAL COLLEGE from JAN 2021 TO JUNE 2022 diagnosed as stroke considering the inclusion and exclusion criteria.

Inclusion Criteria

- 1 Acute Ischemic stroke diagnosed on clinical / radiological basis.
- 2 Acute Hemorrhagic stroke diagnosed on clinical / radiological basis.
- 3 Patient admitted in general medical ward/neurology ward with abrupt onset of focal neurological deficit of vascular origin, ischemic or haemorrhagic.
- 4 Patients directly reporting to Al Ameen Medical College and District Hospital Vijayapura.

Exclusion Criteria:

- 1 Previous stroke/uncertain stroke patients.
- 2 Patients referred from primary /secondary health care centres following first aid.
- 3 Patients reporting after 3 days of onset of symptoms.
- 3 Patients with serious co-morbidities such as pulmonary or endocrine disease, hepatic failure, renal failure with dialysis.
- 4 Patients who use diuretics before the stroke attack.
- 5 Transient ischemic attack patients.
- 6 Patients with uncertain clinical diagnosis and non-reassuring imaging.
- 7 Patients with random blood sugar $> 300 \text{ mg \%}$.

Sample Size- 50

The study includes 50 patients of stroke (ischemic and hemorrhagic) in patients admitted in medical wards and neurology ward. Ethical committee approval was obtained for conducting the study.

Informed consent was obtained from all the patients. A carefully elicited history and repeated clinical examinations were used in ascertaining the temporal profile of the disease and the probable area of

brain that is affected. A detail history taking was done for risk factors like smoking, alcohol, rheumatic valvular heart disease, tuberculosis and family history of cerebrovascular disease.

A clinical search for extra-cranial carotid artery narrowing, cardiac diseases which can give rise to cerebral embolism, evidence for generalized arterial disease, systemic hypertension, diabetes mellitus, rheumatic valvular heart disease and other risk factors were made.

Laboratory evaluation and other investigations: After detailed history and meticulous neuromedical examination including palpation and auscultation of brachiocephalic and peripheral pulses, the relevance and priority of any laboratory test in acute stroke should be at the clinician judgement.

1) Complete blood count 2) Hb% 3) ESR 4) Blood sugar RBS mg/dl 5) Renal function- Blood urea and Serum creatinine 6) Serum electrolytes- Sodium and Potassium 7) Bleeding time, clotting time, PT INR, APTT 8) ECG 9) CT-brain plain was done to access the lesion was infarction or haemorrhage and to locate the site of lesion.

RESULT

In this present study 50 patients of Stroke were studied, the incidence of hyponatremia in ischemic and haemorrhagic stroke, its severity in the same and prognostic outcome in acute ischemic and haemorrhagic stroke due to hyponatremia was studied.

Table No 1: Incidence Of Ischemic And Haemorrhagic Stroke In The Study Population.

Stroke	No. of Patients	Percentage
Hemorrhagic	15	30.0
Ischemia	35	70.0
Total	50	100.0

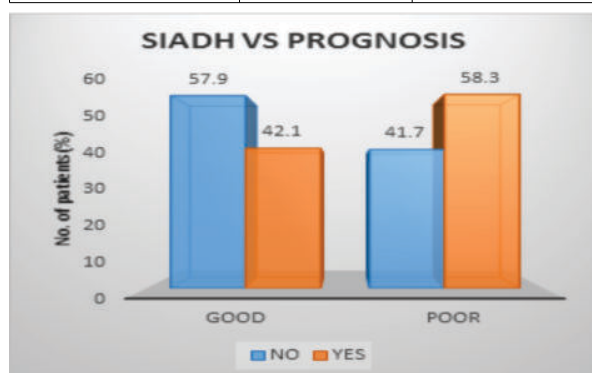


Figure No.1 – Prognostic outcome due to SIADH in Ischemic vs Hemorrhagic Stroke Patients.

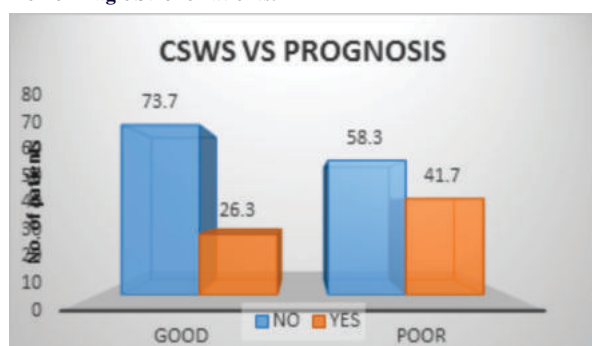


Figure No.2 – Prognostic outcome due to CSWS in Ischemic vs Hemorrhagic Stroke patients.

DISCUSSION

In our study we analysed 50 patients with acute stroke to study the occurrence of hyponatremia. Out of the 50 patients, the majority of stroke patients, about 72 %, belonged to the middle age i.e., 30 – 60 years of age. The mean age of stroke occurrence in males was 50 ($\pm$ 10.5) and that of the females was 58 ($\pm$ 12.3). This is comparable to the population based study by Dalal et al (5) in Mumbai where the mean age for stroke was 66 years.

The majority of males belonged to 40-60 years age group. The prevalence of stroke in females, however was higher in the 50 to 70 years age group. Thus a higher age stratified prevalence for females was found, which is comparable to the data from the 2008 Mumbai stroke registry (5) where a mean of 63.4 years was recorded for females.

Of the stroke patients in our study group, 62% were male and 38% were female. The incidence of ischemic stroke was higher 70 %, of which 60% were male and 40% were female patients. Hemorrhagic stroke was seen in 30% of the total stroke patients, of which 66% were male patients and 33 were female patients. The incidence of ischemic stroke was 70% of the total stroke patients in which the incidence of SIADH was 51.4% and incidence of CSWS was 31.4% in ischemic stroke patients. The incidence of hemorrhagic stroke was 30% of the total stroke patients in which the incidence of SIADH was 33.7% and incidence of CSWS was 27% in hemorrhagic stroke patients.

The incidence of hyponatremia due to cerebral causes was slightly higher than the study by Kuramatsu et al (6) where prevalence was 15%.

Rodrigues B (7) reported a incidence of 16% and Soiza et al (8) 13.8%. Of the hyponatraemic patients, there was a higher incidence of SIADH 46%. CSWS contributed to 31%. The study by Saleem et al (9) showed the respective incidence to be 67% and 33%.

Urinary Sodium Excretion estimation has significant statistical association with hyponatremia and outcome among the study populations. Increased Urinary Sodium Excretion seen both in CSWS and in SIADH SECRETION has significant association with hyponatremia and increases the in-hospital mortality rate among the study patients. Hence, by correcting or preventing urinary sodium loss we can prevent hyponatremia and that will reduce the in-hospital mortality rate among our study patients.

CONCLUSION

Hyponatremia is the most common electrolyte abnormality seen among stroke patients. The prevalence of stroke is higher in males and among the middle aged.

SIADH has a higher prevalence than Cerebral Salt Wasting. Hyponatremia and especially, cerebral salt wasting predisposes to a longer duration of hospital stay and poorer discharge disposition.

Hyponatremia, is an independent predictor of short and long term mortality in stroke. Cerebral Salt wasting has a poorer short term outcome than SIADH.

Thus, a clear distinction between the two entities ought to be made and the appropriate treatment be carried out, to reduce the morbidity, short and long term mortality in acute stroke patients with hyponatremia.

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