

# CHARACTERIZATION OF HYPONATREMIA IN PATIENTS WITH ISCHEMIC STROKE

Zamin Khan<sup>1</sup>, Saleem Iqbal<sup>1</sup>, Farooq Ahmed<sup>2</sup>, Ashfaq Ahmad<sup>1</sup>

<sup>1</sup>Department of Medicine, MTI Khyber Teaching Hospital, Peshawar - Pakistan

<sup>2</sup>Department of Medical Education, MTI Khyber Medical College, Peshawar - Pakistan

## ABSTRACT

**Objective:** To characterize the hyponatremia based on severity in patients with ischemic stroke in the first twenty-four hours.

**Materials & Methods:** This cross-sectional descriptive study was done in the Medicine Department of Khyber Teaching Hospital, Peshawar, after obtaining approval from IREB. For a proportion of 25% population with mild hyponatremia, a sample of 289 was calculated using Open EPI Software keeping 95% as the confidence interval and 5% as the margin of error. We included all adult patients from age 16 years of either gender, having newly diagnosed ischemic stroke and yet had not started any treatment. Patients having other chronic diseases and endocrine disorders which can cause electrolyte disturbances, and act as confounders, were excluded. A Non-probability consecutive sampling technique was used. All data including name, age, gender, address, and the presence or absence of and the severity of hyponatremia was recorded. Data was analyzed using SPSS-22.

**Results:** The mean age of the patients was 53 years with SD  $\pm$  8.53 (range 40-69 years). Male patients were 56.1% while 43.9% were females. Out of 289 patients, 101 (35%) patients had hyponatremia. Amongst these patients having hyponatremia, mild hyponatremia was present in 63 (62%), moderate hyponatremia in 27 (27%) and profound or severe hyponatremia was present in 11 (11%).

**Conclusion:** Hyponatremia was present in about 1/3rd of patients who presented with ischemic stroke in our hospital. Among these, severe hyponatremia was seen in 11% of the patients.

**Keywords:** Hyponatremia, ischemic stroke.

**This article may be cited as:** Khan Z, Iqbal S, Ahmed F, Ahmad A. Characterization Of Hyponatremia In Patients With Ischemic Stroke. J Med Sci 2024 january;32(1):82-84

## INTRODUCTION

A stroke is defined as a focal or global neurological deficit due to a vascular event, which lasts for 24 hours or more or leads to death.<sup>1,2</sup> Electrolyte disturbances e.g. hypernatremia, hyponatremia, and hypokalemia are quite common in patients suffering from stroke. These disturbances may result from the elevation of brain natriuretic peptides (BNP), the syndrome of inappropriate antidiuretic hormone (SIADH), and/or inappropriate fluid intake or loss. These disturbances may negatively influence the outcome of such patients. The patients may develop impaired consciousness levels, seizures, complications due to seizures, or even death.<sup>3</sup> When the serum level of sodium is less than 135 mmol/L, it is called hyponatremia.<sup>4</sup> The hyponatremia is categorized as mild hyponatremia if

the serum sodium level is 130-134mmol/L, moderate hyponatremia if the level is 125-129 mmol/L and profound or severe hyponatremia if the level is below 125mmol/L.<sup>5,6</sup> In patients with serum hyponatremia, however, the total body sodium may be low, high, or normal.<sup>7</sup> Hyponatremia not only is associated with high mortality in hospitalized patients but even after discharge from health care centers. The high mortality amongst the patients with hyponatremia appears to be due to the severity of the underlying disease, so the hyponatremia acts as a marker of the severity of the disease and worse prognosis.<sup>8</sup> In patients with stroke, hyponatremia may be clinically asymptomatic and may be associated with instability, falls, and impaired cognition.<sup>9,10</sup> As early detection and correction of electrolyte disturbances in patients with ischemic may reduce mortality, we embarked on this study to determine the frequency and stage of hyponatremia in patients suffering from ischemic stroke.

## MATERIAL AND METHODS

This cross-sectional study was done in the Medicine Department of Khyber Teaching Hospital, Peshawar, after obtaining approval from IREB. For a proportion of 25% population with mild hyponatremia, a sample of 289

Correspondence

**Dr Saleem Iqbal**

Associate Professor Medicine

Medical B Ward, Khyber Teaching Hospital, Peshawar,

**Cell:** +92-333-9125084,

**Email:** drsalimiqbal1@gmail.com

**Date Received:** 24/09/2023

**Date Revised:** 28/10/2023

**Date Accepted:** 19/12/2023

was calculated using Open EPI Software keeping 95% as the confidence interval and 5% as the margin of error.<sup>11</sup> We included all adult patients from age 16 years of either gender, having newly diagnosed ischemic stroke and yet had not started any treatment. Patients having other chronic diseases and endocrine disorders which can cause electrolyte disturbances, and act as confounders, were excluded. A non-probability consecutive sampling technique was used. We informed all patients and their caregivers about the research, and consent was taken from them in writing. After taking a detailed history and performing a clinical examination, all the participants were admitted to the medical ward. After confirmation of the diagnosis as ischemic stroke, 3 ml of venous blood was taken from the patients and was sent to the local hospital laboratory for measurement of serum electrolytes including sodium, potassium, and chloride by using the pertinent reference methods of the National Institute of Standards and Technology (NIST).<sup>12</sup> All data including name, age, gender, address, and the presence or absence of and the severity of hyponatremia was recorded. We used Statistical Package for Social Sciences (SPSS) version 20 for data analysis. Hyponatremia was stratified amongst age and gender, for

effect modifications. All results were presented in the form of tables and graphs.

**RESULTS**

The age of the 289 patients, ranged from 18 to 75 years, 53 years was the mean age with SD ± 8.53. Male patients were 56.1% while 43.9% were females. The results related to the baseline characteristics are presented in the form of Tables and Bar graphs as follows.

**DISCUSSION**

The mean age of our patients was 53 years with SD ± 8.53. However, the mean age was 61.45 ± 11.8 years of the patients studied in another study. There is quite a significant difference in the age of the patients in these two studies, the obvious reason may be a population difference. In our study, 56% (162) of the patients were males while 44% (127) of the patients were females. Kidwai et al. have reported that 60% of the patients as males while 40% of the patients as females.<sup>13</sup> In both of the above studies, males were predominant i.e. 56-60%. This shows that somehow hyponatremia is more common in male patients presenting with ischemic stroke. Whether it was just a coincidental finding or there is some correlation between the male gender and hyponatremia in ischemic stroke needs to be sorted out. Mahesar et al. have reported hyponatremia in 38.6% of patients presenting with ischemic stroke. Out of these 38.6% of the patients, mild hyponatremia was present in 64.7%, moderate hyponatremia in 25.5%, and severe hyponatremia in 9.8% of patients.<sup>11</sup> Another study conducted on 132 patients at Karachi reported that mild hyponatremia was present in 25% of the patients (130-134mMol/L), but moderate hyponatremia was present in 9.8%.<sup>11</sup> Saleem S et al. have also reported hyponatremia in 353 patients out of 1000 patients, i.e. 35.5%.<sup>14</sup> So most of the studies have reported that 35-38.6% of the patients suffering from ischemic stroke have hyponatremia.

**CONCLUSION**

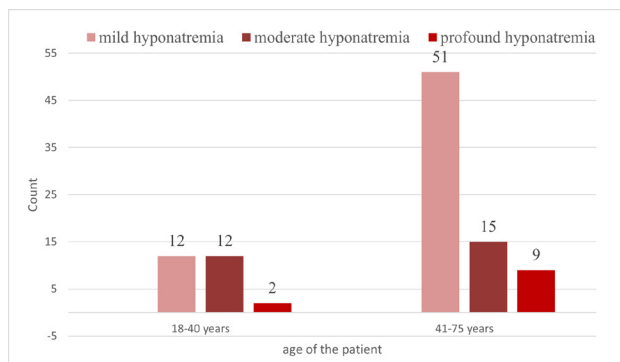
Our study concludes that 35% of our patients who presented with ischemic stroke had hyponatremia. Among these, severe hyponatremia was seen in 11% of the patients. Further large-scale studies are needed at multiple sites to determine the true prevalence, etiology and outcomes of hyponatremia.

**REFERENCES**

1. Goldstein LB, Adams R, Becker K, et al.: Primary prevention of ischemic stroke: a statement for healthcare professionals from 86 the Stroke Council of the American Heart Association. *Circulation* 2001; 103: 163-82.
2. Douglas VC, Aminoff M J, et al. *Stroke: Nervous System*. Papadakis MA, McPhee SJ, Rabow MW, McQuaid AR. *Current Medical Diagnosis and treatment*. McGraw Hill. 2023; 62: 970-1045.

**Table 1: Demographic Biodata of our patients**

| Variables      | Group           | Frequency<br>n=289 | Percentage |
|----------------|-----------------|--------------------|------------|
| Age in years   | 18-40           | 78                 | 27.0%      |
|                | 41-75           | 211                | 73.0%      |
| Gender         | Male            | 162                | 56.1%      |
|                | Female          | 127                | 43.9%      |
| Occupation     | Own Business    | 194                | 67.1%      |
|                | Unemployed      | 95                 | 32.9%      |
| Marital Status | Married         | 237                | 82.0%      |
|                | Unmarried       | 52                 | 18.0%      |
| Hyponatremia   | No hyponatremia | 188                | 65.1%      |
|                | Mild            | 63                 | 21.8%      |
|                | Moderate        | 27                 | 9.3%       |
|                | Profound        | 11                 | 3.8%       |



**Fig 1: Distribution of severity of hyponatremia among different age groups**

3. Bandopadhyay M, Jatua SK, Adhikari M, Bhandari A: Study of electrolyte abnormality in acute stroke. *Annals Intl Med Dental Res*. 2017;3:4-9.
4. Hoorn EJ, Zietse R. Diagnosis and Treatment of Hyponatremia: Compilation of the Guidelines. *J Am Soc Nephrol*. 2017 May. 28 (5):1340-1349.
5. Castillo JJ, Glezerman IG, Boklage SH, Chiodo J 3rd, Tidwell BA, Lamerato LE, et al. The occurrence of hyponatremia and its importance as a prognostic factor in a cross-section of cancer patients. *BMC Cancer*. 2016 Jul 29. 16:564.
6. Verbalis JG, Goldsmith SR, Greenberg A, Korzelius C, Schrier RW, Sterns RH, et al. Diagnosis, evaluation, and treatment of hyponatremia: expert panel recommendations. *Am J Med*. 2013 Oct. 126 (10 Suppl 1):S1-42.
7. Coenraad MJ, Meinders AE, Taal JC, Bolk JH: Hyponatremia in intracranial disorders. *Neth J Med*. 2001;58:123-127.
8. Waikar SS, Mount DB, Curhan GC: Mortality after hospitalization with mild, moderate, and severe hyponatremia. *Am J Med*. 2009; 122: 857-865.
9. Nathan BR: Cerebral correlates of hyponatremia. *Neurocrit Care*. 2007, 6: 72-78.
10. Spasovski G, Vanholder R, Allolio B, Annane D, Ball S, Bichet D, et al; Hyponatraemia Guideline Development Group. Clinical practice guideline on diagnosis and treatment of hyponatraemia. *Nephrol Dial Transplant*. 2014 Apr;29 Suppl 2:i1-i39.
11. Mahesar SA, Memon SF, Mustafa S, Javed A, Butt SM. Evaluation of Hyponatremia in Ischemic Stroke Patients in a Tertiary Care Hospital of Karachi, Pakistan. *Cureus* 11(1): e3926.
12. National institute of neurological disorders and stroke (NINDS). Stroke. hope through research. National institutes of health 1999;23:34-89.
13. Kidwai AA, Ara J, Rasheed SA, Najeebullah, Paracha S. Impact of hyponatremia on outcome of acute ischemic stroke in a tertiary care hospital. *The Professional Med J* 2019;26(10):1789-93.
14. Saleem S, Yousuf I, Gul A, Gupta S, Verma S. Hyponatremia in stroke. *Ann Indian Acad Neurol* 2014;17:55-7.

**Authors Contribution:**

Following authors have made substantial contributions to the manuscript as under

| Authors | Conceived & designed the analysis | Collected the data | Contributed data or analysis tools | Performed the analysis | Wrote the paper | Other contribution |
|---------|-----------------------------------|--------------------|------------------------------------|------------------------|-----------------|--------------------|
| Khan Z  | ✓                                 | ✗                  | ✓                                  | ✗                      | ✓               | ✗                  |
| Iqbal S | ✓                                 | ✓                  | ✗                                  | ✓                      | ✓               | ✗                  |
| Ahmed F | ✓                                 | ✗                  | ✗                                  | ✓                      | ✗               | ✗                  |
| Ahmad A | ✓                                 | ✗                  | ✓                                  | ✗                      | ✓               | ✗                  |

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**Ethical Approval:**

**This Manuscript was approved by the Ethical Review Board of Khyber Teaching Hospital, Peshawar Vide No. 424/DME/KTH.**

**Dated: 25 07 2023**



This work is Licensed under a Creative Commons Attribution-(CC BY 4.0)