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ORIGINAL ARTICLE

Hyponatremia in Ischemic Stroke Patients Presented to the Neurology Department at the Nephrology Institute of Kidney Disease

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ABSTRACT

Objective: This study aims to assess the prevalence of hyponatremia in ischemic stroke patients.

Material and Methods: This study was a descriptive cross-sectional study. This research included all inpatients and outpatients at the Nephrology Institute of Kidney Disease from January 01, 2021, to December 31, 2022. A total of 214 people who had had a stroke were included in the analysis. On an official Proforma, the study's goals, potential harms, and potential rewards were laid out for the participant.

Results: The study examined 214 people who had had an ischemic stroke. The average age of the patients was above 35. Patients' ages averaged 70 years. Male patients comprised 64% of the total, with 76 female patients making up 36% of the sample size. The Incidence of hyponatremia in individuals with ischemic stroke was 24%. The prevalence of hyponatremia increased dramatically between the ages of 51 and 75. Patients with hypertension were more likely to have hyponatremia than those without hypertension (31% vs. 12%, p=0.04). Diabetes doubled the Incidence of hyponatremia, which affected both sexes equally. (60 vs. 20 percent) The Incidence of hyponatremia in the context of an ischemic stroke was shown to be doubled in those with a high body mass index (BMI). (35% vs. 19%)

Conclusion: There was a significant incidence and frequency of hyponatremia after stroke. The prognosis and mortality rate of stroke patients are already poor, and hyponatremia worsens the situation.

Keywords: Inappropriate Antidiuretic Hormone Secretion, Cerebral Salt Wasting Syndrome, Hyponatremia, Stroke, Ischemic, and Hyponatremia.

INTRODUCTION

The WHO classified stroke as "rapidly acquired clinical symptoms of localized or widespread impairment of brain function with no clear non-vascular cause[1]." According to the WHO, about 20 million individuals worldwide have a stroke each year, 33/^{2} - thirds (5 million) die, and 33/^{2} - thirds become permanently disabled[2]. Every ten seconds, a stroke kills someone worldwide[3]. High blood pressure causes an 80percent of a total of strokes (7.6 million worldwide). Smoking, atrial fibrillation, heart failure, and heart attacks increase stroke risk. Ischemic and hemorrhagic strokes exist. Ischemic strokes may occur when a blood clot or fat deposit in the vessel walls clogs a brain-supplying blood vessel[4]. Ischemic cerebral infarction causes 80percent of strokes. A ruptured artery causes a hemorrhagic stroke. It causes 12% of strokes and is more deadly Clinical stroke diagnosis is followed by brain CT or MRI confirmation. Pakistan has 35% hyponatremia, according to estimates. 7. First-week hyponatremia is more likely to hinder stroke survivors' recovery. Post-stroke After a brain injury, hyponatremia occurs. After submitting electrolyte blood samples, data, and proforma, patients' hyponatremia was detected[5].

MATERIAL AND METHODS

This study was a descriptive cross-sectional study. From January 01, 2021, through December 31, 2022, all inpatients and outpatients of the Nephrology Institute of Kidney Disease were included in the study. Patients who had had a stroke were involved in the research, which followed them for one year. For this study, we assumed a 15% hyponatremia prevalence to determine our sample size. n z= 01xpx(01-P)/d2 Where N is the total number of people in the sample, z is the z-score (set at 1.90 to provide a 94% confidence level), p is the illness prevalence in decimal form, and d is the margin of error (8%). Cases of acute ischemic stroke from the ages of 20 to 82, both sexes combined, confirmed by history, neurological examination, and imaging modalities. However, the following patients are not eligible: Patients having a known history of a hemorrhagic stroke, transient ischemic attack, recurrent stroke, venous thrombosis, meningitis (viral, fungal, tuberculous, fungal), or brain abscess will be ruled out. Patients with preexisting signs of congestive heart failure and renal failure are not eligible. Patients having a history of or current symptoms consistent with gastroenteritis, head trauma, brain tumor, pulmonary Koch's, bacterial pneumonia, bronchogenic carcinoma, leukemia, lymphoma, recent surgery, or usage of drugs that may produce hyponatremia will not be accepted. Patients who met the inclusion criteria and were seen in the Neurology outpatient department or hospitalized with a diagnosis of ischemic stroke at Chandka Medical College Hospital Larkana were recruited in the research. The patient was briefed about the study's rationale and anticipated outcomes. We took down details about the subjects' identities, such as names, ages, and sexes.

Weight, height, waist circumference, and blood sugar were measured randomly. After obtaining the patient's informed and signed permission, each patient's information was recorded using a standardized data collection instrument (proforma: annex-A). The blood was transported to the lab, where the salt content could be analyzed. When the serum sodium level dropped below 120mEq/l, it was diagnosed as hyponatremia. SPSS 22 was used to analyze the data. Descriptive statistics determined the frequency and percentages of categorical variables, including gender, obesity, smoking, and diabetes. High blood pressure and low sodium levels. Quantitative factors such as age, salt level, BMI, blood pressure, and ischemic stroke duration were subjected to mean standard deviation analyses. A chi-square test was conducted to determine the impact of age, sex, hypertension, and diabetes on the outcome variable. The cutoff for significance was P0.04.

RESULTS

The study included 214 people who had had an ischemic stroke. There were 144 people treated inside the hospital and 60 treated outside. Out of the 164 patients, 64 (27%) were younger than 38 years old, and among them, 10 (5%) had hyponatremia. Of the 104 (48%) patients aged between 5 and 58, 18 (7%) had hyponatremia. The highest proportion of patients with hyponatremia were those over 62 (20%), although there was no difference in the risk of developing hyponatremia across the three age categories (p = 0.680). Image 1 from the Figure 1 (Table 1). Out of 214 patients, 138 (64%). Were male, and 35 (16%) had hyponatremia. Females made up 42%(20%), and 18%(7%) of the hyponatremic population. Hyponatremia in ischemic stroke is just as likely in males and females, as shown by the p-value of 0.986.

(table 2). Sixty-six (30%) patients were classified as obese, and eleven percent (14) of those individuals also suffered from hyponatremia. When compared to the 148 (71%) non-obesity stroke patients, 28 (12%) were hyponatremic, indicating that hyponatremia develops more commonly in obese patients than in non-obese patients (p = 0.049). (table3).

There were 42 patients (21%) with diabetes and 16 patients (8%) with hyponatremia in the group of stroke patients with diabetes; among the non-diabetic patients, 170 (79%), only 36 (15%) were hyponatremic, with a p-value of 0.09. (table 4). Sixty percent of patients had hypertension, and among those with hypertension, 19 percent had hyponatremia due to their ischemic stroke. However, only 4 percent of patients with normotension did, yielding a p-value of 0.02. This suggests that hypertension is a major risk factor for ischemic stroke and hyponatremia (table 5). The Chi-square statistic was used to determine significance. Fifty-two (23%) people who had an ischemic stroke also suffered from hyponatremia. Stroke prevalence by age group

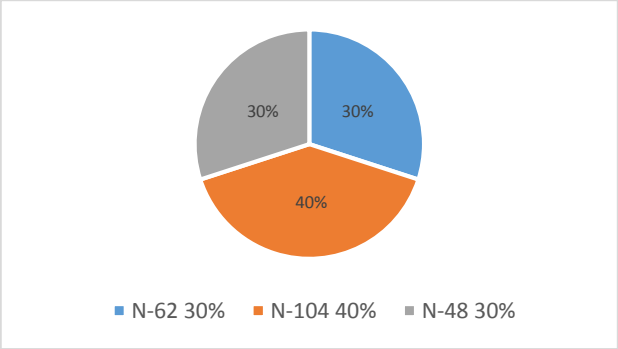

Figure 1: Distribution of Age at Ischemic Stroke Diagnosis (n=214)

Table 1: Hyponatremia age groups.

Age	(hyponatremia)		(Total)	P- value
	present	absent		
< 35	(7%) 10	(18%) 38	(20%) 48	
>41-65	(09%) 24	(38%) 80	(52%) 104	0.986
> 61	(7%) 18	(219%) 44	(30%) 62	
Total	52	162	214	

Table 2: Gender-Based Classification of Hyponatremia

Gender		hyponatremia		Total	p-value
		present	absent		
	Male	(16%) 34	(49%) 106	(66%) 140	0.989
	Female	(7%) 18	(25%) 56	(35%) 74	
Total		52	162	214	

Table 3: Stratification For Hyponatremia Concerning Obesity

		hyponatremia		Total	p-value
		present	absent		
	present	(12%) 24	(20%) 42	(32%) 66	0.051
Obesity	.absent	(11%) 28	(55%) 120	(68%) 148	
Total		52	162	214	

Table 4: Stratification for Hyponatremia concerning Diabetes Mellitus

		Hyponatremia		Total	p-value
		present	absent		
	*present	(7%) 32	(11%) 13	(21%) 42	
Diabetes	*absent	(16) 72	(64%) 68	(79%) 172	0.09
Total		52	162	214	

Table 5: Stratification of Hyponatremia concerning Hypertension

	Hyponatremia		Total	p-value
	present	absent		
Hypertensive	(19%)42	(41%) 86	(59%)106	0.04
Normotensive	(7%) 10	(36%) 38	(41%) 44	
Total	52	81	214	

DISCUSSION

The risks of a salt shortage were first highlighted in The McCane in 1935[6]. Peters et al., in 1951 at Yale, identified three neurologic patients with hyponatremia and presented their findings. Hyponatremia resulted from cerebral salt wasting disorder, as proposed by Cort at Yale in 1953[7]. Schwartz et al. published their SIADH research. For almost twenty years, no " CSW " was mentioned in any academic papers. Nelson et al. in 1981 coined the term cerebral salt wasting syndrome, which had previously been abandoned in the medical literature[8]. Neurological patients often have hyponatremia, an abnormally low sodium level. Sub-120 mEq/l sodium levels, hyponatremia affects 21% of hospitalized patients. Hyponatremia increases a patient's risk of hospital mortality by 1.4 times compared to those with normal blood salt levels. To maintain a stable internal environment, the body relies on several hormonal and physiological processes, the disturbance of which may result in an imbalance of fluids and electrolytes[9]. Sodium is the most abundant extracellular compound and hence the most important factor in determining serum osmolality. Serum osmolality is regulated by the combined actions of circulating vasopressin and water intake. Absolute plasma sodium values are inadequate to offer information on the patient's volume status because relative sodium concentration varies with water homeostasis[10]. Hyponatremia is a common medical condition that may affect up to 21 percent of individuals[11].

The expansion of the ECF is associated with higher GFR and renal blood flow in SIADH. Peripheral edema or distension of the veins in the neck are not present, which are signs of hypervolemia[12]. Lower blood levels of urea and uric acid are associated with decreased reabsorption in the proximal tubules, where urea and uric acid are reabsorbed. Reduced efficiency due to osmolality of 270mOsm/kg water. The urine osmolality during hypotonicity is more than a hundred mOsm/kg of water—clinical euvolemia. The decline of extracellular fluid volume does not manifest itself clinically[13]. No orthostasis, tachycardia, hypohydration, or decreased skin turgor was seen. High extracellular fluid volume does not manifest itself clinically. There is no edema or ascites. Urine sodium concentration of more than 20 mOsm/l despite a typical sodium intake and regular operation of the thyroid and adrenal glands[14-15]. You haven't taken any diuretics lately. Uric acid in the blood was 4. mg/dl. Fractional urea excretion is more than 50%; fractional sodium excretion is greater than 1% at blood urea nitrogen levels of 10 mg/dl. Untreated hyponatremia after infusion of 0.8% saline[16-17]

CONCLUSION

Twenty-three percent of people who have an acute ischemic stroke also have hyponatremia. People with hypertension and those between 61 and 82 are at higher risk. Both men and women were affected in the same way; there was no discrimination based on sexual orientation. People who are both overweight and diabetic are at a higher than twofold increased risk of suffering an ischemic stroke. Hyponatremia and, in particular, cerebral salt wasting are independent predictors of short- and long-term death after a stroke. Moreover, it increases the likelihood of a patient needing additional care after being discharged from the hospital. People with ischemic stroke should be tested for hyponatremia and treated promptly to reduce their risk of complications and death.

REFERENCES

1. Ischemic stroke care guidelines for Pakistan. Official guidelines of Pakistan Society of Neurology (approved in December 2009).
2. Shah SA, Siddiqui S. Siddiqui-Shah Depression Scale (SSDS): Development and Validation. Psychol Devel Soc. 1997;9:245-62.
3. Nazeer A, Kamal A, Khan KM, Tariq S. Frequency of complications in hospitalized stroke patients.Pak J Med Health. Sci. 2010;4:127-9.
4. J Stroke Cerebrovasc Disc.National Stroke Association.2014 May-June;23(5):850-4.
5. Astrom M, Adolfsson R, Asplund K. Major depression in stroke patients. A 3-year longitudinal study. Stroke. 1993;24:976-82. World Health Report 2009. Geneva: World Health Organization. (Cited

August;23.
6. Rosamond W, Flegal K, Gary Friday G, Furie K, Go A, Kurt Greenlund K, et al. Heart Disease and Stroke Statistics, A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee; 2007 update. (Cited 2014- 28
7. Truelsen T, Heuschmann PU, Bonita R, Arjundas G, Dalal P, Damasceno A, et al. Standard method for developing stroke registers in low-income and middle-income countries: experiences from a feasibility study of a stepwise approach to stroke surveillance. The Lancet Neurology. 2007; 6: 134-39.
8. Feigin VL, Lawes CMM, Bennett DA, and Anderson CS. Stroke epidemiology: A review of population-based studies of Incidence, prevalence, and case-fatality in the late 20th century. Lancet Neurology. 2003; 2:43-53.
9. World Stroke Campaign; World Stroke Organization; (Cited on 2011 August, 24)
10. Kaste M, Fogelholm R, Rissanen A. Economic burden of stroke and the evaluation of new therapies. Department of Clinical Neurosciences, Helsinki University Central Hospital, Finland; Public Health. 1998; 112: 102-112.
11. World Stroke Campaign; World Stroke Organization; (Cited on 2011 August, 24)
12. Steven C, Cramer MD. Repairing the Human Brain after Stroke: I. Mechanisms of Spontaneous Recovery. Annals of Neurology. 2008; 63: 272-87.
13. Spasovski G, Vanholder R, Allolio B, Annane D, Ball S, Bichet D,ET AL. Clinical practice guidelines on diagnosis and treatment of hyponatremia.Nephrol dial transplant.2014 February 25.
14. Sherlock M, Agha A, et al., Incidence and pathophysiology of severe hyponatremia in neurosurgical patients.Postgrad Med J.2009 Apr.85(1002):171-5.
15. Saleem S, Yousuf I, Gul A, Gupta S, Verma S. Hyponatremia in stroke. An Indian Acad Neurol.2014;17:55-57.
16. Home EJ, Zietse R, Hyponatremia and mortality: Moving beyond associations.Am J Kidney Dis.2013;62:139-49.
17. Leonard J, Garrett RE, Salottolo K, Slone DS, Mains CW, Carrick MM, et al. Cerebral salt wasting after traumatic brain injury; A literature review. Scand J Trauma Resusc Emerg Med .2015;23;98.