DOI: https://doi.org/10.53350/pjmhs22168372

ORIGINAL ARTICLE

Frequency of Hyponatremia in Patients with Ischemic Stroke Presenting in Neurology Department Chandika Medical College Larkana

NAGINA SHAIKH[1], SAMEENA MAJEED[2], SHAHNAZ SHAH[3], MUHAMMAD MUNWAR ALI[4], JAYSINGH[5], AIJAZ ALI[6]
[1]*Consultant Neurologist Neurology Department Chandka Medical College Hospital Larkana*
[2]*Consultant Neurologist Chandka Medical College Hospital Larkana*
[3]*Assistant professor, Dept Of Neurology, Jinnah Postgraduate Medical Center/Jinnah Sindh Medical University Karachi*
[4]*Assistant Professor Neurosurgery department SMBBMU Larkana*
[5]*Consultant Neurologist Dr Ruth k M Pfau Civil Hospital Karachi*
[6]*Assistant Professor Neurology CMC /SMBBMU Larkana*
Correspondence to: Nagina Shaikh, Email: dr.naginashaikh@gmail.com

ABSTRACT

Introduction: The World Health Organization describes a stroke as having "rapidly emerging clinical symptoms of localized or generalized impairment of brain function without obvious non-vascular cause1. Hyponatremia is more likely to impede stroke survivors' ability to recover from the condition. Our research evaluated the incidence of hyponatremia in ischemic stroke. Therefore, the precise size of the issue would be evaluated.

Objective: To determine the frequency of hyponatremia in patients with ischemic stroke.

Material and Methods: The design of this study was a descriptive cross-sectional study. All in patients and out patients coming in Neurology department of Chandka Medical College Hospital Larkana**,** and the duration of this study was Six months, from 13 October 2020 to 12 April 2021. A total of 107 stroke patients were included in this study. The purpose, risk and benefits of the study were explained to the patient on a prescribed Proforma,

Results: A total of 107 Ischemic stroke patients were included in this study. Most of the patients were above 40 years of age. The average age of the patients was 68 years. Out of 107 patients, 70(65%) were male and 37(35%) were female. Frequency of Hyponatremia in patients with ischemic stroke was observed in 24% cases. Rate of developing Hyponatremia was significantly high in age group of 60 to 80 years. Similarly Hyponatremia was significantly high in hypertensives as compared to non-hypertensive Patients (32% vs. 13% p=0.03) . There was no gender predilection seen, Diabetes increased the risk of developing hyponatremia about two folds. (38% versus 20%). Increased BMI, Obesity increased the risk of developing hyponatremia in the setting of ischemic stroke two folds. (36% vs 18%)

Conclusion: The prevalence and frequency of post-stroke hyponatremia was found to be considerable. This is especially concerning because hyponatremia has a worse effect than stroke itself on prognosis and death.

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

INTRODUCTION

The World Health Organization describes a stroke as having "rapidly acquired clinical symptoms of localised or widespread impairment of brain function with no evident non-vascular cause1." According to a WHO estimate, over 15 million people worldwide experience a stroke each year, of which approximately 33% (5 million) die and 33% become permanently incapacitated. Stroke claims a life globally every ten seconds, and it happens once every half-second. The primary risk factor for stroke, which accounts for more than 80% of all stroke occurrences (12.7 million globally), is high blood pressure. Smoking, atrial fibrillation, heart failure, and heart attacks are additional risk factors for stroke. The two types of strokes are ischemic and hemorrhagic. A blood clot or the hardening of the blood vessel as a result of the buildup of fat in the vessel walls might clog a blood vessel that supplies blood to the brain, resulting in an ischemic stroke. Ischemic brain infarction accounts for around 4/5 (more than 80%) of stroke patients. Hemorrhagic stroke is brought on by a blood artery rupturing, which results in bleeding. It accounts for 1/5th (13%) of all instances of stroke and carries a greater mortality risk. [3].

The first stroke diagnosis is made clinically, and imaging methods such as brain CT or MRI are then used to confirm the diagnosis. 4,5,6. Estimates place the frequency of hyponatremia in Pakistan as high as 34% 7. Hyponatremia in the first week is more likely to damage stroke survivors' ability to recover from the stroke. after stroke Hyponatremia is characterised as an electrolyte imbalance that results from a recent brain injury. (such as a stroke) Patients' hyponatremia was discovered after submitting blood samples for electrolytes, gathering data, and filling out proforma.

MATERIAL AND STUDY DESIGN

The design of this study was a descriptive cross-sectional study. All in patients and out patients coming in Neurology department of Chandka Medical College Hospital Larkana**,** and the duration of this study was Six months, from 13 October 2020 to 12 April 2021. 107 stroke patients were included in the study. The sample size was calculated with taking prevalence of hyponatremia as 16%. $N = Z^2 \times P \times (1-P) / d^2$ Where N = sample size of the study, Z = is the Z score and is taken as 1.96 for 95% confidence level, P = is prevalence of the disease expressed as decimal; and d = margin of error (7%).

Confirmed cases of acute ischemic stroke by history, neurological examination and imaging modalities from either sex having age ranging from 16 to 90 years. The following patients are excluded: patients with Hemorrhagic stroke, Transient ischemic stroke, recurrent stroke, venous thrombosis, meningitis (viral, fungal, tubercular, fungal) brain abscess will be excluded on the basis of clinical picture and and imaging studies of brain. Patients already having congestive cardiac failure and renal failure as evidenced by their previous medical record are excluded.

Exclusion criteria include any individuals with a history of gastroenteritis, head injury, brain tumour, pulmonary Koch's, bacterial pneumonia, bronchogenic carcinoma, leukaemia, lymphoma, recent surgery, and use of medications that might induce hyponatremia. Patients, attending the Neurology outpatient department and admitted in Chandka medical college hospital Larkana with diagnosis of ischemic stroke and fulfilling the inclusion criteria were enrolled for the study. The purpose and benefits of study were explained to patient. Demographic information including name, age and gender was recorded. BMI, blood pressure and random blood sugar levels were recorded. After taking informed and written consent from the patient and data collection instrument (proforma: annex-A) was filled for each patient. Blood collection was collected and sent to laboratory for sodium level. Hyponatremia was labelled when serum sodium level was below 130mEq/l.

Data was analyzed by SPSS version 17. Descriptive statistics was applied to calculate the frequencies and percentages of categorical variables such as gender, obesity, smoking diabetes

mellitus, hypertension and hyponatremia. Mean ± standard deviation was calculated for quantitative variables like age, sodium level, BMI, blood pressure and duration of ischemic stroke. Stratification was undertaken on age, sex, hypertension and diabetes mellitus and chi-square test was applied to see the effect of these on outcome variable. P<0.05 was taken as significant.

RESULTS

A total of 107 Ischemic stroke patients were included in this study. Out of them 77 were indoor patients, while 30 patients were outdoor. The number of patients having age Less than 40years were 31 (28%) out of them 5(4.6%) patients have hyponatremia, 52(49%) patients have the age range of 4-60 years, from this group 9 (8.5%) patients have hyponatremia. 24(22%) patients have age >60years, that have higher percentage i.e 12 (11.2%)of hyponatremia with p value of 0.789.that signifies that there is not much difference in risk of developing hyponatremia in three different age groups. (Figure 1) (Table 1). From 107 patients 70(65.4%) were male out of them 17 (15.9%) turned to be hyponatremic. Female number was 37(34.6%) out of them 9(8.4%) females were hyponatremic. With p value of 0.996. that indicates that both genders are equally prone to develop hyponatremia in ischemic stroke. (table 2). Obesity was seen in 33(31%) of patients, out of them hyponatremia was seen in 12(11.2%) of patients. While 14 (13.1%) were hyponatremic from 74(69%) non obese stroke patients with p value of 0.052, that signifies that hyponatremia frequently develop in obese patients as compared to non-obese. (table3).

Diabetes was associated with stroke in 21(20%) of patients, and hyponatremia was seen in 8 (7.5%) in this group, 86(80%) were non diabetic, and out of them 18 (16.8%) were hyponatremic, with a p value of 0.10 (table 4). Hypertension was seen in 63(59%) of patients, 20(18.7%) hypertensive patients having ischemic stroke have hyponatremia, while from 44(41%) normotensive patients only 6 (5.4%) patients have hyponatremia with p value of 0.03. that indicates that hypertension is major risk factor for ischemic stroke as well as development of hyponatremia in ischemic stroke (table 5). p- value was obtained using chi square test. Hyponatremia was seen in 26(24%) of ischemic stroke patients. Age distribution in stroke patients

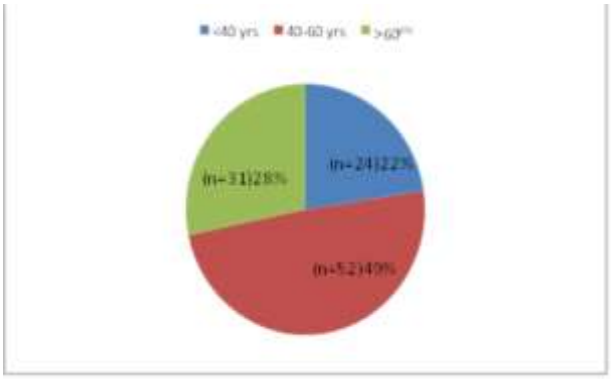

Figure 1: Age Distribution in Ischemic Stroke n=107

Table 1: Stratification of Hyponatremia with Respect to Age.

Age	Hyponatremia		Total	
	present	absent		P- value
Less than 40	(4.6%) 5	(17.8%) 19	(22%) 24	
40-60	(11.2%) 12	(37.4%) 40	(49%) 52	0.789
More than 60	(8.5%) 9	(20.5%) 22	(29%) 31	
Total	26	81	107	

Table 2: Stratification of Hyponatremia with Respect to Gender

Gender		hyponatremia		Total	p-value
		present	absent		
	Male	(15.9%) 17	(49.5%) 53	(65.4%) 70	0.996
	Female	(8.4%) 9	(26.2%) 28	(34.6%) 37	
Total		26	81	107	

Table 3: Stratification For Hyponatremia With Respect To Obesity

		hyponatremia		Total	p-value
		present	absent		
	present	(11.2%) 12	(19.6%) 21	(31%) 33	0.052
Obesity	absent	(13.1%) 14	(56.1%) 60	(69%) 74	
Total		26	81	107	

Table 4: Stratification for Hyponatremia with Respect To Diabetes Mellitus

		hyponatremia		Total	p-value
		present	absent		
	present	(7.5%) 8	(12.1%) 13	(20%) 21	
Diabetes	absent	(16.8%) 18	(63.6%) 68	(80%) 86	0.10
Total		26	81	107	

Table 5: Stratification of Hyponatremia with Respect to Hypertension

	hyponatremia		Total	p-value
	present	absent		
Hypertensive	(18.7%)20	(40.2%) 43	(59%) 63	0.03
Normotensive	(5.6%) 6	(35.5%) 38	(41%) 44	
Total	26	81	107	

DISCUSSION

The dangers of salt deficiency were originally discussed in The McCane in 1936. Three neurologic patients with hyponatremia were recognised and reported by Peters et al. in 1950 at Yale. According to Cort in Yale in 1952, the patient had cerebral salt wasting disease, which led to hyponatremia. The SIADH study was published by Schwartz et al. The term CSW disappeared from literature for more than two decades. The phrase cerebral salt wasting syndrome, which had been dropped from the literature, was first used by Nelson et al in 1981. The most typical electrolyte imbalance in neurological patients is hyponatremia. 20% of hospitalised patients experience hyponatremia, which is defined as a sodium level of less than 130mEq/l. It is 1.5 times more likely for patients with hyponatremia to die in the hospital than for patients with normal blood salt levels. Internal body homeostasis is tightly controlled by a variety of hormonal and physiological processes; any disruption in any of these processes leads to a loss of water and electrolyte balance. Since sodium is the main extracellular component, it is the main determinant of serum osmolality. The interaction between circulating vasopressin and water consumption controls serum osmolality. Since relative sodium concentration fluctuates with water homeostasis, absolute plasma sodium readings are insufficient to provide information on the patient's volume status. A relatively prevalent illness that affects up to 22% of patients is hyponatremia.

ECF expansion in SIADH is characterised by elevated GFR as well as increased renal blood flow. There are no indications of hypervolemia, such as peripheral edoema or neck vein distension. Because urea and uric acid are reabsorbed in proximal tubules and there is generally less reabsorption occurring in proximal tubules, it is linked to lower levels of urea and uric acid in the blood. 275mOsm/kg of water less effective osmolality. During hypotonicity, urine osmolality is more than 100 mOsm/kg of water. Euvolemia clinically. There are no visible clinical symptoms of extracellular fluid volume loss. No tachycardia, reduced skin turgor, dry mucous membrane, or orthostatis were seen. There are no visible clinical symptoms of high extracellular fluid volume. No ascites or edoema. sodium >20mOsm/l in the urine with normal dietary salt consumption. thyroid and adrenal function that is normal. No recently used diuretic medications. 4 mg/dl plasma uric acid. 10 mg/dl of blood urea nitrogen fractional urea excretion exceeds 55%; fractional sodium excretion exceeds 1%. Hyponatremia that was not treated after a 0.9% saline infusion

restricting fluid intake to treat hyponatremia. Inadequate urine dilution (100mOsm/kg of water) or abnormal results on the water load test (80% excretion of 20 ml of water per kilogramme of body weight over a period of 4 hours). Despite clinical euvolemia and hypotonicity, elevated plasma AVP levels.

CONCLUSION

In 24% of individuals with an acute ischemic stroke, hyponatremia develops. In hypertensive individuals and those between the ages of 60 and 80, the incidence is greater. There was no preference based on gender; both men and women were equally impacted. Obese and known diabetic people have a twofold greater chance of having an ischemic stroke. A stroke's short- and long-term mortality can be independently predicted by hyponatremia and, in particular, cerebral salt wasting. Additionally, it puts patients at risk for longer hospital stays and worse discharge attitudes. To decrease morbidity and short- and long-term mortality, individuals with ischemic stroke should be evaluated for hyponatremia early on and given the proper therapy.

REFERENCES

1. WHO MONICA Project Principal Invest .The world health organisation monica project (monitoring trends and determinants in cardiovascular disese.): A major international collaboration. Journal of clinical epidemiology.1988;41(2):105-114.
2. World Health Report 2007. Geneva: World Health Organization. (Cited August 23)
3. Qamar ZK. Depression among stroke patients and relation with demographic and stroke characteristics. 2011.
4. Ischemic stroke care guidelines for Pakistan. Official guidelines of Pakistan Society of Neurology (approved in December 2009).
5. Shah SA, Siddiqui S. Siddiqui-Shah Depression Scale (SSDS): Development and Validation. Psychol Devel Soc. 1997;9:245-62.
6. Nazeer A, Kamal A, Khan KM, Tariq S. Frequency of complications in hospitalized stroke patients.Pak J Med Health. Sci. 2010;4:127-9.
7. J Stroke Cerebrovasc Disc .National Stroke Association.2014 May-June;23(5):850-4.
8. 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.
9. 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
10. Truelsen T, Heuschmann PU, Bonita R, Arjundas G, PDalal 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.
11. 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.
12. World Stroke Campaign; World Stroke Organization; (Cited on 2011 August, 24)
13. 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.
14. World Stroke Campaign; World Stroke Organization; (Cited on 2011 August, 24)
15. Steven C, Cramer MD. Repairing the Human Brain after Stroke: I. Mechanisms of Spontaneous Recovery. Annals of Neurology. 2008; 63: 272-87.
16. 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 feb 25.
17. Sherlock M, Agha A et al,Incidence and pathophysiology of severe hyponatremia in neurosurgical patients.Postgrad Med J.2009 Apr.85(1002):171-5.
18. Saleem S,Yousuf I,Gul A,Gupta S,Verma S. Hyponatremia in sroke. An Indian Acad Neurol.2014;17:55-57.
19. Hoom EJ,Zietse R,Hypoantremia and mortality:Moving beyond associations .Am J Kidney Dis.2013;62:139-49.
20. Leonard J, Garrett RE, Salottolo K, Slone DS, Mains CW, Carrick MM, et al. Cerebral salt wasting after traumatic brain injury; A review of the literature . Scand J Trauma Resusc Emerg Med .2015;23;98.
21. Kalita J, Singh RK, Misra UK, Cerebral Salt Wasting Is The Most Common Cause Of Hyponatremia In Stroke. J Stroke Cerebrovasc Dis.2017;26:1026-32.
22. Saleem S et al .Hyponatremia in stroke .An Indian academy Neurol .2014;17:55-57.
23. Cuesta M, Thompson CJ, The Syndrome of inappropriate anti-diuresis. Best pract Res Clin endocrinol Metab .2016 march 30(2);175-87.