

Electrolyte Imbalance In Acute Stroke

Meenakshi Kalyan*, Waleed Khalid Nahdi**, S.A.Kanitkar***, Abhijit Moharkar****, Rajdeb Saha*****

* Associate Professor, ** Junior Resident, *** Professor, **** Junior Resident, Dept. Of Medicine, Dr. D.Y.Patil Medical College, Pimpri-Pune-. 411018.

Abstract: Background: Electrolyte imbalance is an important cause of mortality and morbidity in cerebro vascular accident. Timely treatment can decrease the mortality. Objective: To study the electrolyte disturbances including serum and urinary sodium, potassium and chlorides in acute stroke with its comparison in ischaemic and haemorrhagic stroke. Methods: Serum electrolytes (sodium potassium and chlorides) and urinary electrolytes were investigated in 50 acute stroke patients in a tertiary care hospital. The data was analysed using Chi-square test using SPSS (Statistical package for social science) software. Results: Mean age of the patients was 54 years. 23 patients (46.0%) had haemorrhagic stroke and 27 (54.0%) had ischaemic stroke. 25 (50.0%) had dyselectrolytaemia which is statistically significant ($p = 0.047$). 10 (37.0%) ischaemic stroke patients and 6 (26.1%) haemorrhagic stroke patients had hyponatremia which is significant ($p = 0.048$). Conclusion: Hyponatremia was found more in ischemic strokes. [Meenakshi K NJIRM 2017; 8(4):23-26]

Key Words: cerebrovascular accident, electrolyte imbalance.

Author for correspondence: Meenakshi Kalyan, RH No. 24, Mayureshwar, Sai Nisarg Park, Pimple Saudagar Pune 411027 M: 9850342276 E-Mail: drmeenakshi.kalyan@gmail.com

Introduction: Stroke is one of the leading causes of death and disability in India. The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population based studies¹.

Disorders of sodium and potassium concentration are the commonest electrolyte abnormalities found in cerebro vascular accident (CVA) and may contribute to mortality unless corrected urgently². Hyponatraemia, hypernatraemia resulting from inappropriate secretion of antidiuretic hormone (ADH), increase in Brain Natriuretic-peptide (BNP), Atrial Natriuretic peptide and inappropriate fluid intake and loss; can lead to complications like seizures and death³.

It is often precipitated by concomitant use of various drugs like diuretics. Syndrome of inappropriate ADH secretion (SIADH) is a leading cause of electrolyte disturbance in these patients⁴. SIADH and the consequent hyponatraemia is likely to aggravate the brain edema in CVA. The INTERSALT study has shown that in CVA patients there is increased renal excretion of various cations and this also contributes to the serum electrolyte disturbances⁵. Mild hypo or hypernatremia may be auto reversible but may cause death in severe conditions. Common complications after acute stroke include neurological complications like recurrent stroke and seizures and medical complications like chest infection, UTI, bowel or bladder dysfunction, deep vein thrombosis, pulmonary embolism, upper gastrointestinal bleeding, aspiration, bedsores, falls, malnutrition⁶.

Studies showing the extent of dyselectrolytemia in CVA patients are rare from India.

This study is designed to document disturbances in serum sodium, potassium and chlorides as well as the urinary excretion of these electrolytes in acute phase of stroke patients.

Methods: This is a cross sectional study conducted on 50 patients of Acute stroke in Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune over a period of two years after obtaining ethical committee approval. Patients of any age between 20-70 yrs, diagnosed with CVA infarct/hemorrhage by appropriate imaging, either CT scan or MRI, were included.

Patients with sub-arachnoid haemorrhage (SAH), renal failure, previous diuretic or steroid therapy, patients with documented infection were excluded from the study. Patients presenting with severe hyperglycaemia (>300 mg/dl), severe Hypertriglyceridaemia (> 400 mg/dl) were excluded from the study to avoid the chance of pseudohyponatraemia.

Complete history and thorough general physical examination and CNS examination was performed in all patients. Investigations like complete blood count, blood sugar level, liver function test, renal function test, lipid profile, serum sodium, potassium, chlorides urine sodium and potassium, serum osmolality were also done. The radiological investigations included Chest X-ray, USG Abdomen and Pelvis, CT

scan Brain and MRI Brain plain/contrast with veno/angiogram.

Statistical Analysis were assessed using mean, standard deviation, Pearson chi-square and was considered significant only if the p value is less than 0.05.

Results: 31 (62.0%) stroke patients were male and 19 (38.0%) were female. Out of 50 stroke patients, 27 (54.0%) had headache, 25 (50%) had vomiting, 14 (28%) had vertigo, 3 (6%) had seizure, 14 (28%) had weakness in limb. 10 (20%) patients had no symptoms at all. Amongst these associated risk factors were found in patients, 38 (76%) hypertensive, 24 (48.0%) diabetic and 29 (58.0%) were alcoholic and smokers. 16 (69.6%) haemorrhagic stroke patients had headache in comparison to 11 (40.7%) ischaemic stroke patient. 16 (69.6%) haemorrhagic stroke patients had vomiting in comparison to 9 (33.3%) ischaemic stroke patient. The association between type of stroke and symptoms was not statistically significant. ($p > 0.05$). Maximum patients were from 51-60 years age groups followed by 61-70 years age group as shown in Table 1.

23 patients (46.0%) had haemorrhagic stroke and 27 (54.0%) had ischaemic stroke. (Figure 1). 25 patients

(50%) had dyselectrolytemia (Table 3) which is significant ($p=0.047$).

Table 1: Distribution of stroke patients according to age

Age (in years)	Total	Percentage
≤50	6	12.0%
51-60	15	30.0%
61-70	12	24.0%
71-80	11	22.0%
>80	6	12.0%
Total	50	100%

Figure 1: Distribution of stroke patients according to type of stroke

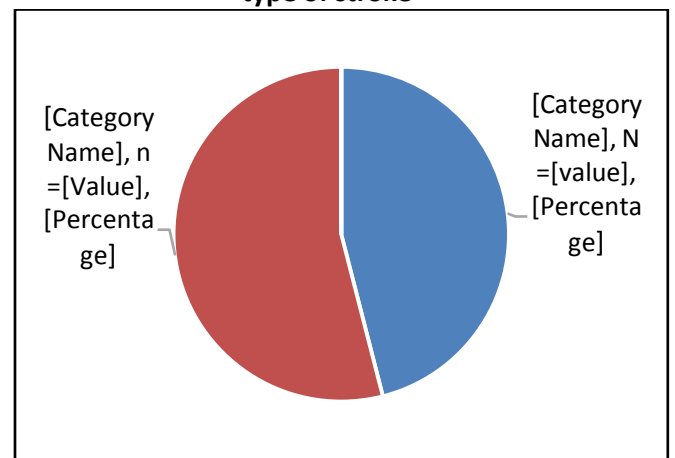


Table 2: Comparison of various laboratory investigation between haemorrhagic stroke and ischaemic stroke

Investigations	Haemorrhagic stroke (n=23) (Mean ± SD)	Ischaemic stroke (n=27) (Mean ± SD)	P values
serum osmolality (mmol/kg)	298.7 ± 23.5	301.4 ± 21.6	0.6748
urine sodium (mEq/L/24 hours)	60.3 ± 9.4	63.3 ± 10.4	0.6346
urinary potassium (mEq/L/24 hours)	75.6 ± 12.5	71.4 ± 11.7	0.7403
S. Cholesterol (mg/dl)	234.5 ± 43.5	246.7 ± 36.9	0.4189
HDL (mg/dl)	110.5 ± 16.8	112.4 ± 17.1	0.9409
LDL (mg/dl)	136 ± 13.2	142.7 ± 21.4	0.0243
TG (mg/dl)	167.2 ± 31.5	175.3 ± 26.7	0.4167
S. Creatinine (mg/dl)	1.27 ± 0.62	1.81 ± 0.48	0.2112
BUN (mg/dl)	9.2 ± 1.6	12.5 ± 1.9	0.4162

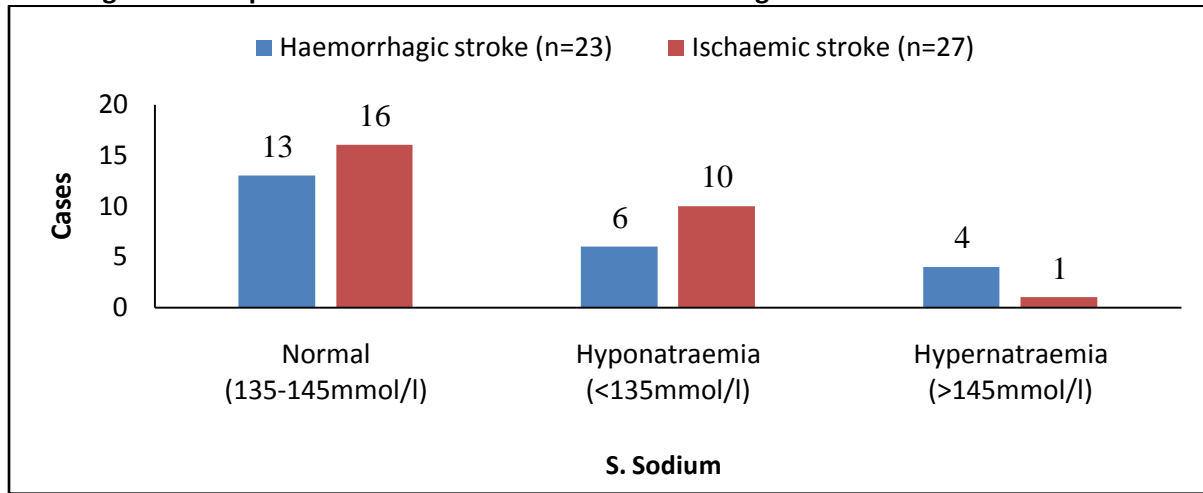
Table 3: Association of type of stroke with dyselectrolytaemia

Dyselectrolytaemia	Haemorrhagic stroke (n=23)		Ischaemic stroke (n=27)	
	Frequency	%	Frequency	%
Present	08	34.7%	17	62.9%
Absent	15	65.3%	10	37.1%

$p = 0.047$

10 (37.0%) ischaemic stroke patients and 6 (26.1%) haemorrhagic stroke patients had hyponatremia (Figure 2) which is significant ($p=0.048$).

Figure 2: Comparison of S. Sodium between haemorrhagic stroke and ischaemic stroke



$p=0.048$

10 (43.5%) haemorrhagic stroke patients had hypokalaemia in comparison to 6 (22.2%) ischaemic stroke patient. 12(52.2%) haemorrhagic stroke patients had normal serum potassium level in comparison to 18 (66.7%) ischaemic stroke patients. The association between type of stroke and hypokalaemia and hyperkalaemia was not statistically significant. ($p > 0.05$) 5 (21.7%) haemorrhagic stroke patients had hypochloraemia in comparison to 3 (11.1%) ischaemic stroke patient. 18 (78.3%) haemorrhagic stroke patients had normal serum chloride level in comparison to 21 (85.2%) ischaemic stroke patients. The association between type of stroke and serum chloride level was not statistically significant. ($p > 0.05$)

Discussion: Stroke is the third most common cause of death in developed nations after ischaemic heart disease and cancer in developed countries.

Maximum patients were from 51-60 years age groups (30.0%) followed by 61-70 years age group (24.0%). In the study conducted by Hasaan H. Musa et al⁷, the common affected age group was between 41 and 60 years (42.55%), followed by age group 61 and 80 (40.96%).

In our study 31 were males and 19 were females. Boutayeb et al⁸ indicated that stroke is more prevalent among men than women with ratios varying from 1.3:1 to 2:1.

In our study, out of 50 stroke patients, 38 (76%) had hypertension, 24 (48.0%) had diabetes and 29 (58.0%) were alcoholic and hypertension was the most associated risk factor. Sokrab TO et al⁹ and Longo et al¹⁰, found that hypertension was the most common associated risk factor. Mean LDL mg/dl was 139.5 ± 18.4 and was found statistically significant.

In the present study of 50 stroke patients, 25 (50.0%) had dyselectrolytaemia. The study conducted by Hasan MK et al¹¹, 70% of all patients with acute stroke had electrolyte disturbances. In the present study, 8 (34.7%) haemorrhagic stroke patients had dyselectrolytaemia in comparison to 17 (62.9%) ischaemic stroke patient. The association between type of stroke and dyselectrolytaemia was statistically significant ($p=0.047$). The study conducted by Mahmudur Rahman Siddiqui et al¹² 53% of total acute stroke patients had dyselectrolytaemia. 62.22% of acute haemorrhagic stroke & 43.39% of acute ischaemic stroke patients had dyselectrolytaemia.

Of our 50 stroke patients, 16 (32.0%) patients had hyponatraemia and 5 (10.0%) had hypernatraemia and 29 (58.0%) had normal serum sodium levels. Also in present study, 10 (37.0%) ischaemic stroke patients had hyponatremia in comparison to 6 (26.1%) haemorrhagic stroke patients. 13 (56.5%) haemorrhagic stroke patients had normal serum sodium level in comparison to 16 (59.2%) ischaemic stroke patient. The association between type of stroke and serum sodium level was statistically significant

($p=0.048$). In our study serum and urinary Potassium, chlorides and bicarbonates were not statistically significant.

This was similar to the study conducted by Hasaan H. Musa et al,⁷ Sisir Chakraborty et al,¹³ and by Hasan MK et al¹¹, which had prevalence of hyponatraemia in ischemic strokes.

Conclusion: Incidence of Hyponatremia was relatively higher in ischemic strokes as compared to other electrolytes. Close monitoring of serum electrolytes must be done in all patients who are admitted with stroke in order to properly manage and decrease the mortality rate.

References:

- Pandian JD, Sudhan P. Stroke Epidemiology and Stroke Care Services in India. *Journal of Stroke*. 2013;15(3):128-134. doi:10.5853/jos.2013.15.3.128.
- Kusuda K, Saku Y, Sadoshima S et al. Disturbances of fluid and electrolyte balance in patients with acute stroke. *Nihon Ronen Igakkai Zasshi* 1989; 26: 223-7.
- Coenraad M J, Meinders A E, Tall J C et al. Review Hyponatraemia in intracranial disorders. *The Netherlands Journal of Medicine* 2001;58; 123 – 127.
- Moussa NA, Osman AR, Yahya TM. Acute hyponatremic encephalopathy after a cerebrovascular accident. *Am J Med Sci* 1998; 316: 56-9.
- Xie JX, Sasaki S, Joossens JV et al. The relationship between urinary cations obtained from the INTERSALT study and cerebrovascular mortality. *J Hum Hypertens* 1992; 6: 17-21.
- Navarro J C, Bitanga E, Suwanwela N et al. Complication of acute stroke: A studying ten Asian countries, *Neurology Asia* 2008; 13: 33 – 39
- Hasan MK, Hasan AB, Rubaiyat KA. Electrolyte Disturbances in Acute Phase of Stroke Patients. *Dinajpur Med Col J* 2013 Jan; 6 (1):12-16.
- Boutayeb A, Derouich M, Boutayeb W, Lamlili MEN. Cerebrovascular Diseases and Associated Risk Factors in WHO Eastern Mediterranean Countries, *Cardiology and Angiology*. 2014 An. *Inter. J.* 2(1):62-75.
- Sokrab TO, Sid-Ahmed FM, Idris MNA. Acute Stroke Type, Risk Factors, and Early Outcome in a Developing Country: A View from Sudan Using a Hospital-Based Sample. *J Stroke Cerebrovasc. Dis.* 2002. 11(2): 63-5.
- Longo-Mbenza B, Lelo TM, Mbulu PJ. Rates and predictors of stroke-associated case fatality in black Central African patients. *Cardiovasc.* 2008. *J. Afr.* 19:72-6
- Hasan MK, Hasan AB, Rubaiyat KA. Electrolyte Disturbances in Acute Phase of Stroke Patients. *Dinajpur Med Col J* 2013 Jan; 6 (1):12-16.
- Mahmudur Rahman Siddiqui, Quazi Tarikul Islam, Md Azharul Haque, Md Javed Iqbal, Ahmed Hossain, Yousuf Ur Rahman, Shahriar Mahbub, Asif Alam Sazzad. Electrolytes status in different type of acute stroke patients and their correlation with some common clinical Presentation. *J MEDICINE* 2012; 13: 133-137
- Sisir Chakraborty, Kaushik Ghosh, Rajdip Hazra, Rabindra Nath Biswas, Susmita ghosh, Ambarish Bhattacharya, Sukdeb Biswas. Serum and urinary electrolyte levels in Cerebro-Vascular Accident patients: A cross sectional study. *American Journal of Internal Medicine* 2013; 1(4): 36-39.

Conflict of interest: None
Funding: None
Cite this Article as: Meenakshi K, Waleed N, S. Kanitkar, Abhijit M, Rajdeb S. Electrolyte Imbalance In Acute Stroke. <i>Natl J Integr Res Med</i> 2017; 8(4):23-26