Original Article

Dyselectrolyteaemia in Stroke Patients at a Tertiary Level Hospital in Bangladesh

Pal BK[1], Majumder MI[2], Chowdhury NH[3], Das P[4], Saha CK[5], Basak PM[6]

Abstract:
Background: *Stroke is a neurological catastrophe, which is a major cause of death and disability in Bangladesh. Dyselectrolyteaemia particularly hyponatraemia complicates the condition of the patient of the stroke. WHO defines stroke as sudden development of neurological deficit, focal or global, persisting for more than 24 hours or patient dies within 24 hours, which is vascular in origin and non-epileptic and non-traumatic in nature.* ***Objective:*** *To find out the type of dyselectrolyteaemia in stroke, relationship between the type of stroke and electrolyte imbalance and to observe grading of hyponatraemia.* ***Design & Place of Study:*** *This was a cross sectional study which was conducted in the Department of Medicine, Sher-E-Bangla Medical College Hospital, Barisal, from 1st September 2004 to 31st July 2006.* ***Methods:*** *A total of 50 patients with stroke was included in the study after confirming with radiological investigation.* ***Results:*** *Fifty cases including 32 male (64%) and 18 female (36%) aged 30 to 70 years above were studied. Most of the incidence of stroke was between the ages of 50 to 69 years. 19 patients (38%) had electrolyte imbalance. Out of all patients with electrolyte imbalance 100% had hyponatraemia, 52% had hypochloraemia and 10.5% had hypokalaemia. Electrolyte imbalance was more common in haemorrhagic stroke (42.85%) than ischaemic stroke (31.80%).* ***Conclusion:*** *Dyselectrolyteaemia occurs in stroke. Hyponatraemia is the commonest type, common in elderly and more in haemorrhagic stroke.*

Key words: Dyselectrolyteaemia, Stroke, Hyponatraemia, hypokalaemia

Received: July 25, 2016; **Accepted:** August 5, 2016

Introduction:
Stroke is the third most common cause of death in the developed world and is the most common cause of adult physical disability[1]. About one-fifth of patient with an acute stroke will die within a month of the event and half of those who survive will be left with physical disability[2].

There are several factors which are associated with stroke. Some of which are fixed and some are modifiable. Fixed factors are age, gender, race, heredity, previous ischaemic vascular events (MI, stroke), high fibrinogen and modifiable factors are high blood pressure, heart disease, diabetes mellitus, hyperlipidemia, smoking, excessive alcohol consumption, polycythemia, elevated homocysteine, elevated anti-cardiolipin antibodies, low serum folate obesity, and oral contraceptives[2-4].

Electrolytes take part an important role in various types of disease process. Traditional modifiable risk factors are now being treated but there is a pressing need to identify additional treatable risk factors that are easily measured and highly prevalent in general population. There is hardly available data on serum electrolytes level after cerebrovascular events in Bangladesh. After stroke, electrolyte imbalance is a common phenomenon when patients undergone tube feeding.

Electrolyte imbalance is mostly caused by Cerebral Salt Wasting (CSW), enteral tube feeding, vomiting, enteritis, inappropriate use of intravenous fluid and inadequate intake due to dysphagia, dementia, delirium and use of diuretics. Some previous studies revealed some sort of electrolyte imbalance immediate after stroke[5-8].

Materials and Methods:
Fifty patients of age more than 30 years diagnosed as stroke were included in the study after taking written consent. Non probability (purposive) sampling method was used. All patients were selected consecutively after considering inclusion (patients above 30 years of age, patients with stroke after confirming with radiological investigations) and exclusion criteria (Age less than 30 years, patients with history of head injury, patients with SOL in the brain).

[1] Dr. Bablu Kumar Pal, Assistant Professor, Department of Nephrology, Comilla Medical College, Comilla, Bangladesh.
[2] Prof. Md. Mahabubul Islam Majumder, Professor, Department of Medicine, Comilla Medical College, Comilla, Bangladesh.
[3] Dr. Md. Nazmul Hasan Chowdhury, Associate Professor, Department of Neurology, Comilla Medical College, Comilla, Bangladesh.
[4] Dr. Panchanan Das, Assistant Professor, Department of Neurology, Comilla Medical College, Comilla, Bangladesh.
[5] Dr. Chinmoy Kumar Saha, Assistant Professor, Department of Medicine, Comilla Medical College, Comilla, Bangladesh.
[6] Dr. Prabir Mohan Basak, Assistant Professor, Department of Medicine, Rajshahi Medical College, Rajshahi, Bangladesh.

Address of Correspondence: Dr. Bablu Kumar Pal, Assistant Professor, Department of Nephrology, Comilla Medical College, Comilla, Bangladesh. Mobile: +8801915579839, Email: drbablu98@gmail.com

Investigations that were done in this study were Blood for TC, DC, ESR & Hb%, Urine RME, Serum Creatinine, Serum Lipid Profile (Fasting), Serum Electrolytes, ECG, CT Scan of head. We had considered Normal range of electrolytes as Serum Sodium: 135-145 mEq/L, Serum chloride: 95-110 mEq/L, Serum potassium: 3.5-5 mEq/L. The relationships between different variables were analyzed with the Chi-square test using the software SPSS. Statistical significance was set at $p<0.05$ and confidence interval was set at 95% level.

Results:

Out of 50 patients 14 (28%) patients were above 70 years of age, 15 (30%) within 61-70 years of age, 13 (26%) within 51 to 60 years, 5 (10%) within 41 to 50 years of age and 3 (6%) within 31 to 40 years of age. Among the patients 32 (64%) were male and 18 (36%) were female. Male and female ratio was 1.77:1.

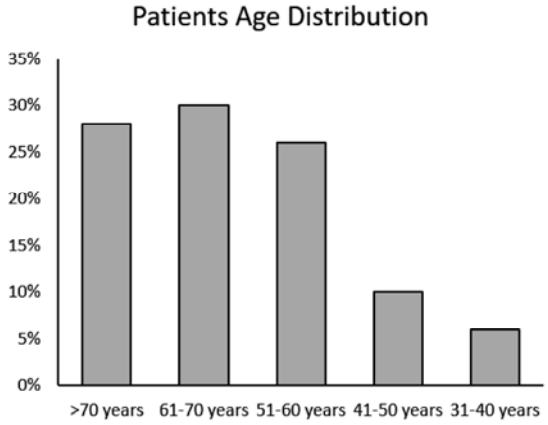

Figure-1: Age distribution of the patients

Among the stroke patients 44% had cerebral infarction and 56% had haemorrhagic stroke. Concomitant diseases of the stroke patients are expressed in Table I. Among the patients 52% patients were smoker, 32% had habit of tobacco leaf or Jorda chewing and 20% subjects had the habit of both.

Table-I: Concomitant disease distribution of the stroke patients

Concomitant Diseases	Number of the Patients	Percentage
Hypertension	34	68%
Hypercholesterolaemia	13	26%
Diabetes mellitus	10	20%

Thirty eight percent of the patients had electrolyte imbalance and 62% had serum electrolytes within normal range. Out of all patients with electrolytes imbalance 100% had hyponatraemia, 52% had hypochloraemia and 10.5% had hypokalaemia. 90% of patients had mild, 5% had moderate and 5% had severe hyponatraemia (Table II).

Table-II: Distribution of electrolyte imbalance among the patients

Electrolytes imbalance	Percentage of the Patients		
Hyponatraemia	100%	Mild Moderate Severe	90% 5% 5%
Hypochloraemia	52%		
Hypokalaemia	10.5%		

Up to 60 years of age group, 3 (16%) patients had hyponatraemia. Above 60 years age group, 16 (41%) patients had hyponatraemia. Statistically significant difference was observed in term of serum sodium level within age group ($p<0.001$). Within ischaemic stroke group, 7 (31%) patients had hyponatraemia. Within haemorrhagic stroke group, 12 (42%) patients had hyponatraemia and No statistically significant difference was observed in term of serum sodium level and type of stroke ($p>0.05$).

Table-III: Percentage of hyponatraemia in the stroke patients

Stroke Type	Patients with Hyponatraemia	
	Number	Percentage
Ischaemic stroke	07	31%
Haemorrhagic stroke	12	42%

Discussion:

This study was carried out to find out the type of dyselectrolyteaemia in stroke, relationship between the type of stroke and dyselectrolyteaemia in stroke and to observe grading of hyponatraemia in hospitalized patient in Sher-E-Bangla Medical College Hospital, Barisal.

A total number of 50 cases of stroke patients were selected. Patients diagnosed clinically as stroke, were evaluated by laboratory investigations. Pattern of dyselectrolyteaemia and its relation with stroke patients were identified.

Dyselectrolyteaemia is common in stroke which is mostly caused by Cerebral Salt wasting (CSW), vomiting, enteral feeding and enteritis, inappropriate use of intravenous fluid and inadequate intake due to dysphagia, dementia, delirium and use of diuretics[5-8].

Stroke frequency rises exponentially with increasing age[9-10]. In the present study, all patients were grouped in five age groups. Majority of the study subjects (94%) were above the age of 40 years and the peak incidence was between 61 to 70 years (30%). Men suffer more than women from stroke

and 64% were male and 36% were female i.e. male incidence was 28% higher than female with a ratio of 1.77:1. The rate of haemorrhagic stroke was higher than ischaemic stroke. Out of all patients 34 (68%) had hypertension, 13 (26%) had hypercholesterolaemia, 10 (20%) had diabetes mellitus that resembles the previous studies[11].

In this study, hyponatraemia and hypochloraemia were more common than hypokalaemia and dyselectrolyteaemia was more common in haemorrhagic stroke (42.85%) than ischaemic stroke (31.80%). Similar findings were observed in other related studies[12,13,14].

Limitations:
This study had some limitations. Sample size was small. So, it may not be representative of other centre.

Conclusion:
Electrolyte imbalance is common in stroke. Hyponatraemia is the commonest electrolyte abnormality in stroke, common in elderly patients and commoner in haemorrhagic stroke than in ischaemic stroke.

References:

1. Allen CMC, Lueck CJ, Dennis M. Neurological disease. In: Boon NA, College NR, Walker BR, Hunter JAA (Eds.), Davidson's Principles & Practice of Medicine, 20th ed. New York: Churchill Livingstone; 2006. p 1145-1256.

2. Amos AF, McCarty DJ, Zimmet P. The rising global burden of diabetes and its complications: estimates and projections to the year 2010. Diabet Med. 1997; 14 Suppl 5: S1-85.

3. Ropper AH, Brown RH. Cerebrovascular Diseases. In: Adams and Victor's Principles of Neurology, 8th ed. New York: McGraw-Hill; 2005. p 661-740.

4. Biller J, Love BB. Ischemic cerebrovascular disease. In: Bradley WG, Darott RB, Fenichel GM, Jankovic J (Eds.), Neurology in Clinical Practice, 4th ed. Philadelphia: Butterworth-Heinemann; 2004. p 1197-1245.

5. Mohr JP, Choi DW, Grotta JC, Weir B, Wolf PA (Eds.). Stroke Pathophysiology, Diagnosis and Management, 4th ed. London: Churchill Livingstone; 2004. p 383.

6. Oh H, Seo W. Alterations in fluid, electrolytes and other serum chemistry values and their relations with enteral tube feeding in acute brain infarction patients. J Clin Nurs. 2007; 16 (2): 298-307.

7. Wade S, Smith S, Johnston C, Easton JD. Cerebrovascular diseases. In: Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL (Eds.), Harrison's Principles of Internal Medicine, 16th ed. New York: McGraw-Hill; 2005. p 2372-86.

8. Sakr Y, Rother S, Ferreira AM, Ewald C, Dünisch P, Riedemmann N, et al. Fluctuations in serum sodium level are associated with an increased risk of death in surgical ICU patients. Crit Care Med. 2013; 41 (1): 133-42.

9. Botania R, Beaglegore R, North JDK. Events, incidence and case fatality rates of cerebrovascular disease in Auckland, New Zealand. Am J Epidemiology. 1984; 120: 236-43.

10. Kusuda K, Saku Y, Sadoshima S, Kozo I, Fujishima M. Disturbances of fluid and electrolyte balance in patients with acute stroke. Nihon Ronen Igakkai Zasshi. 1989; 26 (3): 223-7.

11. Güçyetmez B, Ayyildiz AC, Ogan A, Guder BY, Özçobanoğlu S, Ayyildiz A, et al. Dysnatremia on intensive care unit admission is a stronger risk factor when associated with organ dysfunction. Minerva Anestesiol. 2014; 80 (10): 1096-104.

12. Soiza RL, Cumming K, Clark AB, Bettencourt-Silva JH, Metcalf AK, Bowles KM, et al. Hyponatremia predicts mortality after stroke. Int J Stroke. 2015; 10 Suppl A100: 50-5.

13. Rodrigues B, Staff I, Fortunato G, McCullough LD. Hyponatremia in the prognosis of acute ischemic stroke. J Stroke Cerebrovasc Dis. 2014; 23 (5): 850-4.

14. Mattsson N, Kumarathurai P, Larsen BS, Nielsen OW, Sajadieh A. Mild Hypokalemia and Supraventricular Ectopy Increases the Risk of Stroke in Community-Dwelling Subjects. Stroke. 2017; 48 (3): 537-43.

Citation of this article:
Pal BK, Majumder MI, Chowdhury NH, Das P, Saha CK, Basak PM. Dyselectrolyteaemia in Stroke Patients at a Tertiary Level Hospital in Bangladesh. Eastern Med Coll J. 2017; 2 (1): 1-3.