

Electrolyte Disturbances in Acute Phase of Stroke Patients

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Data on electrolyte disorders in neurological conditions and in acute stroke are somewhat scanty and not easily compared. In our study we enrolled patients hospitalized within one week of onset of an acute stroke. A total of 70 clinically and CT proven patients admitted over a period of one year in different units of Medicine and recently started Neurology unit of Dinajpur Medical College Hospital were randomly selected. Association of electrolytes imbalance among acute stroke patients were identified and correlated. Out of 70 patients 62.86% were male and 37.14% were female patients of which 34.28% were in the age group 51 to 60 years. Majority of the patients 58.57% had ischaemic stroke, 34.28% patients had intracerebral haemorrhage (ICH) and only 7.14% patients had Subarachnoid haemorrhage (SAH). 70% of total acute stroke patients had electrolyte disturbances. Among 70 stroke patients 58.53% of ischaemic stroke, 50% of haemorrhagic stroke and 60% of SAH patients had electrolyte abnormalities. Total 38.57% of all stroke patients had serum sodium imbalance, 28.57% patients had serum potassium imbalance and only 14.28% patients had serum chloride imbalance. In ischaemic and haemorrhagic stroke patients; hyponatraemia (17.14% & 10%), hypernatraemia (5.71% & 2.85%), hypokalaemia (15.71% & 7.14%), hyperkalaemia (1.41% & 0%), hypochloraemia (2.85% & 4.24%) and hyperchloraemia (5.71% & 0%) respectively were found. In conclusion it is evident that electrolyte disturbances are quite common association of acute stroke and is seen in all types of acute stroke. Among electrolyte disturbances hyponatraemia and hypokalaemia were most common abnormalities.

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Introduction

Stroke is the second most common cause of death after ischaemic heart disease and major cause of disability worldwide.¹⁻³

Among all neurological diseases of adult life stroke clearly ranks first in frequency and importance. At least 50% of neurological diseases in a general hospital are of this type.⁴ According to World Health Organization (WHO), about 15 million people suffer stroke world wide every year. Of these 5 million die and 5 million are permanently disabled.⁵ Stroke is a complex disease that requires the efforts and skills of all members of a multidisciplinary team. There is evidence that organized management in stroke units

improves survival and reduces dependency. How this improves survival is unclear, but parenteral fluids may have reduced the occurrence of dehydration and maintained blood pressure after acute stroke.⁶ Stroke patients die of either due to the primary disease itself or due to complications. 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, malnutrition etc.⁷

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Electrolyte disturbances such as hyponatraemia, hypernatraemia resulting from inappropriate secretion of antidiuretic hormone (ADH), increase in Brain Natriuretic peptide (BNP) and Atrial Natriuretic peptide (ANP),⁸ inappropriate fluid intake and loss; can lead to complications like seizures and death. Most haemorrhagic stroke patients present with headache and vomiting. Vomiting is an important cause of electrolyte disturbances. Electrolyte disturbances are more common in the acute phase of stroke. Data on electrolyte disturbances are scanty; not only in Bangladesh but also in other countries and so difficult to compare. The aim of our present study is to find out the common electrolyte disturbances in acute phase of stroke patients and its' association with outcome.

Methods

In this observational study, a total number of 70 randomly selected, clinically and CT proven acute stroke patients were studied from 01/06/2011 to 31/05/2012 admitted in different medicine units and recently started neurology unit of Dinajpur Medical College Hospital. Patients admitted within one week of the onset of stroke with CT scan of the brain showing Infarct, haemorrhage or

Subarachnoid haemorrhage were enrolled for this study. Serum electrolytes level was estimated in all patients on admission. Association of electrolyte imbalance among acute stroke patients were identified and correlated. All data were collected in individual case record forms. This was done after taking detailed history from the patient or his/her relatives, complete physical examination and necessary investigations. Analysis was carried out using simple statistical methods.

Results

Out of total 70 patients 34.28% were in between 51 – 60 years age group and 62.86% were male and 37.14% were female patients. CT scan findings reveal majority 58.57% patients had ischaemic stroke, 34.28% had intracerebral haemorrhage (ICH), and only 7.14% had subarachnoid haemorrhage (SAH). 70.83% of haemorrhagic stroke, 51.22% of ischaemic stroke patients and all the patients with SAH were hypertensive. 70% of all patients with acute stroke had electrolyte disturbances. Of which 60.57% of ischaemic stroke, 54.16% of haemorrhagic stroke and 60% of SAH patients had electrolyte abnormalities.

Table I: Frequency of serum sodium imbalance in acute stroke patients (n=100)

Types of stroke	Normal S. Sodium (%)	Hyponatraemia (%)	Hypernatraemia (%)	Total (%)
Ischaemic stroke	26 (37.14%)	12(17.14%)	4(5.71%)	42(60%)
ICH	14 (20%)	7(10%)	2(2.85%)	23(32.85%)
SAH	3 (4.28%)	2(2.85%)	0(0%)	5(7.14%)
Total	43(61.42%)	21(30%)	6(8.57%)	70(100%)

s: serum, normal serum sodium: (135-145mmol/l), hyponatraemia: (<135mmol/l), hypernatraemia: (>145mmol/l)

Table II: Association of serum potassium imbalance in acute stroke patients (n=70)

Types of stroke	Normal S. Potassium (%)	Hypokalaemia (%)	Hyperkalaemia (%)	Total (%)
Ischaemic stroke	29(41.42%)	11(15.71%)	1(1.42%)	41(58.57%)
ICH	19(27.14%)	5(7.14%)	0(0%)	24(34.28%)
SAH	2(2.85%)	3(4.28%)	0(0%)	5(7.14%)
Total	50(71.42%)	19(27.14%)	1(1.42%)	70(100%)

S: serum, normal serum potassium: (3.5-5mmol/l), hypokalaemia: (<3.5mmol/l), hyperkalaemia: (>5mmol/L)

Table I shows that 30% of all acute stroke patients had hyponatraemia. Hyponatraemia was most common among ischaemic stroke patients (17.14%) followed by ICH patients (10%) and SAH patients (2.85%). Only 8.57% patients had hypernatraemia of which 5.71% ischaemic stroke and 2.85% were ICH patients respectively. Total 38.57% of all stroke patients had serum sodium abnormality during acute stroke.

Table-II shows that 27.14% of all acute stroke patients had hypokalaemia. Hypokalaemia was most commonly found among ischaemic stroke patients (15.71%) followed by haemorrhagic stroke patients (7.14%) and subarachnoid haemorrhage patients (4.28%). Only 1.42% of all stroke patients had hyperkalaemia, which was one patient with ischaemic stroke. Total 28.56% of all acute stroke patients had serum potassium imbalance.

Table III: Association of various types of electrolyte abnormalities in different types of acute stroke (n=70)

Various types of Electrolyte imbalances	Ischaemic stroke	ICH	SAH	Total (%)
Sodium imbalance	16	9	2	27(38.57%)
Hyponatraemia	12	7	2	21(30%)
Hypernatraemia	4	2	0	6(8.57%)
Potassium imbalance	12	5	3	20(28.57%)
Hypokalaemia	11	5	3	19(27.14%)
Hyperkalaemia	1	0	0	1(1.42%)
Chloride imbalance	6	3	1	10(14.28%)
Hypochloraemia	2	3	1	6(8.57%)
Hyperchloraemia	4	0	0	4(5.71%)

Normal S. sodium: (135-145mmol/l), Hyponatraemia: (<135mmol/l), Hypernatraemia: (>145mmol/l), normal s. potassium (3.5-5 mmol/l), Hypokalaemia: (<3.5mmol/l), Hyperkalaemia: (>5mmol/l), normal s.

chloride level: (95-107mmol/l), Hypochloraemia: (<95mmol/l), Hyperchloraemia: (>107mmol/l).

Table II shows that 27 (38.57%) of acute stroke patients had serum sodium imbalance, 20 (28.57%) had serum potassium imbalance and 10 (14.28%) had serum chloride imbalance. The incidence of serum sodium, potassium and chloride imbalances were higher in ischaemic stroke patients (22.85%, 17.14% and 8.57% respectively) than acute haemorrhagic stroke patients (12.85%, 7.14% and 4.28% respectively).

Discussion

The incidence of stroke increases with increasing age. In our present study 24.28% of patients were in between 51 – 60 years age group, 20% between 61 – 70 years age group, 18.57% above 70 years of age and 18.57% patients were between 20 – 45 years age group. 62.85% of patients were males and 37.14% patients were females i.e., male incidence was 25.71% higher than female which is almost similar to the study of Siddique MR et. al. in DMCH in 2010. Out of 70 patients M: F ratio was 2.2:1.3. This result correlate well with the study of Siddique MAN et al in Chittagong Medical College Hospital¹⁰, though it differs from the study of Badiuzzaman M et al. in Dhaka Medical College Hospital in 2007.¹¹ Majority of the patients (58.57%) had ischaemic stroke, 34.28% patients had intracerebral haemorrhage and only 7.14% patients had subarachnoid haemorrhage. Our study differs markedly from most of the western studies where cerebral infarction and ICH comprise 80% and 20% of acute stroke patients respectively. But our study well correlates with the studies done by Badiuzzaman M et al and Siddique MR et al in DMCH in 2007¹¹ and in 2010 respectively.⁹ Higher rates of haemorrhagic stroke in our country may be due to inadequate treatment or no treatment of hypertension by many of our patients due to poverty and lack of health awareness and poor

drug compliance leading to sudden rise of blood pressure causing intracerebral haemorrhage.

In this study 70% of all acute stroke patients had electrolyte abnormalities. Among 42 patients with ischaemic stroke 25(60.97%), among 24 patients with haemorrhagic stroke 13(54.16%) and among 5 patients with subarachnoid haemorrhage 3(60%) had electrolyte abnormalities. Our study differs from the study of Siddique MR et al. They found 53% patients with acute stroke had dyselectrolytaemia; of which 62.22 % of haemorrhagic stroke patients, 43.39% of ischaemic stroke patients and 100% of patients with SAH had dyselectrolytaemia respectively. This may be due to these small-scale hospital based studies, which may not be representative of the problem in whole country. More over data on electrolyte disturbances in patients with acute stroke are relatively scanty in our country as well as in other parts of the world so difficult to compare.

In our study 30% of all stroke patients had hyponatraemia (Table-I), which is similar to the study of Siddique MR et al.⁹. Hyponatraemia was most common among ischaemic stroke patients (17.4%) followed by haemorrhagic stroke patients (10%) and subarachnoid haemorrhage (2.85%). This finding differs from the study of Siddique MR et al but they found no statistically significant association of hyponatraemia and types of stroke. Only 8.57% patients had hypernatraemia, of which 5.7% were ischaemic stroke patients and 2.85% of haemorrhagic stroke patients. Total 38.57% of all stroke patients had serum sodium imbalance during acute stroke which is similar to the findings of Siddique MR et al.⁹ 27.14% of all stroke patients had hypokalaemia (Table II). Hypokalaemia was most common among ischaemic stroke

patients (15.71%) followed by haemorrhagic stroke patients (7.14%) and patients with SAH (4.28%). Only 1.42% patients with ischaemic stroke and none with ICH or SAH had hyperkalaemia. Total 28.57% patients had serum potassium abnormality during acute stroke. Total 14.28% patients had serum chloride abnormality. 4.28% of haemorrhagic stroke, 2.85% of ischaemic stroke and 1.42% of SAH patients respectively had hypochloraemia. 5.71% patients had hyperchloraemia all of whom had ischaemic stroke. All patients with hyperchloraemia also had hypernatraemia suggesting a possible common aetiology. No patient with ICH and SAH had hyperchloraemia. In a study Kusuda K et al.¹², found that 34% of acute stroke patients presented with serum sodium imbalance and 44% with serum potassium imbalance these results correlate well with our study. However both hyponatraemia and hypokalaemia were more common in ischaemic stroke patients in our study, which differs from the study of Kusuda K et al. and Siddique MR et al. who found these to be more common with haemorrhagic stroke.

Conclusion

This study reveals that electrolyte disturbances are quite common problem after acute stroke. Hyponatraemia and hypokalaemia are most common abnormalities in both ischaemic and haemorrhagic stroke patients. Electrolyte abnormalities result from inappropriate secretion of ADH, increased BNP and ANP secretion; as well as inappropriate and/or inadequate fluid administration and loss of fluid due to vomiting. Electrolyte abnormalities may adversely affect outcome of the acute stroke patients. So serum electrolytes level should be determined in every patient with acute stroke. Thus fluid intake and electrolyte levels should be closely monitored in patients with acute stroke.

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