DYSELECTROLYTAEMIA IN ACUTE STROKE PATIENTS, AN OBSERVATIONAL STUDY

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Abstract:

Background: *There are many studies on stroke, its associated conditions and their effect on stroke patient's outcome, but a few studies on dyselectrolytaemia in stroke patients has been done in our country, even outside.*

Method: *a total number of 100 randomly selected, clinically and CT proven acute stroke patients were studied at medicine units of Dhaka Medical College Hospital. Association of electrolytes imbalance among acute stroke patient were identified and correlated.*

Result: *Out of 100 patients 29% were in between 51-60 years age group & 72% were male and 28% were female patients. Majority 53% patients had Ischaemic stroke, 45% Intracerebral haemorrhage (ICH) and only 2% had Subarachnoid haemorrhage (SAH). 53% of total acute stroke patient had dyselectrolytaemia. Among 100 acute stroke patients 62.22% of haemorrhagic stroke ($p<0.05$) & 43.39% of ischaemic stroke ($p>0.05$) patients had dyselectrolytaemia. Total 36% of all stroke patients had serum sodium imbalance & 31% had serum potassium imbalance. In haemorrhagic stroke & ischaemic stroke patients, hyponatraemia (17% & 13%), hypernatraemia (1% & 3%), hypokalaemia (19% & 11%), hyperkalaemia (0% & 1%), hypochloraemia (9% & 6%) respectively with found.*

Conclusion: *In haemorrhagic stroke, the incidence of dyselectrolytaemia was more than ischaemic stroke and which were mostly hyponatraemia and hypokalaemia.*

Key words: *Stroke, dyselectrolytaemia, electrolytes imbalance,*

Introduction:

Stroke is the most common neurological emergency[1]. Stroke is the third most common cause of death in developed nations after ischaemic heart disease and cancer.[2] The AHA estimates that 780 000 strokes occur each year; 600 000 of these are new strokes, and 180 000 are recurrent strokes.[3] According to year book of the department of Medicine at DMCH (2009) 14.7% of total admission was stroke patients. Stroke is a complex disease that requires the efforts and skills of all members of the multidisciplinary team.[4] A coordinated care of the stroke patient results in improved outcomes, decreased lengths of stay, and decreased costs.[5] Stroke patient die off either due to the primary disease or due to complications. Medical management focus on the prevention of sub acute complications of stroke, including malnutrition aspiration, pneumonia, dyselectrolytaemia, UTI, bowel or bladder dysfunction, DVT, pulmonary embolism, contractures, joint abnormalities, and skin breakdown.[6] Electrolyte disturbances such as hypernatraemia or hyponatraemia, resulting from the syndrome of inappropriate antidiuretic hormone (SIADH), increase of brain Natriuretic peptides (BNP), inappropriate fluid intake and loss, can lead to complications such as seizures or death.[4,7] Most haemorrhagic stroke patients are presented with headache and vomiting.[8] Vomiting is an important cause of dyselectrolytaemia.[2] Complications like dyselectrolytaemia are more common in acute phase.[4]

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In our country, there are many studies on stroke, its associated conditions and their effect on stroke patient's outcome, but a few studies on electrolytes disturbance in stroke patients has been done in our country, even outside.[9] In this study, I attempted to find out the common electrolytes disturbances in acute stroke patients and its effect on the immediate outcome of the patients.

Materials & Method:

In this descriptive cross sectional study, a total number of 100 randomly selected, clinically and CT proven acute stroke patients were studied from Jan 2010 to June 2010 at medicine units of Dhaka Medical College Hospital. Patient admitted within 48 hours of the onset of stroke with CT scan of the brain showing infarct or haemorrhage was enrolled for this study. Serum electrolytes level was done in all patients on admission. Association of electrolytes imbalance among acute stroke patient were identified and correlated. All data were collected in individual case record form. This was done by detailed history from patients or his / her relatives, complete physical examination and necessary investigations. Statistical analysis was carried out by using SPSS v16.0 Windows statistical software. Descriptive statistics were used for the interpretation of the findings. Informed and written consent obtained from all patients or their guardian. Formal Ethical Clearance was obtained from the Research Review Committee of Dhaka Medical College and Hospital.

Result:

Out of 100 patients 29% were in between 51-60 years age group & 72% were male and 28% were female patients. According to CT scan findings majority 53% patients had Ischaemic stroke, 45% Intracerebral haemorrhage (ICH) and only 2% had Subarachnoid haemorrhage (SAH). The low income group (63%) comprises the major percentage of the patients in our study. 77.7% Haemorrhagic stroke and 75.4% Ischaemic stroke patients were hypertensive. 53% ($p>0.05$) of total acute stroke patient had dyselectrolytaemia. 62.22% of haemorrhagic stroke ($p<0.05$) & 43.39% of ischaemic stroke ($p>0.05$) patients had dyselectrolytaemia.

Table-I

Frequency of serum sodium imbalance in stroke patient

Type of stroke	Normal S. Sodium (%)	Hyponatraemia (%)	Hypernatraemia (%)	Total (%)
Intracerebral haemorrhage	27(27%)	17(17%)	1(1%)	45(45%)
Ischaemic stroke	37(37%)	13(13%)	3(3%)	53(53%)
Subarachnoid haemorrhage	0(0%)	2(2%)	0(0%)	2(2%)
Total	64(64%)	32(32%)	4(4%)	100(100%)

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

This table shows that 32% of all stroke patients had hyponatraemia, Hyponatraemia was most common among intracerebral haemorrhage patients (17%) followed by ischaemic stroke patients (13%) and all the patients of subarachnoid haemorrhage had hyponatraemia. Only 4% of all stroke patients had hypernatraemia which was 3% of ischaemic stroke and 1% of intracerebral haemorrhage. Total 36% of all stroke patients had serum sodium imbalance during stroke.

Table-II

Association of hyponatraemia in haemorrhagic and ischaemic stroke (n=94)

Type of Stroke	Hyponatraemia	Normal sodium	Total	p value
Hemorrhagic	19	27	46	
Ischemic	13	37	50	>0.05
Total	32	64	96	

n: number of patient

Chi-square test (χ^2) was done to measure the level of significant (p value). $\chi^2=1.71$, df =1, $p=>0.05$

There is no significant association between hyponatraemia and type of stroke.

Table-III

Frequency of serum potassium imbalance in stroke patient

Type of stroke	Normal S. Potassium (%)	Hypokalaemia (%)	Hyperkalaemia (%)	Total (%)
Intracerebral haemorrhage	26(26%)	19(19%)	0(0%)	45(45%)
Ischaemic stroke	41(41%)	11(11%)	0(0%)	53(53%)
Subarachnoid haemorrhage	2(2%)	0(0%)	1(1%)	2(2%)
Total	69(69%)	30(30%)	1(1%)	100(100%)

n: number of patient, s: serum, normal serum potassium : (3.5-5mmol/l) , hypokalaemia: (<3.5mmol/l), hyperkalaemia: (>5mmol/l)

This table shows that 30% of all stroke patients had hypokalaemia. Hypokalaemia was most common among intracerebral haemorrhage patients (19%) followed by ischaemic stroke patients (11%). Only 1% of all stroke patients had hyperkalaemia which was one of the two patients of subarachnoid haemorrhage. Total 31% of all stroke patients had serum potassium imbalance during stroke.

Table-IV

Association of hypokalaemia in haemorrhagic and ischaemic stroke (n=97)

Type of Stroke	Hypokalaemia	Normal potassium	Total	*p* value
Hemorrhagic	19	26	45	
Ischemic	11	41	52	<0.05
Total	30	67	97	

n: number of patient

Chi-square test (χ^2) was done to measure the level of significant (*p* value).χ^2= 5, df =1, *p*=<0.05

There is significant association between hypokalaemia and type of stroke.

Table V

Association of various type of dyselectrolytaemia in different type of acute stroke. (n=100)

Various type of dyselectrolytaemia	Intracerebral haemorrhage	Ischaemic stroke	Subarachnoid haemorrhage	Total (%)
Sodium imbalance	18	16	02	36(36)
Hyponatraemia	17	13	02	32(32)
Hypernatraemia	01	03	0	4(4)
Potassium imbalance	19	12	0	31(31)
Hypokalaemia	19	11	0	30(30)
Hyperkalaemia	0	01	0	01(01)
Chloride imbalance	09	07	0	16(16)
Hypochloraemia	09	06	0	15(15)
Hyperchloraemia	00	01	0	01(01)
Bicarbonate imbalance	02	0	0	02(2)
Low bicarbonate	02	0	0	02(02)
High bicarbonate	00	0	0	00(00)

n:number of patient, %:percentage, normal s. sodium : (135-145mmol/l), hyponatraemia: (<135mmol/l), hypernatraemia: (>145mmol/l), normal s. potassium : (3.5-5mmol/l) , hypokalaemia: (<3.5mmol/l), hyperkalaemia: (>5mmol/l), normal s. chloride: (96-110mmol/l), hypochloraemia: (<96mmol/l), hyperchloraemia: (>110mmol/l), normal s. bicarbonate: (24-30mmol/l).

This table shows that 36(36%) acute stroke patients had serum sodium imbalances, 31(31%) had serum potassium imbalance, 16(16%) had serum chloride imbalance and only 02(2%) had serum bicarbonate imbalance. The incidence of serum sodium, potassium, chloride and bicarbonate imbalances were higher in intracerebral haemorrhage (18, 19, 09 & 02 patients respectively) than acute ischaemic stroke (16, 12, 07 & 0 patients respectively).

Discussion:

Stroke incidence rises exponentially with increasing age. In this present study, maximum number of patients (29%) were in between 51-60 years age group followed by (22%) between 61-70 years age group. The maximum number of male (21% & 16%) and female (8% & 6%) were also in the above age group respectively. Bevan H et al [10] in his study of stroke also found similar picture. A hospital based study done in DMCH showed that only 1% occurred in <20 years and 26% in 20-45 years and majority are above 45 years.[11] 72% were male and 28% were female i.e., male incidence is 30% higher than female which coincide with international study. The present study coincides with the study of Chowdhury et al,[12] and Kurtzke,[13] where showed that frequency of stroke is 30% higher in men than women. CT scan findings of the studied patients show that majority 53% patients had ischaemic stroke, 45% had intracerebral haemorrhage and only 2% had subarachnoid haemorrhage. This study similar with study of Alam B et al,[14] they studied 1020 patients of stroke in DMCH. Higher rate of haemorrhagic stroke in this present hospital based study and previous Alam B et al [14] study in DMCH may be due to the acute admission is more related to the haemorrhagic stroke.

In this series 53% of our acute stroke patient had dyselectrolytaemia. Among 45 acute intracerebral haemorrhage stroke patients 28(62.22%) had dyselectrolytaemia. There was significant association between dyselectrolytaemia and acute haemorrhagic stroke (*P*=<0.05). Among 53 ischaemic stroke patients 23(43.39%) had dyselectrolytaemia and 30(56.60%) of them had no electrolytes imbalance, but there was no statistical significant association between dyselectrolytaemia and acute ischaemic stroke (*P*=>0.05). All of the 2(100%) subarachnoid haemorrhage patients had dyselectrolytaemia. In a study by Kusuda K et al,[15] found that 52% haemorrhagic stroke (*p*=<0.01) and 26% ischaemic stroke patients had dyselectrolytaemia (*p*=>0.05). In this series the percentages of dyselectrolytaemia is a bit high, may be due to under developed acute management setup in our hospital.

In this study (table-I), 32% of all stroke patients had hyponatraemia. Hyponatraemia was most common among haemorrhagic stroke patients (17%) followed by ischaemic stroke patients (13%) and all the patients of subarachnoid haemorrhage had hyponatraemia. But chi-square test revealed no statistically significant association between hyponatraemia and type of stroke (*p*=>0.05). Only 4% of all stroke patients had hypernatraemia which was 3% of ischaemic stroke and 1% of haemorrhagic stroke. Total 36% of all stroke patients had serum sodium imbalance during stroke. 30% of all stroke patients had hypokalaemia (table-III). Hypokalaemia was most common among haemorrhagic stroke patients (19%) followed by ischaemic stroke patients (11%). chi-square test revealed significant association between hypokalaemia and haemorrhagic stroke (p=<0.05). Only 1% of all stroke patients had hyperkalaemia which was one of the two patients of subarachnoid haemorrhage. Total 31% of all stroke patients had serum potassium imbalance during stroke. 9% haemorrhagic stroke and 6% ischaemic stroke patient presented with hypochloraemia during stroke (*p*=>0.05). 2% haemorrhagic stroke patient presented with low bicarbonate level during stroke. In a study by Kusuda K et al,[15] found that 34% acute stroke patients presented with serum sodium imbalance and 44% with serum potassium imbalance. Both hyponatraemia and hypokalaemia were more common among haemorrhagic stroke patients. All these findings are consistent with this present study.

Conclusion:

The results of the present study demonstrate that in haemorrhagic stroke, the incidence of dyselectrolytaemia was more than ischaemic stroke and which were mostly hyponatraemia and hypokalaemia. Early detection and management of which can improve the overall outcome of stroke patients.

Conflict of interest: We have no conflict of interest.

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