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Dyselectrolytaemia in Acute Stroke Patients, A Study of Hundred Cases in Holy Family Red Crescent Medical College Hospital

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Abstract **Original Research Article**

***Introduction*:** Stroke is a growing public health concern in low- and middle-income countries. There are many studies on stroke, its associated conditions, and its effect on stroke patients' outcomes, but few studies on dyselectrolytaemia in stroke patients have been done in our country. This study aimed to highlight the pattern and correlation of dyselectrolytaemia in acute stroke patients of a tertiary care hospital. ***Methods*:** This cross-sectional study was conducted in the Department of Medicine, Holy Family Red Crescent Medical College Hospital, from January, 2016 to June, 2016. A total of 100 patients with stroke were selected as study subjects as per inclusion and exclusion criteria. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 20.0 for Windows. The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. The chi-square test with Yates correction was used to analyze the categorical variables. Student t-test was used for continuous variables. P values <0.05 were considered statistically significant. ***Result*:** In this study, 31 (31.0%) patients had dyselectrolytaemia. This study shows serum electrolytes of the study patients, it was observed that 17(17.0%) patients had hyponatremia: serum sodium level (<135 mmol/I), 13(13.0%) patients had hypokalaemia serum potassium (<3.5 mmol/l), 16(16.0%) patients had hypochloraemia serum Chloride level (<96 mmol/l) and 11(11.0%) patients had low bicarbonate level (< 24 mmol/I). ***Conclusion*:** This study highlights the prevalence of dyselectrolytaemia in acute stroke patients. Among the 100 patients studied, 17% experienced hyponatremia, 13% had hypokalaemia, 16% exhibited hypochloraemia, and 11% had low bicarbonate levels. These findings highlight the importance of routine electrolyte monitoring and prompt management in acute stroke care to prevent complications and improve patient outcomes.

Keywords: Dyselectrolytaemia, Acute Stroke, Hyponatraemia, Hypokalaemia, Hypochloraemia.

INTRODUCTION

Stroke is defined clinically as "A neurological deficit of sudden onset with focal rather than global neurological symptoms lasting for more than 24 hours or resulting in death before 24 hours and in which after adequate investigation symptoms are presumed to be of non-traumatic in origin [1]. The term stroke is used to describe focal brain dysfunction due to focal ischemia or hemorrhage [2]. Electrolyte disturbances are commonly found in acute stroke settings [3]. Hypernatremia, hyponatremia, and hypokalemia were the commonest types of disturbance [4, 5]. Recently, research on electrolyte disturbances has focused not only on the neuroendocrine mechanism but also on its prevalence, risk factors, and association with other medical conditions [4]. It is found by Siddiqui *et al.*, [3] and Lath [4], studies that the mortality rate of stroke patients with electrolyte imbalance was higher than in patients with normal levels. This is especially true for hypernatremia because of its contribution to the development of brain edema. In Kembuan and Sekeon's [6] study hyponatremia was found in 7.1%. Siddiqui *et al.*, [3] reported a high number percentage of patients with electrolyte imbalance 53.0% of their acute stroke patients. Most of them were in acute hemorrhagic stroke. Among all patients in their study, it was revealed that there were 36.0% patients with sodium disturbance and 31.0% patients with potassium disturbance. Among patients with sodium disturbance, most of them were hyponatremia 32.0%. The majority of potassium

disturbance was hypokalemia 30.0%. In Kembuan and Sekeon [6] study documented 45.9% of patients with electrolyte disturbances. In most of the disturbances in their study, potassium disturbance was 40.0% while sodium disturbance was only detected in 8.2% of patients. Among sodium disturbances, hyponatremia was found in 7.1% of patients and hypernatremia was only 1.2%. According to Huang *et al.*, [7], there are significant contributions of hyponatremia to the outcome of stroke. They documented the higher death rate of patients with hyponatremic than normonatremic patients 3 years after the first stroke attack. However, Huang also reported that there was no significant difference between the two groups in terms of mortality rate while in hospital, functional status when discharged, and the rate of stroke recurrence. Also, there was no difference in mortality rate in 1 to 3 months after discharge. According to Diaz *et al.*, [8], there were two commonest causes of hyponatremia in acute brain disorders which were SIADH (Syndrome of Inappropriate Antidiuretic Hormone) and CSW (Cerebral Salt Wasting). Electrolyte imbalance is not an uncommon association in acute stroke patients. Few studies are highlighting the effect of dyselectrolytaemia on stroke patients in Bangladesh, even in world literature very limited studies have been done on the subject. This study aimed to highlight the pattern and correlation of dyselectrolytaemia in acute stroke patients of a tertiary care hospital.

METHODS

This cross-sectional study was conducted in the Department of Medicine, Holy Family Red Crescent Medical College Hospital, from January, 2016 to June, 2016. Adult patients who were admitted with acute stroke in the Department of Medicine, in Holy Family Red Crescent Medical College Hospital, was considered as the study population. A total of 100 patients with stroke were selected as study subjects as per inclusion and exclusion criteria.

Inclusion criteria:

- Patients are admitted within 48 hours of the onset of stroke with a CT scan or MRI of the brain showing infarction or hemorrhage.
- Serum electrolytes were measured within 48 hours of stroke.
- The patient or relative agreed to give written consent.

Exclusion criteria:

- The patient was admitted after 48hrs of the onset of stroke.
- CT scan or MRI of the brain showing features other than stroke e.g. tumor, inflammatory lesion, and traumatic lesion.
- Patients in whom CT or MRI of the brain is not done.
- Patients in critical stages are not able to give history and without an attendant or refusing to give consent.

Data were collected by interview, physical examination, and lab investigation using a structured questionnaire containing all the variables of interest. Serum electrolytes and all other investigations like CBC, ESR, RBS, Serum creatinine, fasting lipid profile, ECG, CXR, CT scan, or MRI of brain reports were recorded. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 20.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. The chi-square test with Yates correction was used to analyze the categorical variables. Student t-test was used for continuous variables. P values <0.05 were considered statistically significant. The research protocol is approved by the committee (Local Ethical Committee). Informed written consent was taken from the participants.

RESULTS

Table 1: Distribution of the study patients by demographic variables (N=100)

Demographic variables	n	%
Age (in years)		
35-50	21	21.0
51-70	49	49.0
>70	30	30.0
Mean ± SD	65.2±15.1	
Range (min-max)	35-95	
Sex		
Male	62	62.0
Female	38	38.0

It was observed that almost half (49.0%) of the patients belonged to age 51-70 years. The mean age was found 65.2±15.1 years with a range from 35 to 95 years. Sixty-two (62.0%) patients were male and 38(38.0%) patients were female [Table 1].

Table 2: Distribution of the study patients premonitory symptoms (N=100)

Premonitory symptoms	n	%
Headache	68	68.0
Vomiting	28	28.0
Vertigo	26	26.0
Seizure	9	9.0

In this study, 68 (68.0%) patients had headaches, 28(28.0%) patients had vomiting, 26(26.0%) patients had vertigo, and 9(9.0%) patients had seizures [Table 2].

Table 3: Distribution of the study patients serum electrolytes (N=100)

Serum electrolytes	n	%
Serum sodium level (mmol/I)		
Normal (135-145)	75	75.0
Hyponatraemia:(<135)	17	17.0
Hypernatraemia:(>145)	8	8.0
Serum potassium (mmol/l)		
Normal (3.5-5)	83	83.0
Hypokalaemia (<3.5)	13	13.0
Hyperkalaemia (>5)	4	4.0
Serum Chloride level (mmol/l)		
Normal (96-110)	77	77.0
Hypochloraemia (<96)	16	16.0
Hyperchloraemia(>110)	7	7.0
Serum bicarbonate level (mmol/l)		
Normal (24-30)	89	89.0
Low:(<24)	11	11.0

Table 3 shows serum electrolytes of the study patients, it was observed that 17(17.0%) patients had hyponatremia: serum sodium level (<135 mmol/I), 13(13.0%) patients had hypokalaemia serum potassium (<3.5 mmol/l), 16(16.0%) patients had hypochloraemia serum Chloride level (<96 mmol/l) and 11(11.0%) patients had low bicarbonate level (< 24 mmol/I) [Table 3].

Table 4: Distribution of the study patients' dyselectrolytaemia (N=100)

Dyselectrolytaemia	n	%
Present	31	31.0
Absent	69	69.0

Table 4 shows dyselectrolytaemia of the study patients. It was observed that 31 (31.0%) patients had dyselectrolytaemia [Table 4].

DISCUSSION

In this present study, it was observed that almost half 49.0% of patients belonged to age 51-70 years. The mean age was found 65.2±15.1 years with a range from 35 to 95 years. In our country, Hasan *et al.*, [9] reported that the incidence of stroke increases with increasing age, where their study found 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. In another study in Bangladesh, Iqbal *et al.*, [10] found most of the patients (30%) were in between the group of 51-60 years age and the next prevalence group was 61-70 years (22%) ages. The above-mentioned studies are higher than the current study, the higher mean age may be due to geographical variations, racial, and ethnic differences, genetic causes and different lifestyles may have significant influence on acute stroke in diabetics. In this current study, it was observed that 62.0% of patients were male and 38.0% of patients were female. In this current study, it was observed that acute stroke is predominant in the male subject, where 62.0% of patients were male and 38.0% were female, which is closely resembled Wali & Patil [11], Mitchell *et al.*, [12], Hasan *et al.*, [9], Siddiqui *et al.*, [3] and Vemmos *et al.*, [13]. On the other hand, Li *et al.*, [14] and Suk *et al.*, [15] found females predominant. Regarding the premonitory symptoms in this current study, 68.0% of patients had headaches, 28.0% of patients had vomiting, 26.0% of patients had vertigo, and 9.0% of patients had seizures. Electrolyte disturbances such as hyponatremia, hypernatraemia resulting from inappropriate secretion of antidiuretic hormone (ADH), increase in Brain Natriuretic peptide (BNP) and Atrial Natriuretic peptide (ANP) [16], inappropriate fluid intake and loss; can lead to complications like seizures and death. In our country, Hasan *et al.*, [9] reported that most hemorrhagic stroke patients present with headaches

and vomiting. Vomiting is an important cause of electrolyte disturbances, which is comparable with the current study. Electrolyte disturbances such as hyponatremia, hypernatraemia resulting from inappropriate secretion of antidiuretic hormone (ADH), increase in Brain Natriuretic peptide (BNP) and Atrial Natriuretic peptide (ANP) [16], inappropriate fluid intake and loss; can lead to complications like seizures and death. Similarly, regarding the serum electrolytes it was observed in this current series, that 17.0% of patients had hyponatremia: serum sodium level (<135 mmol/I), 13.0% of patients had hypokalaemia serum potassium (<3.5 mmol/l), 16.0% patients had hypochloraemia serum Chloride level (<96 mmol/l) and 11.0% patients had low bicarbonate level (< 24 mmol/I). Siddiqui *et al.*, [3] found more than one-third (36.0%) of acute stroke patients had serum sodium imbalances, 31.0% had serum potassium imbalances, 16.0% had serum chloride imbalances and only 2.0% had serum bicarbonate imbalances. In this present study, it was observed that 31.0% of patients had dyselectrolytaemia. Siddiqui *et al.*, [3] found 53.0% of their acute stroke patient had dyselectrolytaemia. Among 45 acute intracerebral hemorrhage stroke patients 62.22% had dyselectrolytaemia, which differs from the current study, maybe their study was done in a tertiary hospital.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study highlights the prevalence of dyselectrolytaemia in acute stroke patients. Among the 100 patients studied, 17% experienced hyponatremia, 13% had hypokalaemia, 16% exhibited hypochloraemia, and 11% had low bicarbonate levels. These findings highlight the importance of routine electrolyte monitoring and prompt management in acute stroke care to prevent complications and improve patient outcomes.

RECOMMENDATION

Dyselectrolytaemia is an associated disorder of acute stroke patients. Regular monitoring of electrolyte levels, especially sodium, potassium, and magnesium, is recommended in acute stroke patients. Implementing protocols for electrolyte monitoring and management as part of acute stroke care guidelines is necessary. Further studies can be undertaken to evaluate whether early detection of dyselectrolytaemia in acute stroke patients improves outcomes or not.

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