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Study of Electrolyte Abnormality in Acute Stroke.

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ABSTRACT

Background: Among all neurologic diseases of adult, stroke ranks first. There are many studies on stroke, but few studies on electrolytes disturbance have been done in our country, even outside. Aims: The aim of the study was to find out the electrolyte disturbance in acute stroke, to compare serum sodium, potassium level between patients of stroke & to compare the outcome with normal and abnormal initial electrolytes level. **Methods:** It was an observational hospital based study consisted of 100 patients that meet the inclusion criteria. Data was obtained from medical records. **Results:** Sodium disturbances was 37% and potassium disturbances was 33%. 63.83% hemorrhagic patients had dyselectrolytemia & 47.17% ischemic patients had dyselectrolytemia. Without any significant difference (p>0.05). 33% of all patients had hyponatraemia which was most common among hemorrhagic patients (20%) but p value was not significant (p>0.05). Hypokalemia was most common among hemorrhagic patients (20%) and p value was significant (p<0.05). Patients who had dyselectrolytemia, 52.73% had poor outcome and p value was significant (p=.0004). Out of 33 patient with hyponatremia with stroke, 15 died with significant p value (p=0.0003) and out of 31 patient with hypokalaemia with stroke, 13 died and p value was statististically significant (p=0.0043). **Conclusion:** This study reveals that in haemorrhagic stroke, the incidence of electrolytes imbalance was more than ischaemic and which were mostly hyponatraemia and hypokalaemia. Electrolyte imbalance may adversely affect outcome of stroke.

Keywords: Dyselectrolytaemia, electrolytes imbalance, stroke.

INTRODUCTION

Stroke is the second leading cause of death worldwide, causing 6.2 million deaths in 2011. Strokes cause ~200,000 deaths each year in the United States and are a major cause of disability.

The incidence of cerebrovascular diseases increases with age, and the number of strokes is projected to increase as the elderly population grows, with a doubling in stroke deaths in the United States by 2030. According to World Health Organization (WHO), about 15 million people suffer stroke worldwide every year. Of these 5 million die and 5 million are permanently disabled.

Several population based survey on stroke were conducted from different parts of India. During the last decade the age adjusted prevalence rate of stroke was 250-350 per 100000 population in India.

In India, after several population based survey, stroke was ranked as the 6th leading cause of daily loss in 1990 and projected to rank 4th by the year 2020.

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Recent studies show the age adjusted annual incidence rate is 105 per 100000 population in Kolkata and 262 per 100000 population in the rural community of West Bengal.

A CVA patient with poor general condition

In almost all neurological disorders, electrolyte disturbances were prominent. Electrolyte disturbance are commonly found in acute stroke setting. Hypernatremia, hyponatermia and hypokalemia was the commonest type of disturbance. 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.

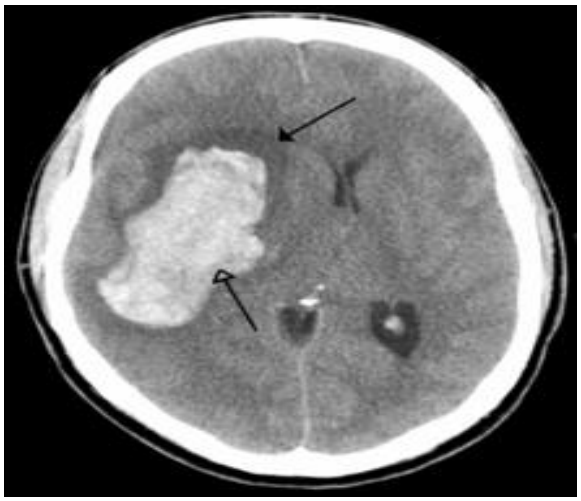
Most haemorrhagic stroke patients are presented with headache and vomiting.[11] Vomiting is an important cause of dyselectrolytemia.[12] Recently, research with electrolyte disturbances is not only focusing on the neuroendocrine mechanism but also on its prevalence, risk factors and association with other medical condition.

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, dyselectrolytemia, UTI, bowel or bladder dysfunction, DVT, pulmonary embolism, contractures, joint abnormalities, and skin breakdown.[8] An early and accurate prediction of stroke outcome in the emergency department is crucial for decision-making, as well as in assessing patient prognosis.

India will face an enormous socioeconomic burden to meet the costs of rehabilitation of "stroke victims" because the population is now surviving through the peak years (age 55-65) of occurrence of stroke (CVD).

Furthermore, published reports suggest that CVD occurs at all ages in both sexes and with increasing frequency with advancing age. Prospective studies on acute stroke have shown that hypertension, diabetes mellitus, low normal hemoglobin and tobacco use (smoking / chewing) are important risk factors (RFs)

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. The study reported here sought to identify the common electrolyte disturbance in acute phase of different type of stroke patients & there association with some common clinical presentation & outcome.



CT showing intracranial haemorrhage

"The recommendations from the American Heart Association for reducing cardiac risk are the same for reducing stroke risk," says Argye Beth Hillis, MD, executive vice chair of the department of neurology and co-director of the cerebrovascular division at Johns Hopkins University School of Medicine in Baltimore. That means a low fat, low sugar, low cholesterol diet.

Reducing Saturated Fat Intake

The basic goal will be to lower the amount of saturated fat in your diet to 8 to 10 percent of your total calories.

- Avoid whole milk; try skim or nonfat instead.
- No eat fatty cuts of meat; try leaner cuts and fish.
- Not eat chicken or turkey with the skin still on.

Cutting Down on Fats Overall

Keep calories from all fats to less than 30 percent of your daily calorie intake.

This may mean:

- Learning new ways of cooking, such as baking or broiling, instead of frying
- Using low-fat or fat-free salad dressings
- Avoiding high-fat additions to foods — for instance, butter and sour cream on your potatoes
- Using small amounts of spreads such as margarine

Cutting Back on Cholesterol

Keep cholesterol intake to below 300 milligrams a day:

- Cut back on meat and dairy products.
- Eat more vegetables, fruits, and whole grains.
- Avoid egg yolks and liver

MATERIALS AND METHODS

During the study period of February 2014 to Augst 2015, a total of 100 cases of stroke (as per the WHO definition)were included in the study who were admitted in the Dept of medicineof Nilratan Sircar Medical College & Hospital,Kolkata. After taking an informed consent from patients or their relatives

Inclusion Criteria

Patients of either sex above 15 years of age with first-ever acute stroke admitted within 48 hours of onset & fulfilling WHO definition of stroke and confirmation of stroke with CT scan of brain.

Exclusion Criteria:

Patients with H/O previous stroke, TIA, Syncope, and any neurological deficit secondary to head injury ie. Subdural Haemorrhage (SDH), Epidural Haemorrhage or an Intracerebral Haemorrhage (ICH) or infarction which is caused by an

infection/tumour (SOL) etc. or having preexisting severe physical or cognitive disabilities.

Permission from the ethical committee of the college was also obtained prior to the execution of this study. Upon admission, a standardized data sheet was used to record demographic & clinical data specially the clinical presentation at the time of admission. To determine the subtype of stroke, clinical examination followed by CT scan of brain was done. A serum sample was taken on the next day of admission. Total serum sodium &potassium level was determined. Study of calcium, magnesium and chloride was excluded from this present study as imbalance of these electrolytes were hardly encountered in association with stroke. The patients were followed up for outcome up to 2 weeks during their stay in hospital and before discharge from the hospital using Glasgow Outcome Scale.

Methods of Data Analysis & Interpretations:

The data was presented in the form of tables, graphs and diagrams & analyzed by using proper statistical tests. For demographic profile, frequency distribution and percentage was to be used. Chi-square test was used to determine the association between electrolyte imbalance & clinical presentation or outcome using Graph Pad Prism 6' software.

RESULTS

This prospective observational study was done in the Department of Medicine, Nilratan Sircar Medical College and Hospital from February, 2014 to August, 2015.A total of 100 CT-confirmed patients of stroke were selected, who were satisfying the inclusion criteria through simple random selection. The results of the present study are analyzed through the following tables and charts.

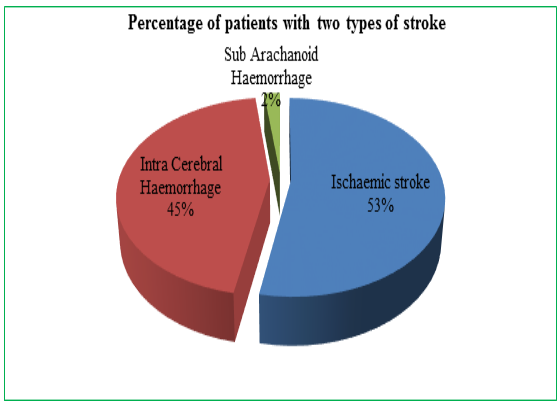


Figure 1: Pie chart showing percentage of stroke encountered in this study.

[Figure 1] shows the majority 53% patients had ischaemic stroke, 45% had intracerebral haemorrhag and only 2% had subarachnoid haemorrhage.

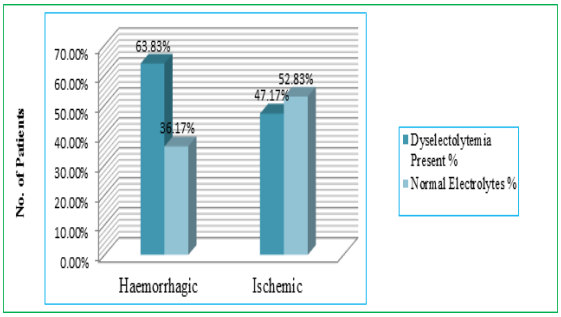


Figure 2: Frequency of Dyselectrolytemia in acute Stroke patient (n=100).

Here 63.83% haemorrhagic patients had dyselectrolytemia & 47.17% ischemic patients had dyselectrolytemia. Without any significant difference (p>0.05).

In our study 33% of all stroke patients had hyponatraemia. Hyponatremia was most common among haemorrhagic stroke patients (20%) followed by ischaemic stroke patients (13%).

Table 1: Frequency of Hypokalaemia in acute Stroke. (n=100).

Type of Stroke	Normal Serum Potassium (%)	Hypokalaemia (%)	P value	Odds ratio
Haemorrhagic Stroke	26	20	.0287	.3488
Ischemic Stroke	41	11		

Here hypokalemia were found in 20% of cases in haemorrhagic stroke patients and 11% of cases in ischaemic stroke patients.

Result shows p=<0.05, which revelled significant association between hypokalemia & type of stroke.

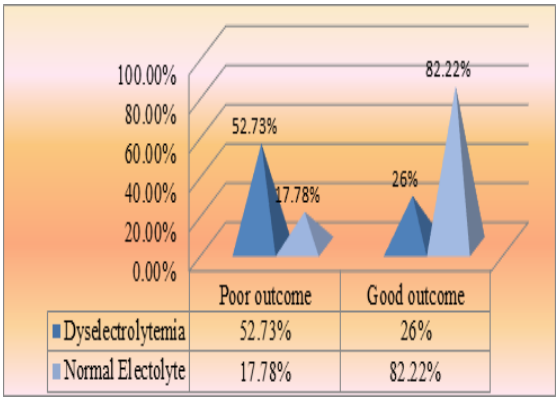


Figure 3: Association between Electrolyte imbalance & Outcome of Stroke

Among dyselectrolytemic patients poor outcome are seen in 52.73% cases and 26% cases with good outcome.

Poor outcome are seen among 52.73% of cases of dyselectrolytic patients.

Table 2: Association between Electrolyte imbalance & Outcome of Stroke.

Glasgow outcome Scale. (GOS)		Dyselectrolytemia present	Normal Electrolyte	Total	P value	Odds ratio
Poor (GOS- 1+3)	Count	29 (18+11)	8 (5+3)	37		
	Percentage	52.73 %	17.78 %	37%		
Good (GOS -4+5)	Count	26 (21+5)	37 (20+17)	63		
	Percentage	47.27 %	82.22 %	63 %		
Total	Count	55	45	100		
	Percentage	100 %	100 %	100 %	0.0004	5.159

Table 3: Association between Hyponatremia & Outcome of Stroke.

Outcome	With Hyponatremia	Without Hyponatremia	Total	P value	Odds ratio
Died	15	8	23	.0003	6.146
Survived	18	59	77		
Total	33	67	100		

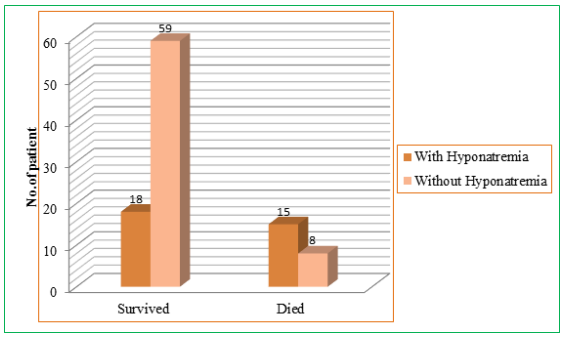


Figure 4: Association between Hyponatremia & Outcome of Stroke.

Table 4: Association between Hypokalaemia & outcome of Stroke.

Outcome	With Hypokalaemia	Without Hypokalaemia	Total	P value	Odds ratio
Died	13	10	23	.0043	4.261
Survived	18	59	77		
Total	31	69	100		

A CVA patient

DISCUSSION

The study was done in the Department of General Medicine, Nilratan Sircar Medical College and Hospital from February 2014 to August 2015. 100 patients of stroke were selected from patients satisfying the inclusion criteria through simple random selection. The findings and inference derived from the study are discussed below.

In this present study CT scan finding of the studied patients show the majority 53% patients had ischaemic stroke, 45% had intracerebral haemorrhage and only 2% had subarachnoid haemorrhage [Figure-1]. Higher rate of ischaemic stroke in this study does not represent the actual proportions in the general population or community. This study is similar with study of Alam B et al, 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 study in DMCH may be due to the acute admission is more related to the haemorrhagic stroke. This is due to the fact that, this study was not conducted at the community level. Majority of the patients with stroke, especially of ischaemic stroke are not complicated and so are not referred to the higher centers for better management. They are managed at local health centers; mostly the complicated patients are referred to the higher centers. Nevertheless, the local patients from Kolkata also had higher rate of haemorrhagic contrary to the other studies (e.g. Indian Collaborative Acute Stroke Study, ICASS). Again, this may be due to the fact that, even in case of the local patients from Kolkata, most patients do not present to the hospitals within the time interval when they could be candidate for thrombolytic therapy (which is mostly due to lack of awareness and health education). So, the uncomplicated low-risk patients either due to apparently less dangerous symptom are unwilling to be admitted to trolley or floor (this is the actual scenario in our extremely overburdened hospital, where most of the patients have to be admitted on trolley and occasionally on floor, initially) or they were not admitted due to actual low-risk as assessed by the physician who attended them at OPD or at the Emergency Department. In this series 55% of our acute stroke patient had dyselectrolytemia & 45% had normal electrolyte. Out of 47 haemorrhagic patients, 30 (63.83%) patients had dyselectrolytemia & out of 53 ischemic patients, 25 (47.17%) patients had

dyselectrolytemia. The result shows that dyselectrolytemia is almost equally common in both haemorrhagic & ischemic group without significant difference (p>0.05). In a study by Kusuda K et al, found that 52% haemorrhagic stroke and 26% ischaemic stroke patients had dyselectrolytemia. In this study 33% of all stroke patients had hyponatraemia. Hyponatremia was most common among haemorrhagic stroke patients (20%) followed by ischaemic stroke patients (13%). But chi-square test revealed no statistical significant association between hyponatremia and type of stroke (p>0.05). Only 4% of all stroke patients had hypernatremia which was 3% of ischaemic stroke and 1% of haemorrhagic stroke. Total 37% of all stroke patients had serum sodium imbalance during stroke 31% of all stroke patients had hypokalemia [Table 1]. Hypokalemia was most common among haemorrhagic stroke patients (20%) followed by ischaemic stroke patients (12%). Chi-square test [Table 1] revealed significant association between hypokalemia and haemorrhagic stroke (p<0.05). Only 2% of all stroke patients had hyperkalemia. Total 33% of all stroke patients had serum potassium imbalance during stroke. In this present study 23% of all patients expired (i.e.GOS-1) and 77% of all patients survived (i.e.GOS-3,4,5) which is similar to the study by Malini Kulshrestha and Vidyanand in northern India. Out of 23 death 36.17% (17) was haemorrhagic patient & 32.73% (18) stroke patients had electrolyte imbalance but death in dyselectrolytemia is almost equally common in both haemorrhagic & ischemic group without any significant difference (p>0.05,).

According to Glasgow outcome Scale total 14 patient had severe disability & 41 patients had moderate disability & dyselectrolytemia present in 11 & 21 patients respectively. 22 patients had good recovery & out of 22 only 5 patients had dyselectrolytemia

63% of all patients (48.51% among survivors) had good outcome and 37% of all patients had poor outcome. Patients who had normal electrolytes, 82.22% had good out come. Patients who had dyselectrolytemia, 52.73% had poor outcome. Association between electrolyte imbalance & outcome of stroke is statistically significant (p=0.0004), [Table-2]. Out of 33 patient with hyponatremia with stroke, 18 survived & 15 died. Out of 67 patients without hyponatremia with stroke, 59 survived & 8 died. The p value for this statistically significant (p=0.0003), [Table 3]. This result is similar to the study done by Sheikh Saleem, Irfan Yousuf 62. Out of 31 patient with hypokalaemia with stroke, 18 survived & 13 died. Out of 69 patients without hypokalaemia with stroke, 59 survived & 10 died. The p value for this statistically significant (p=0.0043), [Table 4]. This result is similar to the study done by GaribaliaSE et al.

CONCLUSION

This study reveals that electrolyte disturbances are quite common problem after acute stroke. Hyponatremia & hypokalemia are most common electrolyte abnormalities in both ischemic & haemorrhagic stroke. Though hyponatremia & hypokalemia were most common among haemorrhagic stroke patients followed by ischaemic stroke patients but chi-square test revealed only statistical significant association between hypokalemia and haemorrhagic stroke. Patients who had no electrolyte imbalance, had good out come & it was statistically significant. The study also showed that there was strong association between hyponatremia or hypokalemia & outcome of stroke. Electrolyte imbalance may adversely affect outcome of stroke. So serum electrolyte should be determined in every patient with stroke. Early detection & management can improve the overall outcome of stroke patients. In this study, 23% patient was expired but death in dyselectrolytemia is almost equally common in both haemorrhagic & ischemic group without any significant difference. According to Glasgow outcome scale 63% of all patients had good outcome and 37% of all patients had poor outcome. Patients who had no electrolyte imbalance, had good outcome & it was statistically significant. The study also showed that there was strong association between hyponatremia or hypokalemia & outcome of stroke.

Limitations

The result of the present study should be interpreted in the light of the following limitations.

Firstly, the sample size was relatively small. Secondly, no long-term follow-up of NIHSS score could be carried out & Thirdly the definite causes of these dyselectrolytemia during acute stroke could not be carried out.

However, the main analysis of the present study was focused to find-out the electrolytes status and common electrolytes disturbances in different type of acute stroke patients and their correlation with different clinical presentations & outcome.

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