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Focus and Scope

The African Journal of Tropical Medicine and Biomedical Research is a multidisciplinary and international journal published by the College of Health Sciences, Delta State University of Abraka, Nigeria. It provides a forum for Authors working in Africa to share their research findings on all aspects of Tropical Medicine and Biomedical Sciences and to disseminate innovative, relevant and useful information on tropical medicine and biomedical sciences throughout the continent. The journal will publish original research articles, reviews, editorials, commentaries, short reports, case reports and letters to the editor. Articles are welcome in all branches of medicine and dentistry including basic sciences (Anatomy, Biochemistry, Physiology, Pharmacology, Psychology, Nursing etc) and clinical sciences (Internal Medicine, Surgery, Obstetrics and Gynaecology, Dental surgery, Child Health, Laboratory Sciences, Radiology, Community Medicine, etc). Articles are also welcome from social science researchers that document the intermediating and background social factors influencing health in countries of Africa. Priority will be given to publication of articles that describe the application of the principles of primary health care in the prevention and treatment of diseases.

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Plasma electrolytes, osmolality and lipid profile in patients with acute stroke in a tertiary hospital in South-South, Nigeria.

Adewolu O.F[1], Odiase F[2]

ABSTRACT

Introduction Stroke or cerebrovascular accident is a leading cause of morbidity and mortality worldwide. Electrolyte imbalances and dyslipidemia cause poor patients' treatment outcomes.

Aim of the study wasto evaluate Plasma electrolytes, osmolality and lipid profile in stroke patients.

Materials and Method: This was a descriptive cross-sectional study conducted between May 2022 to October 2022, on 144 stroke patients seen in the University of Benin Teaching Hospital. Serum electrolytes, Osmolality and lipid profile were assayed. Statistical analysis was done using SPSS version 22. Level of significance established at $p \leq 0.05$

Result: 69.5% of the subjects had ischemic stroke, 30.5% had hemorrhagic stroke. 45.1% of the subjects had hyponatremia and hypo-osmolality, 49% had hypokalaemia, 21.5% had metabolic acidosis and 6% hypochloraemia. Majority of the subjects (98%-99.3%) had normal lipid profile. No statistically significant difference between the electrolyte results of both ischaemic and hemorrhagic stroke.

Conclusion: Electrolyte derangements are common in patients with stroke. Hypokalaemia was the commonest observed, closely followed by hyponatremia and hypo-osmolality in this study. Electrolyte derangements in stroke patients should be promptly corrected and plasma levels monitored to reduce morbidity and mortality.

Key word: Acute Stroke, Plasma electrolytes, lipid profile

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INTRODUCTION

Stroke is a leading cause of adult disability and deaths worldwide, with an annual mortality rate of 5.5 million.[1] Prevalence seems to be on the increase, Nigeria not left out. Prevalence of stroke in Nigeria has been reported to be 1.4 per 1000, while the 30 day case fatality rate is said to be as high as 40%.[2] Some authors[3] reported a pooled crude incidence of 26 per 100,000 persons, while another author[4] reported incidence of 25 per 100,000.

In 2019 worldwide, 103 million cases of stroke was reported and 6.5 million deaths were accounted for by stroke. It was the second leading cause of death and disability[1,5] combined worldwide. Of the total death, 3.3 million deaths were due to Ischemic stroke.[5] One of the leading

causes of stroke in African countries is Hypertension.[6] Changes in lifestyles that support risk factors for stroke is on the increase.

The morbidity and mortality associated with stroke are due to some complications like Cerebral edema, infection, Deep Vein thrombosis and electrolyte derangements.

Disorders of serum electrolytes especially that of Sodium and Potassium have been reported to be the commonest electrolytes abnormalities found in stroke patients.[7] Electrolytes disturbances such as hyponatremia, hypernatremia resulting in increase in Brain Natriuretic Peptide and Atrial Natriuretic Peptide are common in acute phase of stroke.[7]

Studies[7,8] have also been done to determine the relationship of serum lipids and stroke; these studies reported dyslipidemia in stroke patients.

There seems to be paucity of information on electrolyte derangements, lipid profile and serum osmolality in stroke patients in Nigeria.

This study was aimed at evaluating the plasma electrolytes osmolality, lipid profile in stroke patients in Benin City.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted in the Neurology unit of the department of Internal Medicine in a tertiary care hospital, Benin City, from May 2022 to October 2022. A total of 144 patients aged 25-88 years with either ischaemic or hemorrhagic stroke, and diagnosed with either CT scan or MRI of the brain, every consecutive patient admitted in the ward was enrolled in the study. Data collected included demographic data, types of stroke (ischaemic or haemorrhagic), medical history of hypertension, diabetes mellitus was ascertained. This was collected using a structured questionaire. Plasma electrolytes, lipid profile, and Plasma osmolality were measured on the day of admission. Plasma electrolytes were measured using the Ion Selective Electrode Analyzer 4000. Plasma osmolality was measured using an Osmometer. Serum Total Cholesterol, Triglycerides, were measured using Enzymatic kit method.

Statistical Analysis: Statistical analysis was done using SPSS version 22. Student t test was used to compare means of variables. Level of significance was established at $P \leq 0.05$.

RESULT

A total of 144 subjects diagnosed with acute stroke were included in the study. They were aged between 21-94 years. One hundred.(69.5%) of the subjects had ischemic stroke, while 44 (30%) of them had hemorrhagic stroke (Table 1). Mean plasma sodium was 132.6±15.6mmol/L. Plasma Sodium level was normal in 77 (53.5%) of the subjects, while 65 (45.1%) had hyponatremia and 2 (1.4%) had hypernatremia (Table 2). Mean Plasma Potassium was 3.6 ± 0.6 mmol/L. Seventy one.(49%) of the subjects had normal Plasma Potassium, while 71 (49%) had Hypokalaemia and 2 (1.4%) had Hyperkalaemia (Table 2).

Mean Plasma Bicarbonate was 19.5±2.9 mmol/L. Plasma Bicarbonate was normal in 113 (78.4%) of the subjects, while 31 (21.6%) had low Bicarbonate levels (Table 2).

Mean Plasma Chloride was 100.6±7.5 mmol/L. Plasma Chloride was Normal in 138 (95.8%) of the subjects and low in 6 (4.2%) of the subjects.

Mean Plasma Osmolality was 280.5±23.4 mosm/kg. Seventy-seven (53.5%) had plasma osmolality within the normal reference interval,

while 65 (45.1.%) had hypoosmolality, and 2 (1.4%) had hyperosmolality.

Mean Serum Triglyceride was 92.1±43.5mg/dL. Plasma Triglyceride was normal in 143 (99.3%) of the subjects and high in 1 (0.7%) of the subjects (Table 2).

Mean Serum total Cholesterol was 154.7±70.7 mg/dL. Serum total cholesterol was normal in 141 (98%) of the sub subjects and high in 3 (2%) of the subjects (Table 3).

Mean Serum LDL Cholesterol was 97.2±60.0 mg/dL. LDL Cholesterol was normal in 141 (98%) of the subjects and high in 3 (2%) of the subjects (Table 2).

Mean Serum HDL was 38.6±18.3 mg/dL. HDL Cholesterol was normal in 143 (99.3%) of the subjects and low in 1 (0.7%) of the subjects (Table 2).

Mean Plasma Sodium was higher in Hemorrhagic stroke patients (139±11.5 mmol/L) than in ischemic stroke patients (132.9±7.2mmol/L). Difference was not statistically significant. P=0.166 (Table 3).

Mean Plasma Potassium in Haemorrhagic stroke was (3.4±0.2mol/L) and (3.4±0.8mmol/L) in ischemic stroke patients. No statistically significant difference in values observed. P=0.890 (Table 3).

Mean Plasma Bicarbonate was slightly higher (19.7±1.8mmol/L) in Haemorrhagic stroke patients compared with ischemic stroke patients (18.7±2.5mmol/L). Difference was not statistically significant (P=0.440) (Table 3).

Plasma Chloride was higher in subjects with Haemorrhagic stroke (107.2±11.9 mmol/L) compared with ischemic stroke subjects (97.9±6.1mmol/L). Difference was not statistically significant. P=0.131 (Table 3).

Dermographic parameters and types of stroke

TABLE 1:

Age (in years)	<65	67 (46.5%)
	≥65	77 (53.5%)
Sex	Male	80 (55.6%)
	Female	64 (44.4%)
Types of stroke		
	Ischemic – 100 (69.5%)	
	Hemorrhagic – 44 (30.5%)	

TABLE 2:

Plasma Electrolytes, Osmolality and Lipid Profile in the study population

Sodium	n	Mean
Normal (135-145mmol/L)	77 (53.5%)	132.6±15.6mmol/L
Hyponatremia (<135mmol/L)	65 (45.1%)	
Hypernatremia (>145mmol/L)	2 (1.4%)	
Potassium		
Normal (3.5-5mmol/L)	71(49%)	36.6±0.6mmol/L
Hypokalaemia <3.5mmol/L	71 (49%)	
Hyperkalaemia >5mmol/L	2 (1.4%)	
Bicarbonate		19.5±2.9mmol/L
Normal (20-30mmol/L)	113(78.4%)	
Low <20mmol/L	31(21.6%)	
Chloride		100.6±7.5mmol/L
Normal 96-108mmol/L	138(95.8%)	
Hypochloraemia <96mmol/L	6(4.2%)	
Osmolality		280.5±23.4 mOsm/kg
Normal 275-295mOsm/kg	77 (53.5%)	
Low <275mOsm/kg	65 (45.1%)	
High >295mOsm/kg	2 (1.4%)	
Triglycerides		
Normal <150mg/dL	143(99.3%)	92.1±43.5mg/dL

High >150mg/dl	1(0.7%)	
Total Cholesterol		
Normal <200mg/dl	141(98%)	154.7±70.7mg/dL
High ≥200mg/dl	3(2%)	
LDL Cholesterol		
Normal <130mg/dl	141(98%)	97.2±60.0mg/dL
High >130mg/dl	3(2%)	
HDL		
Normal 30-60mg/dl	143(99.3%)	38.6±18.3mg/dL
Low <30mg/dl	1(0.7%)	

TABLE 3:
Comparison of electrolytes in hemorrhagic and ischemic stroke

	Hemorrhagic stroke	Ischemic stroke	P value
Sodium (mmol/L)	139±11.5	132.9±7.2	0.166
Potassium (mmol/L)	3.4±0.2	3.4±0.8	0.990
Bicarbonate (mmol/L)	1 9.7±1.9	18.7±2.5	0.410
Chloride (mmol/L)	107.2±11.9	97.9±6.1	0.131

DISCUSSION

Out of the 144 subjects in this study, 77 representing 53.5% of them were in the age group 65 years and above. This implies that the incidence of stroke was higher in the older age group. Similar observations were made by Ajidahun et al[6] and Hassan et al[9] in their studies.

A larger percentage of the subjects had Ischaemic stroke, and a lower percentage had haemorrhagic stroke. Studies[7,10,11] in other parts of the world have also reported similar findings.

Ischaemic stroke appears to be commoner than Haemorrhagic stroke worldwide. This could be a reflection of socio-economic lifestyle. 45.1% of the subjects in our study had Hyponatremia. Several authors[7,9,12] have reported similar observations in their studies. Hyponatremia is frequent in Acute Stroke patients. Hyponatremia may be seen both in ischemic and hemorrhagic stroke[13] and is associated with worse outcomes and increased mortality.[13] Hyponatremia is usually hypoosmolal and may be due to syndrome of inappropriate Antidiuretic hormone secretion or Cerebral Salt Wasting Syndrome. This could be associated with high mortality rate. Khan et al[14]

reported in their study that it increases brain edema and subsequent neurological consequences. They reported that Hypernatremia is prevalent in ischemic stroke and is independently associated with in-hospital mortality and worse NIHSS scores at admission and discharge. Results in our study showed that hyponatraemia is more common in stroke patients in the area of study and hence, proper and adequate management protocol is to be instituted to prevent fatal outcomes.

Hypernatremia was observed in 1% of the study population. Hypokalaemia was also observed in 49% of the subjects in the study population. Wali[7] et al also reported hypokalaemia in their study in stroke patients in India. Gariballa et al[15] reported in their study that Hypokalaemia is common Post stroke and maybe be associated with a poor outcome. Hyperkalaemia was observed in 1.4% of the cases, hence may not be a common occurrence.

Majority of the patients had normal Plasma bicarbonate levels and a lower percent had low bicarbonate levels. Huang[16] reported in their study that low baseline bicarbonate levels and decreased bicarbonate levels during the ICU stay were associated with a high risk of 30-day mortality in Acute Ischemic Stroke. Metaolic acidosis can contribute to morbidity and mortality.

Majority of the subjects had normal plasma chloride with a few cases of hypochloremia. Bei[17] et al reported that hypochloremia was associated with a 2.4 fold increase in the risk of in-hospital mortality in their study.

Almost half of the separate population had hypoosmolality. This could be multifactorial, ranging from effects of syndrome of inappropriate ADH secretion, to fluid overload especially with hypotonic solution, amongst other causes. This could also be a contributory factor to hyponatremia observed the subjects.

Majority of the study population had normal lipid profile. Only 0.7% had hypertriglyceridemia, 2% hypercholesterolemia, 2% high serum LDL, 0.7% with low serum HDL. Some authors[8,18,19] reported dyslipidemia of varying degrees in their studies. Alamayehu[8] reported 51.1% cases of dyslipidemia in stroke patients in their study. Bharosay et al[18] reported increased risk of ischaemic stroke and poorer prognosis with increased serum levels of total cholesterol, triglycerides, low density lipoprotein, and low serum HDL. Rehman[19] also reported a high frequency of dyslipidemia in stroke patients in India. The observation of cases of dyslipidemia in our study may be influenced by socio-economic and dietary factors.

A comparison of Plasma electrolyte between Ischaemic and Hemorrhagic stroke patients showed that Mean plasma Sodium was higher in Hemorrhagic stroke than Ischaemic stroke, though difference was not statistically significant. Mean Plasma Potassium levels was virtually the same in both groups; Mean plasma chloride was higher in subjects with hemorrhagic stroke than ischaemic stroke, difference not statistically significant.

Mansoor et al[20] reported significantly higher sodium levels in hemorrhagic stroke patients compared with Ischemic stroke patients. Faramand and co authors[21,22] reported that increased sodium concentrations were associated with a higher incidence of stroke and worsening of neurological condition.

CONCLUSION

Electrolyte derangements are common in stroke patients. Hypokalemia is the commonest

observed in our study, followed closely by hyponatremia and hypoosmolality. Patients with Acute stroke should be screened immediately for electrolyte derangements. Early detection, proper monitoring and prompt correction of derangements in Serum electrolyte will reduce morbidity and mortality in stroke patients.

REFERENCES

1. Donker ES Stroke in the 21st century; A Snap shot of the burden, Epidermiology, and Quality of life. Stroke Res Treat 2018
2. Wahab KW. The Burden of Stroke in Nigeria. Int J Stroke. 2008 Nov: 3(4)290-2
3. Adeloye D, Ezejimofor M, Auta A, Moazanje R, Ezeigwe N, Nigige .E et al. Estimating Morbidity due to stroke in Nigeria: A systematic review and meta-Analysis. J neurol Sci 2019.[15](402)136-144
4. Akinyemi RO, Ovbiagele B, Mayowa O. Stroke in Africa: Profile, Progress, Prospects and Priorities, Nature Reviews, Neurology, 17: 634-656
5. Feigin VL, Brainin M, Norrving B, Martins S, Sacco Ret al. World Stroke Organization (WSO). Global Stroke Fact Sheet, 2022. Int J Stroke 2022: 17(1)18-29.
6. Ajidahun O.M, Bebibele C.O. Electrolyte derangements and its association with mortality in stroke patients in the University College Hospital, Ibadan, Nigeria. Afr J Biomed Res, 2020. 59-63.
7. Wali VV, Patil SS. A comparative study of serum electrolytes and lipids in Ischemic and Hemorrhagic stroke. Int J Research Med Sci, 2016, vol 4 (II) 4838-4842.
8. Alemayehu E, Fasil A, Nigatie M, Ambachewb S. Serum Lipid Profile of stroke patients attending Dessie Comprehensive Hospital Dessie, Northeast. Ethopia. A Comparative Cross Sectional study Heriyon 2023 mar 9(3).
9. Hassan MK, Hassan MB, Rubaiyat KA. Electrolyte disturbances in Acute phase of stroke patients. Dinajpur Med Col J Jan 6 (1):12-16
10. Ahmad J Farooq O, Sanaie A et al. Study of Electrolyte abnormalities in Acute stroke and correlation with outcome. IJMSIR 2021. 6(1)337-338.
11. Setya Wati YD et al. Electrolyte disturbances and lipid profiles in Ischemic and hemorrhagic stroke patients in Aisyiyah Bojonegoro Hospital, Indonesia. Int J Res Med Sci 2020. Jun 8 (6):2028-2032
12. Ehtesham M Mohmand M, Raj K, Hussain T, Kavita F, Kumar B et al. Clinical Spectrum of Hyponatremia in patients with stroke. Ceureus 2019, Aug 11 (8).
13. Liamis G, Barkas F, Megapanou E, Christopoulou E, Makri A et al. Hyponatremia in Acute stroke patients: Pathophysiology, Clinical significance and management options. Eur Neurol (2019) 82 (1-3):32-40
14. Khan A, Khan z, Khan S, Ullah A, Ayub G, Tariq Net al. Frequency of hyponatremia and its impact on prognosis in ischemic stroke. Cerues 2023
15. Gariballa SE, Robinson TG, Fortherby MD. Hypokarlemia and potassium excretion in stroke patients. J Am Geriatric Soc 2015, 45:1454-1458.
16. Huang X, Zhang Y. Relationship between serum bicarbonate level and the risk of death within 30 days in ICU patients with acute ischemic stroke. Front Neurol 2023; 14:
17. Bei Hz You S-J, Zheng D, Zhong C-K, Du H-P et al. Prognostic role of hypochloraemia in acute stroke patients. Acta Neurol Scandinavice 2017, 136.
18. Bharosay A, Bharosay V, Bandyopadhyay D, Sodani A, Varma M, Baruah Het al. Effect of Lipid profile upon prognosis in Ischeamic and hemorrhagic cerebrovascular stroke. India J Clin Biochem 2014.

19. Rehman NU, Bilal M, Shah SA, Imran M, Masood A. Frequency of deranged lipid profile in patients with stroke. Pakistan J Neurol 2023.27.4.
20. Mansoor F Kumar Jitesh, Kaur N, Sultan S, Tahir H et al. Frequency of electrolyte imbalance in patients presenting with acute stroke. Ceureus 2021 13(9).
21. Farahmand F,Choobi AB, Heshmat R, Ghafoui HB, Henedanchi S Serum sodium and potassium levels in cerebrovascular accident patients. Maleys T Med Sci 2013: 20:39-43
22. Kabin H, HU Y, Wu Y, Ji Z, Wang S, Lin Z, Pan S et al. Hyperchloremia is associated with poorer outcome in critically ill stroke patients. Front Neurol 2018; 9:485

Adewolu OF, Odiase F. Plasma Electrolytes, Osmolality and Lipid Profile in Patients with Acute Stroke in a Tertiary Hospital in South-South, Nigeria. Afr. J. Trop. Med. & Biomed. Res. 2024; 7(1) 22-29

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