MEDWIN PUBLISHERS
Committed to Create Value for Researchers

Neurology & Neurotherapy Open Access Journal
ISSN: 2639-2178

Short Term Hospital Outcome of Ischemic Stroke Patient Presenting with Hyponatremia

Goutam Saha[1], Md. Shafiqul Islam[1], Uttam kumar Das[1], Md. Rezaul karim Talukder[1], Sajal Kumar Shill[2], Jobaidul Alam Bhuiya[1], Md. Magfur Rahman[3], Sabia Siddika[4]

[1]Assistant Professor, Department of Neurology, Mymensingh Medical College, Mymensingh, Bangladesh

[2]Assistant Professor, Department of Neurology, Kumudini Womens Medical college, Mymensingh, Bangladesh

[3]Cardiac Surgeon & Consultant (Cardiologist & Diabetologist), Department of Cardiac Surgery, Bangabandu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh

[4]Assistant Professor & Head, Department of Anesthesia, US-Bangla Medical College Hospital, Narayangonj, Bangladesh

***Corresponding author:** Goutam Saha, Assistant Professor, Department of Neurology, Mymensingh Medical College, Mymensingh, Bangladesh; Email: publication985@gmail.com

Research Article

Volume 6 Issue 1

Received Date: March 21, 2021

Published Date: May 07, 2021

DOI: 10.23880/nnoaj-16000161

Abstract

This observational prospective study was performed in the Department of Neurology and Medicine wards at Mymensingh Medical College Hospital, Bangladesh over the period of one year to assess the short term hospital outcome of ischemic stroke patients presenting with hyponatremia. Patients diagnosed as ischaemic stroke were primarily enrolled as study population in this study. Of them 50 patients were selected whose serum sodium was less than 135 meq/L as hyponatremic and another fifty patients were selected whose serum sodium was normal level (135-145) meq/L as normonatremic. The patients were followed up at admission and at the time of discharge. Disability was assessed by the mRS score. Mean age of hyponatremia patients and normonatremia patients were 64.8 ± 12.3 years and 60.9 ± 13.1 years respectively. Male were predominant in both groups. Mean Na+ level in hyponatremia patients was significantly lower than normonatremia patients (127.6 ± 5.7 mg/dl vs 139.3 ± 3.5 mg/dl). Even mortality rate was higher in hyponatremia group (12.0%) than that of normonatremia group (4.0%) the difference was not statistically significant ($p>0.05$). No significant difference was observed in disability rate between hyponatremia group and normonatremia group (81.8% vs 72.9%). The mean mRS scores at the time of admission (4.16 ± 1.03 vs 3.74 ± 0.75) and at the time of discharge (3.56 ± 1.21 vs 3.04 ± 0.98) were significantly higher in hyponatremia than normonatremia patients. This study result shows that mRS score is higher in hyponatremic stroke patients than that of normonatrimic stroke patients.

Keywords: Ischaemic Stroke; Hyponatremia

Introduction

Stroke remains a leading cause of death world-wide [1]. World Health Organization defined stroke as a clinical syndrome occurring due to sudden cerebral dysfunction, producing focal or global neurological deficit, persisting for more than24 hours, or the patient dieswithin24 hours, which is vascular in origin, non-traumatic in nature [2]. Incidence of stroke in Bangladesh is 2.55/1000 population/ year in both sexes [3]. Acute ischemic Stroke affects 795,000 people every year, is the fourth leading cause of death and the most common cause of long term disability in the United States [4]. It is the third most common cause of mortality and most common cause of chronic disability in

developed countries. Modifiable risk factors for store are dyslipidaemia, hypertension, diabetes mellitus, valvular heart disease, atrial fibrillation, smoking, ischemic heart disease, sedentary life style and non-modifiable risk factors are age, gender, heredity, high fibrinogen [5]. Hyponatremia is the most common electrolyte abnormality encountered in the hospitalized patient, and the reported prevalence has varied with the nature of the patient population and health care setting studied [6-10]. It frequently develops during the course of hospitalization as a complication of acute illness or a consequence of therapeutic interventions [11-14]. Hyponatremia among hospitalized patients has been associated with increased morbidity and mortality, but whether the mortality is associated with hyponatremia itself or the underlying illness remains unclear [15-17]. Rapid changes in the cell volume as a result of hyponatremia can have profound effects on tissue and organ function, especially the brain. A rapid reduction in plasma sodium concentration can cause brain cell odema, neurological symptoms, including headache, nausea, lethargy and disorientation. If plasma sodium concentration rapidly falls below 115 to 120 mmol/L brain swelling may lead to seizures, coma, permanent brain damage, and death [18]. This study was conducted to predict the short term outcome of ischemic stroke presenting with hyponetremia.

Methods

This prospective observational study was conducted in Neurology and Medicine Wards of Mymensingh Medical College Hospital, Mymensingh, Bangladesh from March 2014 to February 2015 over a period of one year. Patients diagnosed as ischaemic stroke admitted in the Neurology and Medicine Wards of Mymensingh Medical College Hospital were primarily enrolled as study population. Of them, 50 patients were selected as hyponatremic (Serum sodium concentration < 135 meq/L) and another fifty patients were selected as normonatremic (serum sodium = 135- 145 meq/L). After taking written consent patients or eligible attendants were questioned about past and family (parents and siblings) history of stoke. The age, sex, time delay from symptom onset to hospital arrival and risk factors were recorded in a standard and pre-tested structured questionnaire. Serum electrolyte, fasting glucose and lipid profile were measured. All data were compiled and edited meticulously. Quantitative data was expressed as mean & standard deviation and qualitative data was expressed as frequency and percentage and data was analysed by Chi-square (χ^2) test in case of qualitative data and unpaired t test in case of quantitative data. A probability (p) of less than 0.05 was considered statistically significant. Statistical analysis was performed by using SPSS 12.0.

Results

Age group	Group		p value
	Group A (Hyponatremia) n (%)	Group B (Normonatremia) n (%)	
Age in year (Mean ± SD)	64.8 ± 12.3	60.9 ± 13.1	0.121
Gender			
Male	27 (54.0%)	32 (64.0%)	0.309
Female	23 (46.0%)	18 (36.0%)	
Smoking habit	27 (54.0%)	21 (42.0%)	0.23
Systolic BP (mm Hg)	146.6 ± 13.9	151.4 ± 15.5	0.107
Diastolic BP (mm Hg)	88.4 ± 8.5	92.3 ± 8.6	0.025
Diabetic	14 (28.0)	11 (22.0)	0.509

Table 1: Demographic profile and clinical profiles of the study population.

There was no significant difference in age, gender, smoking habit, systolic BP and diabetic between hyponatemic and normonatremic ischemic patients. But diastolic BP was significantly lower in hyponatemic patients than that of normonatremic patients (88.4 ± 8.5 vs 92.3 ± 8.6).

Lipid profile (mg/dl)	Group		p value
	Group A (Hyponatremia)	Group B (Normonatremia)	
T. Cholesterol (mg/dl)	184.9 ± 34.9	178.3 ± 38.1	0.121
HDL(mg/dl)	35.4 ± 5.5	36.9 ± 4.4	0.373
LDL(mg/dl)	119.9 ± 29.8	108.2 ± 27.8	0.149
Triglyceride(mg/dl)	167.1 ± 42.7	153.5 ± 43.9	0.046

Table 2: Lipid profile of the respondents.

There was no significant difference in TC, HDL and LDL between hyponatemic and normonatremic ischemic patients. But Triglyceride was significantly higher in hyponatemic patients than that of normonatremic patients (167.1 ± 42.7 mg/dl vs 153.5 ± 43.9 mg/dl).

Electrolytes (meq/L)	Group		p value
	Group A (Hyponatremia)	Group B (Normonatremia)	
Na+	127.6 ± 5.7	139.3 ± 3.5	0.001
K+	4.1 ± 0.7	3.9 ± 0.6	0.646
Cl-	92.4 ± 18.0	97.0 ± 15.9	0.172

Table 3: Electrolytes of the patients at the time of admission.

There was no significant difference in K+ and Cl- between hyponatemic and normonatremic ischemic patients.

Clinical features	Group		p value
	Group A (Hyponatremia) n (%)	Group B (Normonatremia) n (%)	
Convulsion	10(20)	3 (6)	0.037
Behavioral abnormalities	5 (10)	3 (6)	0.461
Unconsciousness	9 (18)	2 (4)	0.025
Motor weakness	40 (80)	38 (76)	0.629
Sensory disturbance	3 (6)	2 (4)	0.646
Dysphasia	16 (32)	14 (28)	0.663
Dysarthria	18 (36)	16 (32)	0.673

Table 4: Distribution of patients according to clinical features.

Clinical features were almost similar in both groups except convulsion and unconsciousness. Convulsion and unconsciousness were observed significantly higher in hyponatemic patients than that of normonatremic patients.

Outcome Mortality	Group		Odds ratio	95% CI	p value
	Group A (Hyponatremia)n (%)	Group B (Normonatremia)n (%)			
Mortality	6 (12.0)	2 (4.0)	3.27	0.62-17.07	0.14
Disability	36 (81.8)	35 (72.9)	1.67	0.61-4.52	0.31

Table 5: Association of hyponatremia with mortality and disability (mRS>2).

Mortality and morbidity rate was higher in hyponatremia patients (12.0% and 81.8%) than that of normonatremia patients (4.0% and 72.9%) but the difference was not statistically significant (p>0.05).

mRS score	Group		p value
	Group A (Hyponatremia) n (%)	Group B(Normonatremia) n (%)	
Time of admission	4.16 ± 1.03	3.74 ± 0.75	0.022
Time of discharge	3.56 ± 1.21	3.04 ± 0.98	0.021

Table 6: Association of mRS score with hyponatremia.

Table 6 shows association of mRS score with hyponatremia. Mean mRS at the time of admission was 4.16 ± 1.03 and 3.74 ± 0.75 in hyponatremia and normonatremia patients respectively. The difference was statistically significant (p<0.05). Similarly mean mRS at the time of discharge was 3.56 ± 1.21 and 3.04 ± 0.98 in hyponatremia

and normonatremia patients respectively. The difference was statistically significant (p<0.05).

Discussion

In this study, males were predominant than females in both groups indicating that stroke is a male predominant disease. Similar result was seen in the study of Goldberg, et al. [19] and Zhang, et al. [20] but opposite result was seen in the study of Rodrigues, et al. [21] where female is slightly higher in number than male in both groups. Stroke, either ischaemic or haemorrhagic, is more prevalent in men than in women [22]. In the present study mean age in group A and group B were 64.8 ± 12.3 years and 60.9 ± 13.1 years respectively. Almost similar result was seen in the study of Goldberg, et al. [19]. Slightly higher mean age was seen in both groups in the study of Rodrigues, et al. [21]. In this study 27 (54.0%) patients and 21 (42.0%) patients were smoker in group A and group B respectively. Almost similar percent of smoker was seen in both groups in the study of Rodrigues, et al. [21] and Goldberg, et al. [19]. Devkota, et al. [23] reported 58.3% of stroke patients had smoking history. It was seen in this study that diabetes mellitus was in 14 (28.0%) and 11 (22.0%) patients in hyponatremia patients and normonatremia patients respectively. Diabetic was more in hyponatremia patients (44%) than that of normonatremia patients (20%) [19]. Overall incidence was 25% which is consistent with the study of Uddin, et al. [24] where diabetic patient was 20% in ischaemic stroke patients. Diabetic was seen in 38.4% and 28.5% patients in hyponatremia and normonatremia patients respectively in the study of Rodrigues, et al. [21]. In this study, it was seen that lipid profile levels were worse in hyponatremia patients than that of normonatremia patients. Mortality rate was higher in hyponatremia patients (12.0%) than that of normonatremia patients (4.0%). Rodrigues, et al. [21] showed that mortality was higher in hyponatremia patients than normonatremia patients. In-hospital mortality was 13.5% and 10.5% in hyponatremia and normonatremia patients respectively among ischaemic patients Rodrigues, et al. [21] which is consistent with our result in case of hyponatremia. Mortality rate was higher among hyponatremia patients than that of normonatremia patients [25]. Morbidity rate was higher in hyponatremia patients (81.8%) than that of normonatremia patients (72.9%) but the difference was not statistically significant (p>0.05). Mean mRS at the time of admission was 4.16 ± 1.03 and 3.74 ± 0.75 in hyponatremia and normonatremia patients respectively. The difference was statistically significant (p<0.05). Similarly mean mRS at the time of discharge was 3.56 ± 1.21 and 3.04 ± 0.98 in hyponatremia and normonatremia patients respectively. The difference was statistically significant (p<0.05).

Conclusion

This study result shows that mRS score is significantly higher in hyponatremia patient then normonatremia patients but hyponatremia does not have significant mortality and morbidity in acute ischaemic stroke patient in comparison with normonatrimic stroke patients. So, it can be concluded that outcome of ischaemic stroke patients with hyponatremia is worse than ischaemic stroke patients with normonatremia.

References

1. Jafari FH, Ahmed SI, Qureshi HA (2000) Presentation, progression and prognosis of stroke in the hypertensive, the diabetic and the normotensive normoglycemic. J Rawal Med Coll 4: 47-49.

2. Aho K, Harmsen P, Hatano S, Marquardsen J, Smirnov VE, et al. (1980) Cerebrovascular disease in the community: results of a WHO collaborative study. Bull World Health Organ 58(1): 113-130.

3. Bangladesh Bureau of statistics (2000) Statistical pocket book of Bangladesh Statistics Division, Ministry of Planning, Government of Peoples Republic of Bangladesh 2002, pp: 381.

4. Lloyd Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, et al. (2010) Heart disease and stroke statistics-2010 update. A report from the American Heart Association. Circulation 121(7): e46-e215.

5. Boon NA, College NR (2006) Cerebrovascular diseases. Davidson's principle and practice of medicine, 20th (Edn.), Churchill Livingstone, pp: 1202.

6. Chawla A, Sterns RH, Nigwekar SU, Cappuccio JD (2011) Mortality and serum sodium: do patients die from or with hyponatremia? Clin J Am Soc Nephrol 6(5): 960-965.

7. Asadollahi K, Beeching N, Gill G (2006) Hyponatraemia as a risk factor for hospital mortality. QJM 99(12): 877-880.

8. Frenkel WN, Van Den Born BJ, Van Munster BC, Korevaar JC, Levi M, et al. (2010) The association between serum sodium levels at time of admission and mortality and morbidity in acutely admitted elderly patients: a prospective cohort study. J Am Geriatr Soc 58(11): 2227-2228.

9. Arampatzis S, Frauchiger B, Fiedler GM, Leichtle AB, Buhl

D, et al. (2012) Characteristics, symptoms, and outcome of severe dysnatremias present on hospital admission. Am J Med 125(11): 1125e1-1125e7.

10. Renneboog B, Musch W, Vandemergel X, Manto MU, Decaux G, et al. (2006) Mild chronic hyponatremia is associated with falls, unsteadiness, and attention deficits. Am J Med 119(1): 71e1-71e8.

11. Shea AM, Curtis LH, Szczech LA, Schulman KA (2008) Sensitivity of International Classification of Diseases codes for hyponatremia among commercially insured outpatients in the United States. BMC Nephrol 9(1): 5.

12. Boscoe A, Paramore C, Verbalis JG (2006) Cost of illness of hyponatremia in the United States. Cost Eff Resour Alloc 4(1): 10.

13. Vaishya R, Kaur J, Seema Chopra S, Jaswal S (2012) Mortality predictors in severe hyponatraemia in emergency in patients, J Indian Med Assoc 110(2): 94-97.

14. Gill G, Huda B, Boyd A, Skagen K, Wile D, et al. (2006) Characteristics and mortality of severe hyponatraemia–a hospital-based study. Clin Endocrinol 65(2): 246-249.

15. Gankam KF, Andres C, Sattar L, Melot C, Decaux G, et al. (2008) Mild hyponatremia and risk of fracture in the ambulatory elderly. QJM 101(7): 583-588.

16. Hoorn EJ, Rivadeneira F, van Meurs JB, Ziere G, Stricker BH, et al. (2011) Mild hyponatremia as a risk factor for fractures: the Rotterdam Study. J Bone Miner Res 26(8): 1822-1828.

17. Angeli P, Wong F, Watson H, Ginès P (2006) Hyponatremia in cirrhosis: results of a patient population survey. Hepatology 44(6): 1535-1542.

18. John E Hall (2006) The body fluid compartment: Extracellular and intracellular fluid. Edema, Guyton and Hall Textbook of Medical Physiology, 12th (Edn.), Phliladelphia Elsebier Int, pp: 295.

19. Goldberg A, Hammerman H, Petcherski S, Zdorovyak A, Yalonetsky S, et al. (2004) Prognostic importance of hyponatremia in acute ST-elevation myocardial infarction. Am J Med 117(4): 242-248.

20. Zhang Y, Galloway JM, Welty TK, Wiebers DO, Whisnant JP, et al. (2008) Incidence and risk factors for stroke in American Indians: the Strong Heart Study. Circulation 118(15): 1577-1584.

21. Rodrigues B, Staff I, Fortunato G, McCullough LD (2014) Hyponatremia in the prognosis of acute ischemic stroke. J Stroke Cerebrovasc Dis 23(5): 850-854.

22. Dey SK, Ahmed S, Rahman KM, Uddin MJ, Alam MR, et al. (2010) Lipid profile among ischemic and haemorrhagic stroke patients. MMJ 19(2): 176-180.

23. Devkota KC, Thapamagar SB, Malla S (2006) Retrospective analysis of stroke and its risk factors at Nepal Medical College Teaching Hospital. Nepal Med Coll J 8(4): 269-275.

24. Uddin MJ, Alam B, Jabbar MA, Mohammad QD, Ahmed S, et al. (2009) Association of lipid profile with ischemic stroke. MMJ 18(2): 131-135.

25. Scherz N, Labarère J, Méan M, Ibrahim SA, Fine MJ, et al. (2010) Prognostic importance of hyponatremia in patients with acute pulmonary embolism. Am J Respir Crit Care Med 182(9): 1178-1183.