

# Frequency of Hyponatremia in Patients with Ischemic Stroke

Sultana Nazeer<sup>1</sup>, Ayesha Saddique<sup>1</sup>, Balawal Nazeer<sup>1</sup> and Shazia Hayat<sup>2</sup>

## ABSTRACT

**Objectives:** Hyponatremia leads to poor clinical outcomes in patients with ischemic stroke, so this study was conducted to evaluate current magnitude of the problem as there is no such study done in Pakistan on this topic.

**Study Design:** Descriptive study

**Place and Duration of Study:** This study was conducted at the Department of Medicine, Nishtar Hospital, Multan from March 2016 to January 2017.

**Materials and Methods:** One hundred and twenty patients with ischemic stroke were recruited in this descriptive study. The study was conducted at nishtar hospital and duration of this study was three months. Serum Sodium level was checked in these patients and data was analyzed by SPSS – 22.

**Results:** Out of these 120 patients with ischemic stroke, 88 (73.3%) were male and 32 (26.7%) were female patients and male to female ratio was 2.75:1. Mean age of our study cases was  $45.23 \pm 14.87$  years. Of these 120 patients, 70 (58.3%) were from rural areas, 34 (28.3%) belonged to poor families, 64 (53.3%) were from middle income families and 22 (18.3%) belonged to rich families. Mean body mass index (BMI) was  $25.17 \pm 3.22$  kg/m<sup>2</sup> and obesity was noted in 50 (41.7%) patients. History of smoking was present in 66 (55%), diabetes in 52 (43.3%), hypertension in 72 (60%), dyslipidemia in 64 (53.3%) and family history of stroke in 34 (28.3%) patients. Mean serum sodium level was  $137.40 \pm 9.21$  nmol/L (range; 118 nmol/L to 157 nmol/L) and hyponatremia was noted in 48 (40%).

**Conclusions:** Hyponatremia is a common entity in patients with ischemic stroke as very high frequency was noted in our study. Clinicians treating such patients with ischemic stroke must check this parameter on routine basis to avoid future adverse clinical outcome and to improve prognosis of the disease. Hyponatremia was significantly associated with history of hypertension.

**Key Words:** Hyponatremia, ischemic stroke, sodium level.

**Citation of article:** Nazeer S, Saddique A, Nazeer B, Hayat S. Frequency of Hyponatremia in Patients with Ischemic Stroke. Med Forum 2017;28(4):112-115.

## INTRODUCTION

Stroke, a global health problem, is one of the leading causes of long-term disabilities among young survivors and 2<sup>nd</sup> leading cause of death in these patients all over the world.<sup>1-6</sup> Every year, estimated 15 million general population suffer its attack, 33 % of these patients die due to its complications and one third patients experience permanent disabilities which has significant impact on suffering families and also for the society specially in low and middle income countries.<sup>7</sup>

According to WHO estimates stroke will remain 2<sup>nd</sup> leading cause of mortality after heart diseases in underdeveloped as well as developed countries for the year 2020<sup>8</sup>.

Strikingly patients in developing countries are estimated 10 years younger than that being in developed western countries which leads to prolonged disability in these young survivors.

Moreover more than 80 % stroke related deaths are reported from these underdeveloped countries<sup>9</sup>. Stroke may be represented by rapidly developing signs and symptoms of focal, loss of cerebral function, without any evident cause other than those of vascular origins and symptoms which last for more than 24 hours and/or leading to death.

Ischemic Stroke which occurs in 60 – 90 % of all stroke patients in Pakistan is a due to the obstructions within blood vessels which supply blood to the brain<sup>10</sup>. WHO had documented total mortality from stroke is over 75000 per year in Pakistan and large proportion of stroke patients are being admitted at secondary and tertiary level healthcare facilities. Of these stroke patients some may die in hospitals while large number of such patients are left with partial or total disabilities which may exert extra economical and social burden on the family and community<sup>11</sup>.

Hyponatremia is one of the common electrolyte disorders among hospitalized patients and it is generally indicator for a major underlying illness. However prognostic values of hyponatremia in patients with acute first-ever ischemic stroke are yet unclear. Hyponatremia is regarded as a risk factor of stroke, cardiovascular diseases, mental illnesses and chronic

<sup>1</sup>. Department of Medicine / Ophthalmology<sup>2</sup>, NMC, Multan.

Correspondence: Shazia Hayat, Sociologist, Department of Ophthalmology, Nishtar Hospital Multan

Contact No: 0300-3180513

Email: Shaziahayat84@gmail.com

liver diseases. Even mild hyponatremia can be related with increased 1 month mortality rates after myocardial infarction (MI) and it has been recently observed that it may increase 3-years mortality after a stroke<sup>12,13</sup>. Previous studies have reported high frequencies of hyponatremia in literature<sup>12, 13</sup>.

Hyponatremia among patients with ischemic stroke is related with increased morbidity and mortality but there is no such study in Pakistan where ischemic stroke is more common. This study has been proposed to document the frequency of hyponatremia among targeted population. The study results will generate useful database of our local population which will be compared with that of existing literature from different parts of the world. The study results will help to formulate guidelines for the clinicians to diagnose and treat hyponatremia, once its frequency in our population is ascertained which will help to decrease disease morbidity. This will help to improve quality of life of these patients as well as decreased hospital stays which will not only be helpful for suffering families but also for national health economy.

## MATERIALS AND METHODS

A total of 120 patients with ischemic stroke were registered in this study. This descriptive study was done at nishtar hospital Multan using non probability consecutive sampling technique. A predesigned questionnaire was used to record findings and informed consent was taken from all patients/attendants for participation. All the patients with ischemic stroke diagnosed as "CT scan brain plan shows hypo dense area in specific vascular territory, density consistent with ischemic stroke i.e. 30 – 35" aged more than 20 years of either sex were recruited in our study. Patients with coronary artery disease, coagulopathy and bleeding disorders, tuberculous meningitis, viral/bacterial encephalitis, hemorrhagic stroke and multiple sclerosis were excluded from this study. Detailed history and examination was conducted and all relevant information such as diabetes (known diabetic patients taking oral/insulin therapy or those having fasting blood glucose levels more than 126 mg/dl), hypertension (having blood pressures more than 140/90 mmHg noticed twice one week apart), obesity (having BMI more than 27.5kg/m<sup>2</sup>, deranged lipid profile, history of smoking, family history of stroke in first degree blood relatives and serum Sodium levels were noted. Patients were considered hyponatremic, if serum Na<sup>+</sup> levels were <135 nmol/L. Data was entered and analyzed by computer program SPSS-22 to describe proportions for gender, diabetes, obesity, smoking, hypertension, residential status, socioeconomic status, family history, dyslipidemia and hyponatremia and to calculate mean and standard deviation for the age of patients and serum sodium levels. Chi – square test has

been applied to ascertain the role of various modifiable risk factors of ischemic stroke

## RESULTS

Our study comprised of a total of 120 patients with ischemic stroke. Out of these 120 patients with ischemic stroke, 88 (73.3%) were male and 32 (26.7%) were female patients and male to female ratio was 2.75:1. Mean age of our study cases was  $45.23 \pm 14.87$  years (with minimum age was 23 years while maximum age was 86 years). Mean age of the male patients was  $44.34 \pm 14.21$  years while that of female patients  $47.69 \pm 16.54$  years ( $p = 0.278$ ).

**Table No. 1: Cross – tabulation of hyponatremia with regards to gender. (n = 120)**

Gender	Hyponatremia		P - value
	Yes (n = 48)	No (n = 72)	
<b>Male (n = 88)</b>	34	54	
<b>Female (n = 32)</b>	14	18	<b>0.676</b>
<b>Total</b>		<b>120</b>	

**Table No. 2: Cross – tabulation of hyponatremia with regards to residential status. (n = 120)**

Residential status	Hyponatremia		P - value
	Yes (n = 48)	No (n = 72)	
<b>Rural (n = 70)</b>	28	42	
<b>Urban (n = 50)</b>	20	30	<b>1.000</b>
<b>Total</b>		<b>120</b>	

**Table No. 3: Cross – tabulation of hyponatremia with regards to obesity. (n = 120)**

Obesity	Hyponatremia		P - value
	Yes (n = 48)	No (n = 72)	
<b>Yes (n = 50)</b>	18	32	
<b>No (n = 70)</b>	30	40	<b>0.571</b>
<b>Total</b>		<b>120</b>	

**Table No. 4: Cross – tabulation of hyponatremia with regards to smoking. (n = 120)**

Smoking	Hyponatremia		P – value
	Yes (n = 48)	No (n = 72)	
<b>Yes (n = 66)</b>	30	36	
<b>No (n = 54)</b>	18	36	<b>0.195</b>
<b>Total</b>		<b>120</b>	

**Table No. 5: Cross – tabulation of hyponatremia with regards to diabetes. (n = 120)**

Diabetes	Hyponatremia		P - value
	Yes (n = 48)	No (n = 72)	
<b>Yes (n = 52)</b>	22	30	
<b>No (n = 68)</b>	26	42	<b>0.709</b>
<b>Total</b>		<b>120</b>	

**Table No. 6: Cross – tabulation of hyponatremia with regards to hypertension. (n = 120)**

Hypertension	Hyponatremia		P - value
	Yes (n = 48)	No (n = 72)	
Yes (n = 72)	38	34	
No (n = 48)	10	38	
<b>Total</b>	<b>120</b>		

Of these 120 patients, 70 (58.3%) were from rural areas, 34 (28.3%) belonged to poor families, 64 (53.3%) were from middle income families and 22 (18.3%) belonged to rich families. Mean body mass index (BMI) was  $25.17 \pm 3.22 \text{ kg/m}^2$  and obesity was noted in 50 (41.7%) patients. History of smoking was present in 66 (55%), diabetes in 52 (43.3%), hypertension in 72 (60%), dyslipidemia in 64 (53.3%) and family history of stroke in 34 (28.3%) patients. Mean serum sodium level was  $137.40 \pm 9.21 \text{ nmol/L}$  (range; 118 nmol/L to 157 nmol/L) and hyponatremia was noted in 48 (40%).

## DISCUSSION

Stroke is a global health problem which has significant impact on the quality of life of suffering families as it exerts extra financial burden and psychological stress<sup>14-16</sup>. Our study comprised of a total of 120 patients with ischemic stroke. Out of these 120 patients with ischemic stroke, 88 (73.3%) were male and 32 (26.7%) were female patients and male to female ratio was 2.75:1. Different studies have documented male gender preponderance in patients with ischemic stroke. A study conducted by Saeed et al<sup>17</sup> also reported high male gender predominance with 61.1 % in patients with ischemic stroke which is similar to our findings. Javed et al<sup>18</sup> from Dera Gazi Khan also reported 61 % male patients showing male gender predominance which is same as that of our study results. Similarly Farooq et al<sup>19</sup> from Faisalabad has documented 54 % male patients with ischemic stroke which is in compliance with our study results. Sico et al<sup>20</sup> also reported 58 % male gender preponderance which is similar to our study results.

Mean age of our study cases was  $45.23 \pm 14.87$  years (with minimum age was 23 years while maximum age was 86 years). Mean age of the male patients was  $44.34 \pm 14.21$  years while that of female patients  $47.69 \pm 16.54$  years ( $p = 0.278$ ). Javed et al<sup>18</sup> from Dera Gazi Khan also reported  $50.89 \pm 5.87$  years which is close to our study results. A study conducted by Saeed et al<sup>17</sup> also reported  $64.4 \pm 11.5$  years mean age which is quite higher than that being reported in our study.

Of these 120 patients, 70 (58.3%) were from rural areas, 34 (28.3%) belonged to poor families, 64 (53.3%) were from middle income families and 22 (18.3%) belonged to rich families. Mean body mass index (BMI) was  $25.17 \pm 3.22 \text{ kg/m}^2$  and obesity was

noted in 50 (41.7%) patients. History of smoking was present in 66 (55%), diabetes in 52 (43.3%), hypertension in 72 (60%), dyslipidemia in 64 (53.3%) and family history of stroke in 34 (28.3%) patients. Javed et al<sup>18</sup> from Dera Gazi Khan also reported 34 % hypertension in patients with ischemic stroke. Farooq et al<sup>19</sup> from Faisalabad has documented diabetes in 35 %, hypertension in 58 % patients with ischemic stroke, these findings are in compliance with that of our study results. Sico et al<sup>20</sup> also reported diabetes in 33 % and hypertension in 72 % patients which is close to our study results. Mean serum sodium level was  $137.40 \pm 9.21 \text{ nmol/L}$  (range; 118 nmol/L to 157 nmol/L) and hyponatremia was noted in 48 (40%). A study conducted in Connecticut, USA<sup>12</sup> reported 16 % hyponatremia in ischemic stroke patients while in Taiwan it has been reported to be 11.6 %.

## CONCLUSION

Hyponatremia is a common entity in patients with ischemic stroke as very high frequency was noted in our study. Clinicians treating such patients with ischemic stroke must check this parameter on routine basis to avoid future adverse clinical outcome and to improve prognosis of the disease. Hyponatremia was significantly associated with history of hypertension.

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

## REFERENCES

1. Zaman A, Karim R, Khattak U, Tasleem K, Noor M. Frequency of diabetes mellitus as a major risk factor in stroke patients at Hayatabad Medical Complex Peshawar. Khyber J Med Sci 2011; 3(2):65-6.
2. Rodrigues FB, Neves JB, Caldeira D, Ferro JM, Ferreira JJ, Costa J. Endovascular treatment versus medical care alone for ischaemic stroke: systematic review and meta-analysis. BMJ 2016;353:i1754.
3. González RG. Clinical MRI of acute ischemic stroke. J Magn Reson Imaging 2012;36(2):259-71.
4. Higashida RT<sup>1</sup>, Furlan AJ, Roberts H, Tomsick T, Connors B, Barr J, et al. Trial design and reporting standards for intra-arterial cerebral thrombolysis for acute ischemic stroke. Stroke. 2003;34(8): e109-37.
5. Mullen MT, Pisapia JM, Tilwa S, Messé SR, Stein SC. Systematic review of outcome after ischemic stroke due to anterior circulation occlusion treated with intravenous, intra-arterial, or combined intravenous+intra-arterial thrombolysis. Stroke 2012;43(9):2350-5.
6. Kass-Hout T, Kass-Hout O, Mokin M, Thesier DM, Yashar P, Orion D. Is bridging with intravenous thrombolysis of any benefit in

endovascular therapy for acute ischemic stroke? World Neurosurg 2014;82(3-4):e453-8.

7. Basharat Z, Mumtaz S, Rashid F, Rashid S, Mallam SA, Diljan A, et al. Prevalence of risk factors of ischemic stroke in a local Pakistani population. Neuro Sci 2012;17(4):357-62.

8. Okokhere PO, Bankole IA, Erohobia CA. Characteristics, risk factors, and case fatality rate of stroke in hospitalized patients in semi-urban South Nigeria. SAGE Open Med 2013; doi:10.1177/2050312113516112.

9. Zahra F, Kidwai SS, Siddiqi SA, Khan RM. Frequency of Newly Diagnosed Diabetes Mellitus in Acute Ischaemic Stroke Patients. J Coll Physician Surg Pak 2012;22(4):226-9.

10. Marwat MA, Usman M, Hussain M. stroke and its relationship to risk factors. Gomal J Med Sci 2009; 1:17-21.

11. Khan J, Rehman A, Shah AA, Jielani A. Frequency of hypertension in stroke patients presenting at Ayub Teaching Hospital. J Ayub Med Coll Abbottabad 2006;18(1):59-61.

12. Rodrigues B, Staff I, Fortunato G, McCullough LD. Hyponatremia in the prognosis of acute ischemic stroke. J Stroke Cerebrovasc Dis 2014;23(5):850-4.

13. Huang WY, Weng WC, Peng TI, Chien YY, Wu CL, Lee M, et al. Association of hyponatremia in acute stroke stage with three-year mortality in patients with first-ever ischemic stroke. Cerebrovasc Dis 2012;34(1):55-62.

14. Goyal M, Menon BK, van Zwam WH, Dippel DW, Mitchell PJ, Demchuk AM, et al. Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. Lancet 2016;387(10029): 1723-31.

15. Badhiwala JH, Nassiri F, Alhazzani W, Selim MH, Farrokhyar F, Spears J, et al. Endovascular Thrombectomy for Acute Ischemic Stroke: A Meta-analysis. JAMA 2015;314(17):1832-43.

16. Bush CK, Kurimella D, Cross LJ, Conner KR, Martin-Schild S, He J, et al. Endovascular Treatment with Stent-Retriever Devices for Acute Ischemic Stroke: A Meta-Analysis of Randomized Controlled Trials. PLoS One. 2016; 11(1):e0147287.

17. Saeed E, Ali R, Jalal-ud-din M, Saeed A, Jadoon RJ, Moiz M. Hypercholesterolemia in patients of ischemic stroke. J Ayub Med Coll Abbottabad 2015;27(3):637-9.

18. Javid RA, Bhatti A, Azhar MA. Frequency of hypoalbuminemia in patients with ischemic stroke. Pak J Med Health Sci 2016;10(2):571-73.

19. Farooq MA, Anjum MS, Malik FA, Kalsoom N. Frequency of microalbuminuria in patients with ischemic stroke. Rawal Med J 2013;38(2):97-99.

20. Sico JJ, Concato J, Wells CK, Lo AC, Nadeau SE, Williams LS, et al. Anemia is associated with poor outcomes in patients with less severe ischemic stroke. J Stroke Cerebrovasc Dis 2013;22(3):271-8.