

# Psychiatric morbidity among the patients of first ever ischemic stroke

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## Summary

Ischemic stroke is one of the leading causes of mortality and morbidity worldwide and third common cause of death in developed countries which consumes annually a great cost, directly or indirectly and stroke produces a wide range of psychiatric disorders. This was a cross sectional study, conducted in the department of Psychiatry, Sylhet MAG Osmani Medical College Hospital, Sylhet during the period from 1 July 2013 to 30 June 2014 to evaluate the psychiatric morbidity among the patients of first ever ischemic stroke. For this purpose, 66 ischemic stroke patients of first attack between 2 weeks to 2 years of stroke, aged above 18 years irrespective of sex and 66 accompanying healthy persons of the patients and other patients without any kind of stroke matching age and sex fulfilling inclusion and exclusion criteria were taken in Group-A and Group-B respectively. Psychiatric assessment was done using General Health Questionnaire (GHQ12) as a screening tool and all GHQ12 positive cases were evaluated using mental state examination. Diagnoses of psychiatric disorders of all respondents were confirmed by psychiatrist according to Diagnostic and statistical manual of mental disorders (DSM) 5 criteria. Ethical issues were maintained properly and an informed written consent was taken from every patient. After collecting data, editing was done manually and was analyzed with statistical package for social sciences (SPSS) version 21. The result showed that, the mean age of the respondents was 57.6 (SD±5.5) years which was almost identical to control group (p=0.130). Most (87.9%) of the patient were below the age of 65 years. Co-morbid psychiatric disorder was found in (34.8%) patients with ischemic stroke and (13.6%) control subjects (p=0.004). The most common psychiatric disorder was generalized anxiety disorder (13.6%) and major depressive disorder (21.2%) in ischemic stroke group. The results of this study suggested that, a significant number of patients with ischemic stroke were suffering from psychiatric disorders than the age and sex matched control.

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## Introduction

The World Health Organization defines Stroke as rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death with no apparent cause other than of vascular origin.<sup>1</sup> Stroke is one of the leading causes of mortality and morbidity worldwide. It is the third common cause of death in developed countries.<sup>2</sup> Stroke is classified as being either hemorrhagic or ischemic in nature depending on the underlying pathological process responsible. Ischemic stroke is a subtype of stroke said to occur as a result of interruption of blood supply to the brain due to occlusion of blood vessels caused by thrombosis or embolism or both.<sup>3</sup> This interruption results in the focal or global disturbance of cerebral functions because of improper supply of oxygen and nutrients, causing damage to the brain tissue.<sup>4</sup> Several studies have documented that the

ischemic subtype accounts for the greater number of stroke cases accounts for up to 85% of all strokes (Peter et al., 2009).<sup>5,6</sup> Stroke produces a wide range of mental/emotional disorders include post stroke depression (PSD), bipolar disorder, anxiety disorder, apathy without depression, psychotic disorder, pathological affect and catastrophic reaction.<sup>7,8</sup> Studies have shown that neuropsychiatric complications associated with stroke may have negative effect not only on the social functioning and overall quality of life of stroke survivors but also on the recovery of their motor functioning as well.<sup>9</sup> Depression following stroke has been the focus of most research whereas other complications such as anxiety or emotional lability have received relatively little attention.<sup>8</sup> The presence of post-stroke depression has been found to exert negative impact on the recovery of cognitive function, recovery of ability to perform activities of daily living. Depression after stroke runs a chronic course and

is related to increased morbidity and mortality.<sup>10-13</sup> There is paucity of reports on psychiatric morbidity following stroke in Bangladesh and other developing countries, in general. Studies on the psychiatric morbidity of ischaemic stroke, which play a vital role in recovery, are scarce, particularly in our set up. This study is planned to evaluate the prevalence of psychiatric morbidity in first ever ischemic stroke patients from 2 weeks to 2 years of onset of first ever ischemic stroke.

So any person following first ever stroke should examine by a psychiatrist for proper evaluation and appropriate management of the psychiatric morbidities. For this reason the objective of the study was to find out the proportion and pattern of psychiatric disorders among the patients with first ever stroke. This study will give baseline information about psychiatric morbidity among patient with first ever stroke.

### Materials and methods

This was a cross sectional comparative study carried out in the department of Psychiatry in collaboration with the outpatient department of Neurology, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh during the period from 1 July 2013 to 30 June 2014. For this purpose, 66 ischemic stroke recovered patients of first attack between 2 weeks to 2 years of stroke, aged above 18 years irrespective of sex were label as group-A on the other hand age and sex matched 66 accompanying healthy persons of the patients and other patients without any history of any kind of stroke were taken in group-B. Person with history of transient ischemic attack, acute or previous stroke, head injury, any previous psychiatric disorder, person with serious cognitive impairment, other chronic diseases that may cause psychiatric morbidity were excluded from the study. After taking informed consent, respondents were interviewed using data

collection sheet containing socio-demographic and other information. which was structured and fix response type. A GHQ-12 Bangla version was supplied to the patients and advised to fill up the questionnaire. Those who scored 15 or above points were evaluated by mental state examination and DSM 5<sup>14</sup> criteria by the researcher to diagnosed psychiatric disorder clinically. All psychiatric disorder diagnosed clinically was verified by consultant psychiatrist. The interviews were held in a peaceful and non-threatening environment. Ethical issues were maintained properly. After collecting data, editing was done manually and was analyzed with Statistical Package for Social Sciences (SPSS) version 21. Quantitative data were expressed as mean and standard deviation and qualitative data as frequency and percentage. Comparison was done by chi square ( $\chi^2$ ) test and Z test where applicable. A probability (p) value of <0.05 was considered statistically significant and p<0.01 was considered highly significant.

### Results

The result showed that, the age of the respondents was ranging from 45 to 70 years with the mean age of 57.6 (SD±5.5) years in patients with ischemic stroke whereas the age of the control subjects ranged from 47 to 68 years with the mean age of 57.1 (SD±4.5) years. There was no statistically significant difference of age group of the respondents between two groups ( $\chi^2=0.320$ ; p=0.572). In ischemic stroke group, most of the patient 58 (87.9%) were in the age group of below 65 years and 8 (12.1%) respondents were in the age of 65 or above years (Table 1).

According to the distribution, 48 (72.7%) were male and 18 (27.3%) were female in stroke group; whereas 45 (68.2%) were male and 21 (31.8%) were female in control group. Chi square test was employed to analyze the data of sex of the respondents between two groups that did not show any statistically significant difference ( $\chi^2=328$ ; p=0.567) (Table 2).

**Table 1: Distribution of the respondents on the basis of age (n=132)**

Age (in years)	Stroke group (n=66)		Comparative group (n=66)		p value*
	Frequency	Percentage	Frequency	Percentage	
<65	58	87.9	60	90.9	0.572
≥65	8	12.1	6	9.1	
Total	66	100.0	66	100.0	
Mean	57.6 (SD ± 5.5)		57.1 (SD ± 4.5)		†p> 0.05

\*Chi-square ( $\chi^2$ ) test and †Z test were employed to analyze the data.

**Table 2: Distribution of the respondents according to sex (n=132)**

Age (in years)	Stroke group (n=66)		Comparative group (n=66)		p value*
	Frequency	Percentage	Frequency	Percentage	
Male	48	72.7	45	68.2	0.572
Female	18	27.3	21	38.8	
Total	66	100.0	66	100.0	

\*Chi-square ( $\chi^2$ ) test was employed to analyze the data

In terms of social background; maximum respondents were in the lower class of socioeconomic status in both groups and there was no statistically significant difference between two groups ( $\chi^2=0.910$ ;  $p=0.662$ ). In stroke group, 63 (95.5%) patients were married while in control group 65 (98.5%) patients were married. The difference between the two groups in relation to marital status was not statistically significant ( $\chi^2=1.031$ ;  $p=0.310$ ). Occupations of the respondents did not differ significantly between the two groups ( $\chi^2=1.314$ ;  $p=0.859$ ). In stroke group, 48.5% respondents were in primary level, 16.7% respondents were illiterate, 15.2% respondents had passed the secondary school certificate (SSC) examination and 13.6% respondents had passed the higher secondary school certificate (HSC) examination while in control group 53.0% respondents were in primary level, 18.2% respondents had passed the SSC and 15.2% respondents had passed the HSC. The difference between the two groups in relation to educational status was also not statistically significant ( $\chi^2=1.924$ ,  $p=0.750$ ). In terms of social backgrounds maximum respondents were from urban on both group and there was no statistically significant difference between two groups ( $\chi^2=0.534$ ;  $p=0.465$ ) (Table 3).

In terms of medical co-morbidity in stroke group, 23 (34.8%) respondents were diabetics and 39 (59.1%) respondents were hypertensive with significant statistical difference between two groups respectively ( $\chi^2=27.853$ ;  $p<0.001$ ), ( $\chi^2=55.355$ ;  $p<0.001$ ) (Table 4).

Psychiatric co-morbidity was most frequent in stroke group 23 (34.8%) as compared to control group 9 (13.6%) ( $\chi^2=8.085$ ;  $p=0.004$ ). (Table 5). The most common psychiatric disorder was major depressive disorder (MDD) in 14 (21.2%) and generalized anxiety disorder (GAD) in 9 (13.6%) respondents; this was highly significant difference in stroke group as compared to the control group ( $\chi^2=8.748$ ;  $p=0.013$ ) (Table 6).

To see the association of age, sex, hypertension, diabetes mellitus and stroke with co-morbid psychiatric disorder, multivariate analysis was done. Stroke increased the risk of development of co-morbid psychiatric disorder (OR=3.351; 95% CI=1.082-10.375;  $p=0.0367$ ) in multivariate analysis. But age ( $\geq 65$  years) (OR=1.859; 95% CI=0.542-6.380;  $p=0.324$ ), male sex (OR=0.911; 95% CI=0.359-2.311;  $p=0.844$ ); diabetes mellitus (OR=0.717; 95% CI=0.240-2.142;  $p=0.551$ ), hypertension (OR=1.207; 95% CI=0.419-3.477;  $p=0.727$ ) did not predict psychiatric morbidity (Table 7).

**Table 3: Distribution of respondents according socio-demographic condition (n=132)**

Age (in years)	Stroke group (n=66)		Comparative group (n=66)		p value*
	Frequency	Percentage	Frequency	Percentage	
<b>Socio-economic status</b>					
Higher	7	10.6	4	6.1	0.662
Middle	25	37.9	27	40.9	
Lower	34	51.5	35	53.0	
<b>Marital status</b>					
Married	63	95.5	65	98.5	0.310
Widow/ widower	3	4.5	1	1.5	
<b>Occupation</b>					
Service	13	19.7	9	13.6	0.859
Business	18	27.3	21	31.8	
Housewife	12	18.2	14	21.2	
Day labour	6	9.1	7	10.6	
Farmer	17	25.8	15	22.7	
<b>Educational status</b>					
Illiterate	11	16.7	7	10.6	0.750
Primary	32	48.5	35	53.0	
SSC	10	15.2	12	18.2	
HSC	9	13.6	10	15.2	
$\geq$ Graduate	4	6.1	2	3.0	
<b>Social background</b>					
Urban	45	68.2	41	62.1	0.465
Rural	21	31.8	25	37.9	

\*Chi-square ( $\chi^2$ ) test was employed to analyze the data.

**Table 4: Distribution of respondents by co-morbid medical illness (n=132)**

Co-morbid medical disorder	Stroke group (n=66)		Comparative group (n=66)		p value*
	Frequency	Percentage	Frequency	Percentage	
<b>Diabetes mellitus</b>					
Present	23	34.8	0	0.0	0.0010.001
Absent	43	65.2	66	100.0	
<b>Hypertension</b>					
Present	39	59.1	0	0.0	0.0010.001
Absent	27	40.9	66	100.0	

\*Chi square ( $\chi^2$ ) test was employed to analyze the data.

**Table 5: Distribution of respondents by co-morbid psychiatric disorder (n=132)**

Co-morbid psychiatric disorder	Stroke group (n=66)		Comparative group (n=66)		p value*
	Frequency	Percentage	Frequency	Percentage	
Present	23	34.8	9	13.6	0.004
Absent	43	65.2	57	86.4	
Total	66	100.0	66	100.0	

\*Chi-square ( $\chi^2$ ) test was employed to analyze the data.

**Table 6: Distribution of respondents by co-morbid specific psychiatric disorder (n=132)**

Specific psychiatric disorder	Stroke group (n=66)		Comparative group (n=66)		p value*
	Frequency	Percentage	Frequency	Percentage	
MDD	14	21.2	7	10.6	0.013
GAD	9	13.6	2	3.0	
No psychiatric disorder	43	65.2	57	86.4	
Total	66	100.0	66	100.0	

\*Chi-square ( $\chi^2$ ) test was employed to analyze the data.

**Table 7: Multivariate analysis of age, sex, hypertension, diabetes mellitus and presence of stroke and co-morbid psychiatric disorder**

Variables	Adjusted odd ratio(95% CI)	p value
Age $\geq$ 65 years (n=8)	1.859 (0.542-6.380)	p=0.324
Male (n=48)	0.911 (0.359-2.311)	p=0.844
Diabetes mellitus (n=23)	0.717 (0.240-2.142)	p=0.551
Hypertension (n=39)	1.207 (0.419-3.477)	p=0.727
Stroke (n=66)	3.351 (1.082-10.375)	p=0.036

OR=odd ratio, CI=confident interval

## Discussion

The present study revealed that most of the stroke patients were in their late adulthood. The age of the patients ranged from 45 to 70 years with mean age of 57.6 (SD $\pm$ 5.5) years. Among them 58 (87.9%) patients were in the age group of below 65 years. In this regards Kaystha et al., (2010) showed that the mean age of ischemic stroke patients was 61.57 $\pm$ 10.72 years.<sup>15</sup> Zahra et al., (2012) showed that the mean age of ischemic stroke

patients was 60.9 $\pm$ 10.1 years.<sup>16</sup> Mpembi et al., (2013) found that the mean age of stroke patients was 54.7 $\pm$ 12.5 years, ranging from 23 to 75 years.<sup>17</sup> Khalil et al., (2010) in a study in Bangladesh found that 69.7% of their acute ischemic patients were aged between 51 to 70 years.<sup>18</sup> Mpembi et al., (2013) found that about three quarters of patients (74.1%) were aged under 65 years.<sup>17</sup> So the present study finding was consistent with the findings of other studies. Regarding the sex, the current

study showed that, in the stroke group 48 (72.7%) were male and 18 (27.3%) were female. Kyasthagir et al., (2010) in a study in Bangladesh found that 66.1% of their acute ischemic patients were male and 33.9% were female.<sup>15</sup> Guerrero-Romero and Rodríguez-Morán, (1999) found 62.7% of patients were male and 37.3% of patients were female.<sup>19</sup> But Kes et al., (2007) reported 57.6% of patients were female and 42.4% of patients were male.<sup>20</sup> Bravata et al., (2003) reported 54% of patients were female and 46% of patients were male.<sup>21</sup> In this study 34 (51.5%) respondents were in the lower class, 25 (37.9%) respondents were in the middle class and 7 (10.6%) respondents were in the upper class of socioeconomic status in stroke group. This result was correlated with the study of Siddiqui et al., (2013) that 63% stroke patients were lower class, 33% were from middle class and 4% were from higher class of economic status.<sup>20</sup> This result also concordant with the study of Hossain et al., (2011) that 47.0% stroke patients were from lower class, 39% were from middle class and 14% were from higher class of economic status.<sup>22</sup> This may be due to the fact that people of poor socioeconomic condition constitute the major bulk of the population in Bangladesh. The government hospital facilities were mostly availed by poor class. This may be the cause of more poor class in this study. Furthermore, this result correlated with the study by Hart et al., (2000) which concluded that a poor socio-economic circumstance was associated with greater risk of stroke. In this study 63 (95.5%) patients were married.<sup>23</sup> Hossain et al., (2011) found that 97% of stroke patients were married. Stroke patients were aged person and the mean age was about 57.6 years in this study.<sup>22</sup> Aged person are mostly married in this society so married population are higher in this study. In the present study 18 (27.3%) respondents were businessman, 17 (25.8%) were farmer, 13 (19.7%) were service holder, 12 (18.2%) were house wife and 12 (18.2%) were day labour in stroke group. In this regards Siddiqui et al., (2013) found that the majority of stroke patients were unemployed (22%). Other was businessman (20%), housewife (19%) and cultivator (16%).<sup>20</sup> Hossain, (2011) observed that 26% of the participants of stroke patients were businessman, 20% were service holder, 17% were housewife, 13% were farmer, 13% were teacher, 3% were driver, 3% were day laborer, 1% was student and 4% were other professional status.<sup>22</sup> In this study 32 (48.5%) respondents were in primary level, 11 (16.7%) respondents were illiterate, 10 (15.2%) respondents had passed the SSC, 9 (13.6%) respondents had passed the HSC and 4 (6.1%) respondents graduate or above in stroke group. Hossain et al., (2011) found that 27% of stroke patients were passed bachelor or above, 26% were passed primary education, 23% were complete S.S.C, 16% were complete H.S.C and 9% were never attended school.<sup>22</sup> Siddiqui et al., (2013) found that 24% of stroke patients were illiterate. Of the literate group 39% went

to primary school, 20% completed SSC, 8% completed HSC, 5% completed graduation and only 4% completed post-graduation.<sup>20</sup> In the current study 45 (68.2%) respondents were from urban and 21 (31.8%) respondents were from rural social background in stroke group. This result was consistent with the study of Hossain et al., (2011) that the study subjects were from both urban and rural areas with slight urban dominance (54%).<sup>22</sup> This indicated that incidence of stroke may be common both in urban and rural population. The reason urban preponderance might be that, the study was done in the hospitals of Sylhet City where mostly the urban population could avail the hospital facilities due to economic condition. In this study 23 (34.8%) respondents were diabetics in stroke group. This result was correlated with the study of Khalil et al., (2010) that 33.3% of patients with acute ischemic stroke were diabetic.<sup>18</sup> Islam et al., (2010) found that 20% of their patients with acute ischemic stroke were diabetic.<sup>24</sup> Hossain et al., (2011) found 21% diabetes Siddiqui et al., (2013) found 22% diabetes.<sup>20,22</sup> In the present study 39 (59.1%) respondents were hypertensive in stroke group. Islam et al. found 51.7% of their acute ischemic patients were hypertensive;<sup>24</sup> Esalmi et al., (2008) reported hypertension in of 57% of patients;<sup>25</sup> Fuentes et al., (2009) reported hypertension in of 54.2 % of patients;<sup>26</sup> Guerrero-Romero and Rodríguez-Morán, (1999) reported hypertension in of 52.7% of patients;<sup>19</sup> Kaarisilo et al., (2010) reported hypertension in of 58.1% of patients of their series with stroke.<sup>27</sup>

Regarding the psychiatric disorders the current study revealed that, psychiatric disorders was present in 34.8% respondents in stroke patients, while in control group it was 13.6%. Regarding the psychiatric disorders the study showed a highly significant difference in stroke patients than that of control subjects. ( $p=0.004$ ). O'Rourke et al., (1998) found prevalence of psychiatric morbidity among stroke patients was 35.0%.<sup>28</sup> Ajiboye et al., (2013) found that overall psychiatric morbidity rate of 36.0% among stroke patients.<sup>9</sup> In the current study multivariate analysis showed that stroke increased the risk of development of comorbid psychiatric disorder (OR=3.351; 95% CI=1.082-10.375;  $p=0.0367$ ). But age ( $e^{65}$  years) (OR=1.859; 95% CI=0.542-6.380;  $p=0.324$ ), male sex (OR=0.911; 95% CI=0.359-2.311;  $p=0.844$ ); diabetes mellitus (OR=0.717; 95% CI=0.240-2.142;  $p=0.551$ ), hypertension (OR=1.207; 95% CI=0.419-3.477;  $p=0.727$ ) did not predict psychiatric morbidity. The common psychiatric disorder in stroke patient was major depressive disorder in 14 (21.2%) and generalized anxiety disorder in 9 (13.6%) where in control group major depressive disorder was found in 10.6%, generalized anxiety disorder were found in 3.0% of respondents. Regarding the patterns of psychiatric disorders the study also showed a highly significant difference in stroke group as compared to control group ( $p=0.013$ ). In this regards O'Rourke et al., (1998) found that depressive disorder

in 27.5% and anxiety disorder in 7.5%.<sup>28</sup> Ajiboye et al., (2013) found that depression was 19.2%, generalized anxiety disorder in 9.6%.<sup>9</sup> Both these studies supported the present study. But Vuletiæ et al., (2012) found 55% of patients had depressive symptoms and 40% patients had anxiety and depressive symptoms. All patients with anxiety symptoms also had depressive symptoms.<sup>29</sup> The development of post-stroke depression is probably multi-factorial. Where the lesion occur, inadequate social support, dependence to daily living activities and inability to perform previous activities can reduce persons quality of living and make him/her prone to psychiatric illness.

### Conclusion

As the co-morbid psychiatric disorders were significantly more in acute ischemic stroke the patients than the control subjects, it may delay the full recovery of the patients and may cause burden for the patients and also the health delivery system. Therefore, attention should be paid to the anxiety and depressive symptoms in stroke units and try to relieve the patients' emotional stress and personal suffering, which could improve their neurological outcome. This also emphasizes developing a rich referral system and to establish a liaison service between the department of Psychiatry and the department of Neurology to ensure better management of acute ischemic stroke patients.

### References

- Force WT. Stroke-1989. Recommendations on stroke prevention, diagnosis, and therapy. Report of the WHO Task Force on Stroke and other Cerebrovascular Disorders. *Stroke* 1989;20(10):1407-31.
- Sarti C, Rastenytė D, Cepaitis Z, Tuomilehto J. International trends in mortality from stroke, 1968 to 1994. *stroke* 2000;31(7):1588-601.
- Barech MS, Sadiq SM, Zarkoon AK, Gulandam M, Ullah K. Risk factors for Ischemic Stroke in Patients attending Tertiary Hospital in Quetta. *PJNS* 2010;5(1):1-5.
- Memon TF. Differences in distribution of risk factors among patients of hemorrhagic and ischemic stroke admitted in Liaquat University Hospital, Hyderabad, Pakistan. Sweden: Umea University; 2010.
- Onwuekwe IO, Ezeala-Adikaibe B. Ischemic stroke and neuroprotection. *Ann med health sci res* 2012;2(2):186-90.
- Appelros P, Stegmayr B, Terént A. Sex differences in stroke epidemiology: a systematic review. *Stroke* 2009;40(4):1082-90.
- Chemerinski E, Robinson RG. The neuropsychiatry of stroke. *Psychosomatics* 2000 1;41(1):5-14.
- Robinson RG. Neuropsychiatric disorders following stroke. *Can J Psychiatry* 2010;55(6):339-40.
- Ajiboye PO, Abiodun OA, Tunde-Ayinmode MF, Buhari OI, Sanya EO, Wahab KW. Psychiatric morbidity in stroke patients attending a neurology clinic in Nigeria. *Afr Health Sci* 2013;13(3):624-31.
- Williams LS, Ghose SS, Swindle RW. Depression and other mental health diagnoses increase mortality risk after ischemic stroke. *Am J Psychiatry* 2004;161(6):1090-5.
- Pohjasvaara T, Vataja R, Leppävuori A, Kaste M, Erkinjuntti T. Depression is an independent predictor of poor long term functional outcome post stroke. *Eur J Neurol* 2001;8(4):315-9.
- Chemerinski E, Robinson RG, Kosier JT. Improved recovery in activities of daily living associated with remission of poststroke depression. *Stroke* 2001;32(1):113-7.
- Loubinoux I, Kronenberg G, Endres M, Schumann Bard P, Freret T, Filipkowski RK, Kaczmarek L, Popa Wagner A. Post stroke depression: mechanisms, translation and therapy. *Journal of cellular and molecular medicine*. 2012 Sep;16(9):1961-9.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Arlington, VA: American Psychiatric Association; 2013.
- Kayasthagir PK, Das KK, Rahman SW, Hassanuzzaman M, Kandaker MA, Mazumder S. Chronic *Helicobacter pylori* infection as a risk factors for ischemic cerebral stroke. *Bangladesh J Neurosci* 2010;26(1):12-22.
- Zahra F, Kidwai SS, Siddiqi SA, Khan RM. Frequency of newly diagnosed diabetes mellitus in acute ischaemic stroke patients. *J Coll Physicians Surg Pak* 2012;22(4):226-9.
- Mpembu MN, Ma Miezi SM, Peeters A, de Partz MP, Henrard S, MassambaVK, et al. Sociodemographic profile and social support for post-stroke depression in Kinshasa: a rehabilitation based cross-sectional study. *Open J Epidemiol* 2013;2013.
- Khalil MI, Islam MJ, Ullah AKMA, Khan MRK, Islam MR, Rahman HZ, et al. Serum uric acid level among male and female patients with ischemic stroke admitted in a tertiary level Hospital in Bangladesh. *Bangladesh J Neurosci* 2010;26 (1):23-31.
- Guerrero-Romero F, Rodríguez-Morain M. Proteinuria is an independent risk factor for ischemic stroke in non-insulin-dependent diabetes mellitus. *Stroke* 1999;30(9):1787-91.
- Siddiqui MR, Islam QT, Iqbal MJ, Binte-Mosharraf SS. Socio-demographic Status & Associated Risk Factors of the Stroke Patient's in a Tertiary Care Hospital of Bangladesh. *Anwer Khan Mod Med Coll J* 2013;4(2):18-22.
- Bravata DM, Kim N, Concato J, Brass LM. Hyperglycaemia in patients with acute ischaemic stroke: how often do we screen for undiagnosed diabetes?. *QJM* 2003;96(7):491-7.
- Hossain AM, Ahmed NU, Rahman M, Islam MR, Sathya G, Fatema K. Analysis of sociodemographic and clinical factors associated with hospitalized stroke patients of Bangladesh. *Faridpur Med Coll J* 2011;6(1):19-23.
- Hart CL, Hole DJ, Smith GD. Influence of socioeconomic circumstances in early and later life on stroke risk among men in a Scottish cohort study. *Stroke* 2000;31(9):2093-7.

24. Islam MS, Haque A, Ullah AKMA, Khan MRK, Islam MR, Rizvi AN, et al. Association of hyperhomocysteinemia with ischemic stroke. *Bangladesh J Neuroscience* 2010;26(1):1-11.
25. Eslami V, Sahraian MA, Gheini MR, Motamedi M, Yazdani T. Impaired glucose metabolism in non-diabetic patients with acute stroke. *Iranian J Neurol* 2008;7(23):246-58.
26. Fuentes B, Castillo J, Jose BS, Leira R, Serena J, Vivancos J. The prognostic value of capillary glucose levels in acute stroke The GLIAS Study. *Stroke* 2009;40:562-8.
27. Kaarisalo MM, Rähä I, Arve S, Lehtonen A. Impaired glucose tolerance as a risk factor for stroke in a cohort of non-institutionalised people aged 70 years. *Age and ageing*. 2006 1;35(6):592-6.
28. O'Rourke S, MacHale S, Signorini D, Dennis M. Detecting psychiatric morbidity after stroke: comparison of the GHQ and the HAD Scale. *Stroke* 1998;29(5):980-5.
29. Vuletiæ V, Sapina L, Lozert M, Lezaiæ Z, Moroviæ S. Anxiety and depressive symptoms in acute ischemic stroke. *Acta Clin Croat* 2012;51(2):243-6.