

Evaluation of High Density Lipoprotein Cholesterol Concentrations among Elderly Ischaemic Stroke Patients

KAZI JANNAT ARA¹, ABU SHAMS MD HASAN ALI MASUM², MD SHAFIQUS SALEHEEN³, SHEIKH ABDUL KADER¹, SK. MAHBUB ALAM¹, MD. SHAHIDULLAH¹, AKM ANWAR ULLAH¹, NILUFAR FATEMA⁴

¹Department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka, ²Department of Medicine, Anwar Khan Modern Medical College, Dhaka, ³Department of Medicine, Rangpur Medical College & Hospital, Rangpur, ⁴Department of Cardiology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka.

Address for Correspondance: Dr Kazi Jannat Ara, Medical Officer, Department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka. E mail: rimmineuro@gmail.com

Abstract:

Stroke is an alarming health hazard all over the world as well as in Bangladesh and one of the leading causes of mortality and morbidity. There is a well-established inverse relation between serum concentrations of high density lipoprotein cholesterol (HDL-c) and the risk of coronary heart diseases but it is not a well-documented risk factor for stroke. This study was done to evaluate of the HLD-c concentration among elderly ischaemic stroke patients. This cross sectional study was conducted in Out Patient department (OPD) stroke clinic and Indoor of the department of neurology, BSMMU, Dhaka from July 2015 to June 2016. A total 200 patients suffering from ischaemic stroke within the range of 61-95 years of age of both sexes with TIA, and hemorrhagic stroke were included. Patient with Stoke after one month of onset, cases with anti-lipid drugs were excluded. Male and female ratio was 1.95:1. Mean age was 68.4±8.24 years. 75 (52.8%) patients had hypertension, 20 (14.1%) had diabetes mellitus, 10 (7.0%) patients had atrial fibrillation, 8 (5.6%) had ischemic heart disease. 44 (31.0%) patients had smoking habit, mean total cholesterol was 190.7±56.0 mg/dl, mean HDL was 36.9±8.4mg/dl, mean LDL was 123.9±38.8mg/dl and mean Triglyceride was 175.9±70.5 mg/dl. HDL level gradually decreased according to the increment of age. HDL-c is low in elderly ischaemic stroke patient.

University Heart Journal 2017; 13(1): 8-12

Introduction:

Stroke is the second most common cause of death throughout the world and is the most common cause of severe adult physical disability¹ and third leading cause of death in Bangladesh.² The World Health Organization (WHO) ranks mortality due to stroke in Bangladesh as number 84 in the world. The reported prevalence of stroke in Bangladesh is 0.3%. The high number of disability-adjusted life years lost due to stroke (485 per 10,000 people) shows that stroke severely impacts Bangladesh's economy.² Recognized risk factors are hypertension, diabetes, smoking, heart disease, dyslipidaemia. So for primary prevention of stroke, risk factors identification is essential.³

Hyperlipidaemia is manifested by elevation of the plasma concentrations of the various lipid and lipoprotein fractions (total cholesterol, LDL cholesterol, VLDL, triglycerides etc). Elevation of total and LDL cholesterol is associated particularly with atherosclerotic disease (like CHD, stroke etc) risk, but it is increasingly clear

that moderately raised triglycerides or VLDL in the presence of low HDL-cholesterol may also be atherogenic.⁴ There is a well-established inverse relation between serum concentrations of HDL cholesterol and the risk of coronary heart disease,⁵ but it is not a well-documented risk factor for stroke. Several case-control studies have noted an inverse relation between HDL cholesterol and risk of stroke or transient ischemic attack.^{6,7,8} The Framingham Study, the Copenhagen Study and the Israeli Heart Disease Study have all demonstrated a trend toward higher risk of thromboembolic stroke with lower HDL cholesterol levels in men.^{9,10,11} These data add to the evidence relating lipids to stroke and support HDL-C as an important modifiable stroke risk factor.¹² In conjunction with other risk factors, measurement of HDL cholesterol (commonly available from routine lipid screening) could become an increasingly useful tool for identifying elderly persons at high risk of stroke.¹³ Most of the people of Bangladesh are not concerned about the risk factors and warning signs of stroke. Many studies

have been done abroad regarding association between high density lipoprotein cholesterol (HDL-c) and different types of stroke. Low HDL-c associations with stroke, however, have not been clearly identified, particularly in the elderly. No study is available locally that is shown, the relationship between the level of HDL-c concentrations and the risk of ischaemic stroke among elderly patients. Thereafter, this study was carried out to find out the relation of HDL cholesterol concentrations and the risk of ischaemic stroke among elderly patients to validate and develop guidelines in local patients. And patients will be benefited by identifying risk factors, early detection of dyslipidaemia, which will help secondary prevention of stroke by both dietary and pharmacological management.

Methodology:

This cross sectional study was conducted in outpatient department (OPD), Stroke Clinic and Indoor of the Department of Neurology, BSMMU, Dhaka, from July 2015 to June 2016. 142 patients suffering from Ischaemic stroke of age more than 60 years of both sexes were included according to inclusion and exclusion criteria.

Inclusion criteria was clinically diagnosed as Ischaemic stroke of both sexes and age more than 60 years confirmed by CT / MRI scan within one month of stroke and gave informed written consent from the patients or guardians after full explanation of the purpose of the study. Patient with transient ischaemic attack, hemorrhagic stroke of any duration, Stroke after one month of onset, patients already on anti-lipid drugs and Ischemic stroke due to valvular atrial fibrillation (AF), prosthetic heart valve, infective endocarditis, patent foramen ovalae, atrial septal defect and atrial myxoma were excluded from this study. Clinical diagnosis was established from history and thorough physical examination. Past medical and personal history for cigarette smoking, arterial hypertension, diabetes mellitus, AF and ischaemic heart disease and other associated disease condition was also be sought. Patients or eligible attendant was questioned about past and family (parents and siblings) history. Computed tomography (CT)/ MRI scan of brain was done in all cases. Fasting lipid profile (Total cholesterol, low density lipoprotein, high density lipoprotein, and triglycerides) was done from participants who had fasted for 12 hours over night in department of Biochemistry, BSMMU. Lipid profile was measured by "Accelerator selective detergent method done in Abbott ARCHITECT PLUS ci 4100. All data were

recorded systematically in preformed data collection form (questionnaire). Computer based statistical analysis were carried out with appropriate techniques and systems. Continuous data were expressed as mean and standard deviation and qualitative data were expressed as frequency distribution and percentage. Statistical analysis was performed by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-20) (SPSS Inc, Chicago, IL, USA). Associations between qualitative data were analyzed by chi-square test. For all statistical tests, we considered p value <0.05 as statistically significant.

Results:

Table-I

Distribution of patients by gender (n=142)

Gender	Frequency	Percentage%
Male	94	66.2
Female	48	33.8
Total	142	100

Table I shows male was predominant than female. Male female ratio was 1.95:1.

Table-II

Distribution of patients by age group

Age group	Frequency	Percentage
61 – 70	101	71.1
71 – 80	27	19.0
>80	14	9.9
Total	142	100.0
Mean ± SD	68.4 ± 8.24	
Range (min-max)	61 - 95	

TableII shows distribution of patients according to age. Maximum patients were in age group 61-70 years in both groups. Mean age was 68.4 ± 8.24 years within the range of 61 – 95 years.

Table-III

Distribution of the patients by clinical presentation

Clinical presentation	Frequency	Percentage
Hemiparesis	94	66.2
Inability to talk	81	57.0
Hemiplegia	48	33.8
Vertigo	29	20.4
Headache	13	9.2
Vomiting	10	7.0
Loss of consciousness	4	2.8
Convulsion	3	2.1

Table III shows clinical presentation of the patients. Hemiparesis was presented in 66.2% patients followed by 57.0% patients were inability to talk, 33.8% presented with hemiplegia, 20.4% had vertigo, 9.2% had headache, 7.0% had vomiting, 2.8% had loss of consciousness and 2.1% had convulsion

Table-IV

Distribution of the patients according to risk factor

Risk factor	Frequency	Percentage
Hypertension	75	52.8
Smoking	44	31.0
Diabetes mellitus	20	14.1
Atrial Fibrillation (AF)	10	7.0
Ischemic heart disease	8	5.6
Hypertension with DM	6	4.2
Hypertension with IHD	5	3.5

Table IV shows distribution of patients according to risk factor. Seventy five (52.8%) patients had hypertension, 20 (14.1%) had diabetes mellitus, 10 (7.0%) patients had atrial fibrillation, 8 (5.6%) had ischemic heart disease, 6 (4.2%) patients had hypertension with diabetes mellitus and 5 (3.5%) patients had hypertension with ischemic heart disease. Forty four (31.0%) patients had smoking habit.

Table V

Distribution of the patients by co-morbidity

Co-morbidity	Frequency	Percentage
Hypertension	75	52.8
Diabetes mellitus	20	14.1
Chronic Kidney Disease (CKD)	18	12.7
Ischemic heart disease	8	5.6
Chronic Congestive heart failure (CCF)	5	3.5
COPD	3	2.1
Hypothyroid	2	1.4

Table V shows distribution of patients according to co-morbidity. Seventy five (52.8%) patients had hypertension, 20 (14.1%) had diabetes mellitus, 18 (12.7%) patients had CKD, 8 (5.6%) had ischemic heart disease, 5 (3.5%) patients had CCF and 3 (2.1%) patients had COPD and 2 (1.4%) patients had hypothyroid.

Table-VI

Lipid profile of the respondents

Lipid profile (mg/dl)	Mean \pm SD	Range (Min-max)
T. Cholesterol	190.7 \pm 56.0	51 – 629
HDL	36.9 \pm 8.4	25 – 69.0
LDL	123.9 \pm 38.8	42 – 210
Triglyceride	175.9 \pm 70.5	45 - 399

Table VI shows that the mean T. Cholesterol was 190.7 \pm 56.0 mg/dl, mean HDL was 36.9 \pm 8.4 mg/dl, mean LDL was 123.9 \pm 38.8 mg/dl and mean Triglyceride was 175.9 \pm 70.5 mg/dl.

Table-VII

High density lipoprotein cholesterol (HDL) level in different age groups.

Age group	HDL (mg/dl)[Mean \pm SD]
61 – 70	37.9 \pm 9.1
71 – 80	36.4 \pm 6.1
>80	30.7 \pm 4.1
Total	36.9 \pm 8.4

Table VII shows high density lipoprotein cholesterol (HDL) level in different age groups. HDL was 37.9 \pm 9.1, 36.4 \pm 6.1, 30.7 \pm 4.1 in age groups 61-70 years, 71-80 years and >80 years respectively

Table-VIII

Percentage distribution of high density lipoprotein cholesterol (HDL) level and incidence of ischaemic stroke according to age

Age group	HDL (mg/dl)	HDL (mg/dl)	p-value
	<40 n(%)	\geq 40 n (%)	
61 – 70	65 (68.4)	36 (76.6)	0.312
71 – 80	16 (16.8)	11 (23.4)	0.348
>80	14 (14.7)	0 (0.0)	0.004
Total	95 (100.0)	47 (100.0)	0.019

Table VIII shows incidence of ischaemic stroke patients in different (HDL) level and in different age groups. HDL level gradually decreased according to the increment of age.

Discussion:

Stroke is a worldwide health problem. It makes an important role to morbidity, mortality and disability in developed as well as developing countries. In this study, male were predominant than female which were 94

(66.2%) cases and 48 (33.8%) cases respectively. Ischaemic stroke is more prevalent in men than in Women.¹⁴ Similar result was found in the two studies^{15,16}. Stroke incidence rates are 1.25 times greater in men. Men develop ischemic strokes at higher rates than women up to the age of 75 years. Age is the single most important risk factor for stroke. For each successive 10 years after age 55, the stroke rate more than doubles in both men and women.^{17,18} In this study, mean age was 68.4±8.24 years. Maximum patients were in age group 61-70 years. This result is consistent with the result of Sagui et al. and Zhang et al. Ischemic stroke is associated with aging. Regarding clinical presentation, hemiparesis presented in 66.2% patients followed by 57.0% patients were inability to talk, 33.8% presented with hemiplegia, 20.4% had vertigo, 9.2% had headache, 7.0% had vomiting, 2.8% had loss of consciousness and 2.1% had convulsion. Most estimates for hypertension indicate a relative risk of stroke of approximately 4 when hypertension is defined as systolic blood pressure ≥160 mm Hg and/or diastolic blood pressure ≥95 mm Hg. A summary of seven studies assigning a relative risk of 1 for borderline or mild hypertension determined the relative risk to be about 0.5 at a blood pressure of 136/84 mm Hg and about 0.35 at a blood pressure of 123/76 mm Hg.¹⁹ In this study, 52.8% patients had hypertension. Hypertension was common in ischaemic and haemorrhagic stroke.¹⁴ Eight (5.6%) patients had ischaemic heart disease and 20 (14.1%) patients had diabetes mellitus. Diabetes mellitus was found more in ischaemic stroke patient than that of haemorrhagic stroke patients in a study.¹⁶ Diabetes is a strong risk factor for ischaemic stroke due to accompanying risk factors, such as obesity and high blood pressure.²⁰ Case-control studies of stroke patients and prospective epidemiological studies have confirmed an independent effect of diabetes. Relative risk of ischemic stroke in persons with diabetes from 1.8 to 3.0. Thirty one percent of the patients were smoker. Dey et al. showed smoking was common in both types of stroke.¹⁴ Devkoto et al. reported 44.3% of ischaemic stroke patients had smoking history.²¹ Smoking increases both haemorrhagic and ischaemic stroke risk.²⁰ Cigarette smoking increases risk (RR) of ischemic stroke nearly two times.²² AF is independent negative prognostic factors in older patients with stroke. The higher prevalence of AF in the older patients emphasizes its absolute impact on the mortality and recurrence after the first ischemic stroke in the age group 75 years and older.²³ In this study 10 (7.0%) patients had atrial fibrillation. Lipid profile of the patients was

recorded. Mean T. Cholesterol was 190.7 ± 56.0 mg/dl. This result is consistent with the study of Mahmood et al.²⁴ but contradict with the study of Zhang et al.¹⁶ and Dey et al.¹⁴ The mean HDL was 36.9 ± 8.4 mg/dl. This result is concordant with the study of Dey et al.¹⁴ But Zhang et al. and Mahmood et al. found HDL is significantly higher in haemorrhagic stroke patients than that of ischaemic stroke patients. The mean LDL was 123.9 ± 38.8 mg/dl. This result is consistent with the study of Mahmood et al.²⁴ The mean Triglyceride was 175.9 ± 70.5 mg/dl. This result is consistent with the result of Saadatnia et al.²⁵ and Ziakas et al.²⁶ High level of serum total cholesterol and low density lipoprotein (LDL) cholesterol showed significant risk in ischemic stroke (p<0.05). In contrast, low level of high density lipoprotein (HDL) cholesterol appeared as a significant risk factor (p<0.01) indicating beneficial effect of HDL cholesterol on atherosclerotic process. Serum triglyceride level showed no significant effect on ischemic stroke (p>0.05).²⁷

Conclusion:

It can conclude that, male suffers more from the ischaemic stroke than female. Most of the stroke cases occur in age group 61 – 70 years among elderly peoples. Hypertension is more common in ischaemic stroke patients. HDL is low in ischaemic stroke patients.

References:

1. Langhorne, R. 2013. Stroke disease. In: Walker, B.R., Colledge, N.R., Ralston, S.H., Penman, T.D., ed. Davidson's principles and practice of medicine. Elsevier Health Sciences. 22nd edition. P-1234
2. Islam, M.N., Moniruzzaman, M., Khalil, M.I., Basri, R., Alam, M.K., Loo, K.W. and Gan, S.H. Burden of stroke in Bangladesh. International journal of stroke, 2013;8(3):211-13.
3. Smith, W.S., English, J.D., Johnston, S.C. Cerebrovascular Disease. In : Fauci, A.S., Braunwald, E., Kasper, D.L., Hauser, S.L., Longo, D.L., Jameson, J.L., et al, editors. Harrison's Principles of Internal Medicine, 17th edition. McGraw-Hill Companies, 2008;2513-36.
4. Bennett, P.N., Brown, M.J. 2003. Clinical Pharmacology. 9th edn. Churchill livingstone, 521-3.
5. Gordon, D.J. and Rifkind, B.M. High-density lipoprotein—the clinical implications of recent studies. New England Journal of Medicine, 1989;321(19), 1311-16.
6. Qizilbash, N., Duffy, S.W., Warlow, C. and Mann, J. Lipids are risk factors for ischaemic stroke: overview and review. Cerebrovascular diseases, 1992;2(3):127-136.
7. Sridharan, R. Risk factors for ischemic stroke: a case control analysis. Neuroepidemiology, 1992;11(1):24-30.
8. Bihari-Varga, M., Székely, J. and Gruber, É. Plasma high density lipoproteins in coronary, cerebral and peripheral vascular disease The influence of various risk factors. Atherosclerosis, 1981;40(3-4), 337-45.

9. Gordon, T., Kannel, W.B., Castelli, W.P. and Dawber, T.R. Lipoproteins, cardiovascular disease, and death: the Framingham Study. *Archives of internal medicine*, 1981;141(9):1128-31.
10. Lindstrom, E., Boysen, G. and Nyboe, J. Influence of total cholesterol, high density lipoprotein cholesterol, and triglycerides on risk of cerebrovascular disease: the Copenhagen City Heart Study. *Bmj*, 1994;309(6946):11-15.
11. Tanne, D., Yaari, S. and Goldbourt, U. High-density lipoprotein cholesterol and risk of ischemic stroke mortality. *Stroke*, 1997;28(1), 83-87.
12. Sacco, R.L., Benson, R.T., Kargman, D.E., Boden-Albala, B., Tuck, C., Lin, I.F., et al. High-density lipoprotein cholesterol and ischemic stroke in the elderly: the Northern Manhattan Stroke Study. *Jama*, 2001;285(21), 2729-35.
13. Curb, J.D., Abbott, R.D., Rodriguez, B.L., Masaki, K.H., Chen, R., Popper, J.S., et al. High Density Lipoprotein Cholesterol and the Risk of Stroke in Elderly Men The Honolulu Heart Program. *American Journal of Epidemiology*, 2004;160(2), 150-57.
14. Dey, S.K., Ahmed, S., Rahman, K.M., Uddin, M.J., Alam, M.R., Bhattacharjee, M., et al. Lipid profile among ischemic and haemorrhagic stroke patients. *Mymensingh medical journal: MMJ*, 2010;19(2), 176-80.
15. Sagui, E., M'Baye, P.S., Dubecq, C., Fall, K.B., Niang, A., Gning, S., et al. Ischemic and Hemorrhagic Strokes in Dakar, Senegal. *Stroke*, 2005;36(9), 1844-47.
16. Zhang, Y., Galloway, J.M., Welty, T.K., Wiebers, D.O., Whisnant, J.P., Devereux, R.B., et al. 2008. Incidence and risk factors for stroke in American Indians. *Circulation*, 118(15), 1577-84.
17. Brown, R.D., Whisnant, J.P., Sicks, R.D., O'Fallon, W.M., Wiebers, D.O. Stroke incidence, prevalence, and survival: secular trends in Rochester, Minnesota, through 1989. *Stroke*. 1996;27, 373-80.
18. Wolf PA, D'Agostino RB, O'Neal MA, Sytkowski P, Kase CS, Belanger AJ, Kannel WB. Secular trends in stroke incidence and mortality: the Framingham Study. 1992;23:1551-55.
19. MacMahon, S. and Rodgers, A. The epidemiological association between blood pressure and stroke: implications for primary and secondary prevention. *Hypertension Research*, 17(Supplement1), 1994;S23-S32.
20. Becker, J.U., Stroke, Ischemic. Updated: Jun 19, 2009; viewed on: 20/09/2009 Available at <http://emedicine.medscape.com/article/793904-overview>
21. Devkota, K.C., Thapamagar, S.B. and Malla, S. Retrospective analysis of stroke and its risk factors at Nepal Medical College Teaching Hospital. *Nepal med Coll J*, 2006;8(4):269-75.
22. Shinton, R. and Beevers, G. Meta-analysis of relation between cigarette smoking and stroke. *Bmj*, 1989; 298(6676):789-94.
23. Kaarisalo, M.M., Immonen Rähä, P., Marttila, R.J., Lehtonen, A., Salomaa, V., et al. Atrial fibrillation in older stroke patients: association with recurrence and mortality after first ischemic stroke. *Journal of the American Geriatrics Society*, 1997;45(11):1297-1301.
24. Mahmood, A., Sharif, M.A., Khan, M.N. and Ali, U.Z. Comparison of serum lipid profile in ischaemic and haemorrhagic stroke. *Journal of the College of Physicians and Surgeons Pakistan*, 2010;20(5), 317-30.
25. Saadatnia, M., Feiz, M., Ziaei, S.E., Hamzeh, M., Ghorbani, E. and Keshteli, A.H. Lipid Profile in Patients with Ischemic and Hemorrhagic Stroke. *Journal of Isfahan Medical School*, 2011;29(129):172-78.
26. Ziakas, G.N., Hatzitolios, A.I., Savopoulos, C.G., Kounanis, A.D., Christoforidis, J.P. and Ziakas, A.G. D006: Lipids and fibrinogen plasma levels in ischemic and hemorrhagic stroke. our experience in 2538 patients. *American Journal of Hypertension*, 2000;13(S2): 234A-235A.
27. Uddin, M.J., Alam, B., Jabbar, M.A., Mohammad, Q.D. and Ahmed, S. Association of lipid profile with ischemic stroke. *Mymensingh medical journal: MMJ*, 2009;18(2):131-35.