

Risk Factors in Young Stroke

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Abstract:

Background: Stroke in young age is less frequent than in older populations but has a major impact on the individual and society. This study was done to find out aetiological pattern and associated risk factors of stroke in young adults.

Methods: This descriptive cross-sectional observational study was conducted in the Department of Medicine and Neurology, Dhaka Medical College, Dhaka, during the period of April to October 2016. We studied consecutive 100 stroke patients between the age of 15-45 years.

Results: In this study 62% patients were male and 38% were female, male incidence is 24% higher than female and ratio is 1.38. Infarction was found in 65% cases. Haemorrhage was in 35% cases. Dyslipidaemia was mostly associated risk factor in both infarction (76.91%) and in haemorrhage (85.71%). High prevalence of dyslipidaemia as associated risk factor may indicate premature atherosclerosis.

Conclusion: Stroke in young requires a different approach to investigation and management than stroke in the elderly due to differences in the relative frequencies of possible underlying causes. It remains the case, however, that atherosclerosis contributes to a large proportion of stroke in young patients, thus conventional risk factors must be targeted aggressively.

Keywords: Risk Factor; young stroke, haemorrhagic stroke, infarctive stroke.



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Introduction:

Stroke is a major cause of morbidity and mortality. It is one of the most common neurological disorders and third common cause of death worldwide.¹ The world health organization defined stroke as a syndrome of rapidly developing clinical sign of focal or global disturbance of cerebral function, persisting for at least 24 hours or leading to death with no apparent cause other than vascular origin.¹ Stroke may be ischemic or hemorrhagic and usually occurs in the elderly and middle aged.

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The occurrence of stroke in the age group of 15-45 years is referred to as stroke in young adults.¹ Strokes in this group are relatively uncommon. National survey of stroke in USA revealed that only 3.7% of all strokes occurred among patient's aged 15-45 years. Approximately 10% to 14% of ischemic strokes occur in young adults.² A hospital based study done in Dhaka Medical College Hospital showed that among all the stroke patients only 1% suffered stroke is less than 20years age group and 26% within 20-45 years.³ Moreover, age specific prevalence of stroke (34-45y) of a population based study done in Bangladesh revealed 4.37 per 1000 is higher than that of Taiwan, where the prevalence was reported 0.51 per 1000 persons aged 35 to 44 years. This comparison indicates that the stroke prevalence in young Bangladeshi population is much higher than the Asian far-east, commonly known for high prevalence of stroke.^{3,4}

The etiology and prognostic features that characterize stroke in older persons may not apply to young adults. Stroke in young adults include a wide variety of disorders those are less frequent in older age groups. Though there are some

overlap in the risk factors between these two groups but there are some clearly distinct risk factors for ischemic and hemorrhagic strokes in young adults ;e. g. -congenital heart disease (patent foramen ovale), valvular heart disease, family history of stroke, premature atherosclerosis, connective tissue disease with vasculitis, hematological variables, smoking, drug abuse, some genetic disease, coagulopathy, arteriovenous malformation (AVM), aneurysm, and in female oral contraceptive pill, pregnancy, postpartum state, migraine etc. This suggest that it should be possible to make a considerable impact on the stroke incidence in young adults by minimizing the relevant risk factors in the population by screening or case finding for high risk individuals to whom preventive treatment may be offered.

In terms of risk factors stroke in young adults is remarkably heterogeneous and often a diagnostic challenge. Western reports show that in this age group, cardio embolization and non atherosclerotic vasculopathies are relatively important risk factors of ischemic stroke as compared to atherosclerotic vasculopathy and small artery occlusion which is common in elderly. It is important to find out the etiologic factors and management of these factors adequately for appropriate prevention and recurrence. Type of stroke in young adults may influence the outcome and may have a dramatic impact in the quality of life in survivors⁵. Regarding hemorrhagic stroke in young adults subarachnoid hemorrhage and intracerebral hemorrhage are common in this group than older⁶⁻⁸ This study was designed to find out the risk factors of stroke in young adults in Dhaka Medical College Hospital.

Materials and Methods:

This cross-sectional study was conducted in the Department of Medicine and Department of Neurology, Dhaka Medical College, Dhaka, during the period of April to October 2016. We studied consecutive 100 stroke patients between the age of 15 and 45. Detailed history was taken and all patients were examined thoroughly to elicit the aetiological and risk factors. All were investigated with routine blood count, urine examination, blood glucose, lipid profile, serum creatinine, ECG, chest X-ray and CT scan of brain. Further investigations were done according to the clinical and laboratory findings.

Results:

The maximum number of patients (29%) in this study were in between 40-45 years followed by (24%) between the age of 35-39 years. Sixty two percent were male and 38% were female. In this series only 13% was illiterate. Of the literate group

30% went to primary school and 16% completed graduations. Fifty five percent patients came from urban areas and majority patients comprised of house wife (24%) followed by service holder (20%) and unemployed (19%). 38% were smoker whereas 8% had the habit of betel nut chewing (Table I). 65% suffered from ischemic stroke, 25% suffered from intracerebral hemorrhage, 10% suffered from subarachnoid hemorrhage (Figure 1). About sixty eight percent patients with infarctive stroke had high level of LDL (Table II) and 62.22% patients with haemorrhagic stroke had high lipid level (Table III).

Table I: Distribution by Socio-demographic variable (n=100)

Patient characteristics	Numbers of the patients	Percentage (%)
Age groups (in years):		
• 15-19	08	08
• 20-24	10	10
• 25-29	19	19
• 30-34	10	10
• 35-39	24	24
• 40-45	29	29
Sex:		
• Male	62	62
• Female	38	38
Literacy:		
• Illiterate	13	13
• Primary	30	30
• Secondary	41	41
• Higher Secondary	16	16
Residence:		
• Urban	55	55
• Rural	45	45
Occupation:		
• Service	20	20
• Business	09	09
• Student	12	12
• Laborer	10	10
• Cultivator	06	06
• House wife	24	24
• Unemployed	19	19
Habit:		
• Smoking	38	38
• Betel nut	08	08

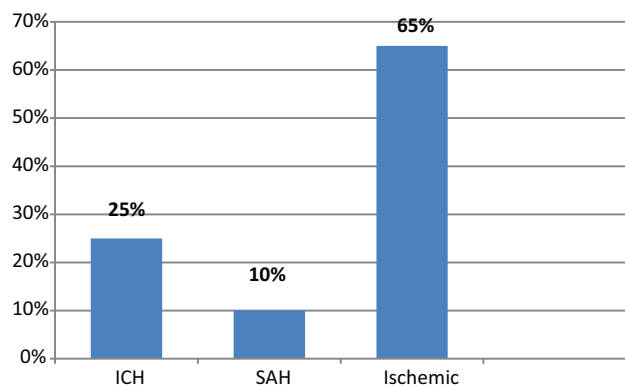


Figure 1: Types of Stroke

Among the hypertensive patients only 25% were compliant to antihypertensive medications. A good number of patients (35%) were diagnosed as hypertensive for the first time after admission in hospital (Table IV). Out of 12 diabetic patients,

50% were previously diagnosed. Among them 33.33% had controlled and the remaining 16.66% had uncontrolled diabetes mellitus (Table V).

16% of the stroke suffered female patients used oral contraceptive in their life time, 84% never used oral contraceptive during the acute attack. In this series only 2% of the patients were suffering from SLE, another 2% were due to vasculitis (Takayasu arteritis). Dyslipidemia was associated with 76.91% infarctive stroke patients (Table VI) and 62.22% patients of haemorrhagic stroke (Table VII).

Among 10 patients of subarachnoid hemorrhage 8 (80%) had ruptured aneurysm and 2 (20%) had ruptured AVM. Majority (75%) of aneurysmal subarachnoid hemorrhage were due to ruptured anterior communicating artery aneurysm followed by 12.5% posterior communicating artery and 12.5% middle cerebral artery.

Table II: Lipid profile of patient with infarctive stroke (n=65)

Abnormal lipid profile	Male	Female	Total
High LDL (≥ 100 mg/dl)	36 (55.38%)	8 (12.30%)	44 (67.68%)
Low HDL (< 35 mg/dl)	28 (43.07%)	8 (12.30%)	36 (55.37%)
High Cholesterol (> 200 mg/dl)	16 (24.61%)	4 (6.15%)	20 (30.76%)
Triglyceride (> 150 mg/dl)	8 (12.30%)	8 (12.30%)	16 (24.60%)

Table III: Lipid profile of patient with haemorrhagic stroke (n=35).

Abnormal lipid profile	Male	Female	Total
High LDL (≥ 100 mg/dl)	14 (40.00%)	10 (22.22%)	24 (62.22%)
Low HDL (< 35 mg/dl)	14 (40.00%)	6 (17.14%)	20 (57.14%)
Triglyceride (> 150 mg/dl)	16 (45.71%)	0 (%)	16 (45.71%)
Cholesterol (> 200 mg/dl)	4 (11.42%)	0 (%)	4 (11.42%)

Table IV: Stroke with hypertension (n=40)

Hypertension	Number of patients	Percentage (%)
Previously known	26	65
• Compliant	10	25
• Non-compliant	16	40
Diagnosed on admission	14	35
Total	40	100

Table V: Stroke with Diabetes Mellitus (n=12)

Diabetes Mellitus	Number of patients	Percentage (%)
Previously known	06	50
• Controlled	04	33.33
• Uncontrolled	02	16.66
Diagnosed on admission	06	50
Total	12	100

Table VI: Different risk factors of infarctive stroke with male, female distribution (n=65).

Risk factors	Male	Female	Total
Dyslipidemia	28 (43.07%)	22 (33.84%)	50 (76.91%)
Mitral stenosis	8 (12.30%)	15 (23.07%)	23 (35.37%)
Hypertension	10 (15.38%)	10 (15.38%)	20 (30.76%)
Smoking	16 (24.61%)	2 (3.07%)	18 (27.68%)
OCP		18 (63.16%)	
DM	4 (6.15%)	0 (0%)	4 (6.15%)
IHD	2 (3.07%)	2 (3.07%)	4 (6.14%)

Table VII: Different risk factors of haemorrhagic stroke with male, female distribution (n=35).

Risk factors	Male	Female	Total
Dyslipidemia	14 (40.00%)	10 (22.22%)	24 (62.22%)
Hypertension	12 (34.28%)	8 (22.85%)	20 (57.13%)
Smoking	18 (51.42%)	2 (5.71%)	20 (57.13%)
OCP		6 (25.00%)	
DM	6 (17.14%)	2 (5.71%)	8 (22.85%)
IHD	2 (5.71%)	0 (0%)	2 (5.71%)

Discussion:

Stroke incidence rises exponentially with increasing age. In this study, all the patients were grouped in six age groups. Majority of the study subjects were above 40 years of age. A hospital based study done in Dhaka Medical College Hospital showed that only 1% stroke occurred in <20 years and 26% in 20-45 years. There is not enough study of stroke in young adults (15-45 years) in Bangladesh.

In this study, 62% patients were male and 38% were female, male incidence is 24% higher than female and ratio is 1.38. Gender variation was not very much significant with slight male predominance and consistent with other studies.⁹

Though it is observed in many studies that haemorrhages are the more common than infarction in young age, in our study CT and MRI findings of the studied patients show that 65% had ischemic stroke while 35% had hemorrhage. Higher rate of hemorrhagic stroke is also have been reported in a number of hospital series in Asian countries such as Singapore, Malaysia (33%), Thailand (30%), Korea (31%), Taiwan (31%). Higher rate of hemorrhage stroke in this present hospital based study may be due to the fact that acute admission is more related to the hemorrhagic stroke. Among the associated risk factors in infarctive stroke cases, dyslipidemia is present in 76.91% cases. Other mostly

associated risk factors are mitral stenosis, hypertension, smoking, OCP, In haemorrhagic cases, dyslipidemia is again found to be the highest associated risk factor present in 85.71% cases. Other frequent factors are hypertension, smoking.

In this study cardiogenic cerebral embolus is one of the most common cause of ischemic stroke in the young, accounting for up to 35.37% of cases. Among the cardio embolic causes the mitral valvular disease is the most common. Most of the patient with valvular heart disease had history of Rheumatic Fever. Valvular heart diseases were more prevalent in the female group in this study. Bevan et al showed that about 35.4% cerebral infarcts are due to cardio embolic source. However, in some studies, it was found that cardioembolic disease as cause of infarction is less common in developing countries in contrast to atherothrombotic disease which is more common.¹⁶⁻¹⁷

Present study shows that 40% of the stroke patients are suffering from HTN. Study among the NIDDM within BIRDEM by Latif et al found 50.3% of the patient were hypertensive. Bevan et al showed that 31% of the patient with cerebral infarction had HTN. The present study correlates with this western study. This study shows that 35% stroke patients were hypertensive and 40% were on irregular treatment. This present study is almost similar with the study of Chowdhury et al, who studied 74 hypertensive patients with suffered stroke and had shown that 34% of the patients were not aware that they were hypertensive and 60.7% were on irregular treatment. Yoshinaryi et al showed in his study that the percentage of ischemic stroke was similar with normotensive patients but the incidence was higher in untreated cases of HTN. Hypertension is more frequent in haemorrhagic strokes than Infarctive cases So, effective control of HTN is essential.

Diabetes mellitus was not commonly associated risk factor found in our study like other studies.⁹ Dyslipidemia remains as a silent risk factor regarding both Infarctive and haemorrhagic stroke. In our study we have found that associated lipid abnormality is high LDL in both Infarctive and haemorrhagic strokes present in 67.68% and 62.22% cases respectively. Low HDL is also common in both types 55.37% and 57.14% cases respectively. High cholesterol level is found to be more associated with infarction than haemorrhage.

Hayee et al showed that 19.07% of the total cases of stroke had raised serum cholesterol which is lower than the present study. The role of dyslipoproteinaemia in the pathogenesis of cerebrovascular disease is less certain than for coronary artery disease; more consistent association has been noted with low HDL cholesterol and high total cholesterol to HDL cholesterol ratio than with total cholesterol, low density lipoprotein cholesterol and triglycerides.¹² HDL cholesterol

plays a fundamental role in the regulation of atherogenesis via its effects on reverse cholesterol transport¹³ and vascular remodeling.¹⁴ However as dyslipidemia is highly prevalent as associated risk factor, it is likely that premature atherosclerosis may consist a considerable proportion of aetiology of young stroke.

The present study shows that 38% patients were smoker. Multiple individual studies have demonstrated that the risk of stroke is increased among the cigarette smokers.

There is little doubt that regular use of estrogen is associated with increased risk of stroke. In this study out of 38 female patients, 63.16% patient had history of taking OCP, 36.84% of patient never used oral contraceptives in their life time. The use of OCP is associated with nine fold increase risk of cerebral infraction in women. Physical activity has inverse relationship with the stroke. Exercise is effective in the prevention of cardiovascular disease and stroke. The benefits are largely manifested through the role that exercise plays an important role in control of certain modifiable risk factors such as blood lipid abnormalities, diabetes and obesity. This study shows that during onset of stroke 72% were during rest, 24% at work. This study indicates that, those who were hard workers were affected less. Herman et al suggested that physical activity reduces the risk of stroke. Hart et al¹⁵ studied 416 men who had stroke and revealed that men with manual occupation and men whose father had manual occupation had significantly higher rate of stroke than men in non manual worker. In this present study sedentary workers form the major percentage of stroke.

Conclusion:

In this study a number of modifiable risk factor were identified, of which dyslipidemia, valvular heart disease and HTN are important risk factor, next are smoking, DM and IHD. Stroke is more preventable than to cure. In an underdeveloped country like ours, the best policy for combating stroke is primary prevention. Most of the valvular heart diseases are rheumatic in origin, which can be prevented through primary and secondary prevention of rheumatic fever. By controlling HTN we significantly reduce the incidence of stroke. Smoking, one of the frequent risk factor for stroke, can be controlled by anti-smoking campaign. Proper screening, counseling, regarding diet and ensuring drug compliance can control IHD and DM which are the other important risk factors. Preventive measures focus on the risk factors and etiology should be strongly enforced in young adults and aggressive treatment and secondary prevention as well as rehabilitation should be considered.

Conflict of interest: None.

References:

1. Ropper A H, Brown R H. Adam's and Victor's Principles of neurology. New York: McGraw hill; 2005:708-710.

2. Ji R, Schwamm LH, Pervez MA, Singhal AB. Ischemic stroke and transient ischemic attack in young adults: risk factors, diagnostic yield, neuroimaging, and thrombolysis. *JAMA Neurol* 2013;70(1):51-7.
3. Mohammad Q D, Alam B, Habib M, Hossain S, Haque B, Haque A, et al . Prevalence of stroke in Bangladeshi population-A population based study. *JAFMC* 2009;5(1):24-7.
4. Lipska K , Sylaja P N, Sarma P S, Thanka K R, Kutty V R. Risk factors for acute ischemic stroke in young adults in South India. *JNNP* 2007; 78:959- 63.
5. H. Marini C, Totaro R, De Santis F, Morris T, Barnett S, Bacoulas M, et al. Stroke in young adults in the community in Italy. *Stroke* 2001;32 (1):180- 210.
6. Marini C, Totaro R, De Santis F, Ciancarelli I, Baldassarre M, Carolei A. Stroke in young adults in the community-based L' Aquila registry: incidence and prognosis. *Stroke* 2001;32; (1)52-6.
7. Jacobs BS, Boden-Albala B, Lin IL, Sacco RL, Stroke in the young in the Northern Manhattan stroke study. *Stroke* 2002;33 (12):2789-983.
8. Gandolfo C, Conti M. Stroke in young adults: *Epidemiology Neurological Sciences* 2003;24: S1-3.
9. Nedeltchev K, der Maur TA, Georgiadis D, Arnold M, Caso V, Mattle HP et al. Ischaemic strokes in young adults: predictors of outcome and recurrence. *J Neurol Neurosurg Psychiatry* 2005; 76: 191-5.
10. Putaala J, Metso AJ, Metso TM, Konkola N, Kraemer Y, Haapaniemi E et al. Analysis of 1008 consecutive patients aged 15-49 with first ever ischemic stroke, the Helsinki young stroke registry. *Stroke* 2009; 40 (4): 1195-1203.
11. Varona JF, Guerra JM, Bermejo F, Molina JA, Gomez de la Cámara A. Causes of ischemic Stroke in young adults and evolution of the etiological diagnosis over the Long term. *European Neurology* 2007; 57 (4):212-18.
12. Curb JD, Abbott RD, Rodriguez BL, Masaki KH, Chen R, Popper JS. High density lipoprotein cholesterol and the risk of stroke in elderly men:the Honolulu Heart Program. *Am J Epidemiol* 2004;160:150-7.
13. Lewis GF, Rader DJ. New insights into the regulation of HDL metabolism and reverse cholesterol transport. *Circ Res* 2005;96:1221-32.
14. Alagona C, Soro A, Westerbacka J, Ylitalo K, Salonen JT, Salonen R et al. Low HDL cholesterol concentration is associated with increased intima-media thickness independent of arterial stiffness in healthy subjects from families with low HDL cholesterol. *Eur J Clin Invest* 2003;33:457-63.
15. Hart CL, Hole DJ, Smith GD. Influence of socioeconomic circumstance in early and later life on stroke risk among men in a Scottish cohort study. *Stroke* 2000; 31 (9): 2093-7.
16. Lee T-S, Hsu W-C, Chen C-J, et al. Etiologic study of young ischemic stroke in Taiwan. *Stroke* 2002;33: 1950-5.
17. Garbusinski JM, van der Sande MA, Bartholome EJ, Dramaix M, Gaye A, Coleman R et al. Stroke presentation and outcome in developing countries. *Stroke* 2005; 36: 1388-93.