



Risk Factors and Cardiac Abnormalities Associated with Stroke in Young Patients: An Observational Study in a Tertiary Care Hospital in Bangladesh

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Abstract

Background: *There are various risk factors for both coronary artery and cerebrovascular disease. It is well known that coronary artery disease increases the risk of stroke and TBI. Contrary to this, the incidence of these risk factors varies across coronary artery disease and ischemic stroke, as well as between stroke subtypes, due to the more complex aetiology.*

Objective: *The aim of the study is to find out the risk factors and cardiac abnormalities associated with stroke in young patients.*

Methods: *This hospital based cross-sectional study was conducted from April 2015 to October 2015 in the indoor patients in Department of Medicine of Shaheed Suhrawardy Medical College Hospital, Dhaka. Patients of young age (15-45 years) with stroke admitted in the hospital were considered as the sample size of the study.*

Results: *This study showed that among the patients majority were in 41 to 45 years age group (36.0%). The proportion of 26 to 30 years, 31 to 35 years and 36 to 40 years age group patients were very close (18.0%, 20.0% and 22.0% respectively). Only 4.0% were less than 25 years age. Majority of the patients had valvular heart disease (64.0%). Among others 16.0% had myocardial infarction, 10.0% had ischemic heart diseases and 8.0% had atrial fibrillation. The Framingham Heart study risk equation revealed that over 75.0% of stroke patients also had some form of cardiac diseases.*

Conclusion: *Heart disease in young people can cause stroke, which is a serious complication that needs to be taken seriously. Stroke is a leading cause of death and disability. Ischemic strokes in young individuals are more likely to be heart-related than cerebral when the exact cause is unknown.*

Keywords: *Stroke, Young patients, Cardiac diseases, Ischemic stroke, Risk Factors.*

Introduction

Strokes in young adults (18–50 years old) are on the rise and already account for up to 15–18 percent of all strokes, according to current estimates.^[1,2] These young people, many of whom are contemplating whether or not to raise a family or pursue a job, are at a very high risk of suffering recurrent stroke.^[3] Patients between the ages of 15 and 45 with a diagnosis of stroke include cerebral infarction, arteriovenous malformation, cardiogenic emboli, and intracerebral hemorrhage. Atherosclerosis and cardiogenic emboli are the most common causes of cerebral infarction in young people. Ischaemic strokes in the young have different causes in different countries and populations than in the elderly. It was found that the most common cause of Ischaemic Stroke in young individuals was cardiac embolism, followed by arterial dissections.^[4] Large arterial atherosclerosis and small artery disease rarely outweighed other known causes of strokes. Atherosclerotic cerebral infarction is predisposed by hypertension, previous transient ischemic attack, and hyperlipidemia. Up to a third of all young people who suffer a stroke have a cardiogenic cerebral embolism. Embolic particles from the venous blood cannot reach the systemic circulation because of the pulmonary capillary bed, a filter in the normal circulatory system.^[5] Embolic events, including stroke, that occur as a result of material from the venous compartment crossing the lung capillary filter are known as paradoxical embolism. Young adults who have risk factors for cardiovascular disease (CVD) are more likely to die than those who don't.^[6] Hypertension, diabetes mellitus, hyperlipidemia, and cigarette smoking are the most common risk factors for cerebrovascular illness.^[7-8] Hypertension and arteriovenous malformation are the most common causes of intracerebral bleeding. Aneurysms, intraventricular bleeding, and arteriovenous malformations are the most common causes of subarachnoid hemorrhage. There is a nine-fold increase in the risk of stroke in women who use oral contraceptives.^[9] There

are numerous ways in which alcohol can cause stroke, including inducing cardiac arrhythmias and abnormalities in cardiac wall structure that increase the risk of cerebral embolism; inducing hypertension, which increases the risk of clot formation; stimulating cerebral vascular smooth muscle contraction, which reduces blood flow; and altering the metabolism of the cerebrum.^[10-11] Although transesophageal echocardiography can detect cardiac embolic sources in patients with undiagnosed cerebral infarction, conventional diagnostic techniques cannot.^[12] A few juvenile stroke patients have risk factors that can't be categorized. In many cases, transesophageal echocardiography and angiography are useful in determining the causes of young adult strokes whose risk factors were previously unknown.. Young adults may not have the same etiological and predictive characteristics of elder stroke victims. Migraine headaches may result in a brain infarction. 13 There is little difference between the incidence of migraine in young stroke patients and the general population (those under 45 years of age). Acute ischemic neurologic episodes have previously been linked to mitral-valve prolapsed.^[14] Stroke in young people is caused by a variety of reasons, however heart problems are a major contributor. More than 23.6 million people are predicted to die from cardiovascular disease by 2030, making it the leading cause of mortality in the world.^[14] As of 2008, cardiovascular fatalities accounted for 30 percent of all global mortality, with 80 percent of those deaths occurring in low- and middle-income nations.^[15] Stroke affected 33 million persons worldwide in 2010, with 16.9 million people experiencing their first stroke^[16]. After heart disease, stroke was the second most common cause of death worldwide, accounting for 11.13 percent of all deaths. It is estimated that stroke is the second greatest cause of death in the world today. Stroke kills roughly six million individuals every year. Stroke affects one in every six persons in the globe. Individuals in resource-poor countries bear the brunt of stroke's burden. There is still a lot we don't know about stroke as a

public health problem. Efforts to improve public health education and advocacy around the world must be stepped up.^[17] So, this cross sectional study is designed to see the Risk Factors and cardiac abnormalities associated with Stroke in young patients at Shaheed Suhrawardy Medical College.

Objectives

- To find out the Risk Factors and cardiac abnormalities associated with Stroke in young patients.

Methodology

This hospital based cross-sectional study was conducted from April 2015 to October 2015 in the indoor patients in Department of Medicine of Shaheed Suhrawardy Medical College Hospital, Dhaka. Patients of young age (15-45 years) with stroke admitted in the hospital were considered as the sample size of the study.

Inclusion Criteria

- Stroke patients of both sex between 15-45 years.
- Patients who have given informed written consent.

Exclusion Criteria

- Patient having associated chronic infections or illness
- Patients of cancer and immunosuppressive illness.

Sample Size

Purposive sampling technique was adopted in this study. All the available subjects during the data collection period who fulfilled the study selection criteria were included in the study. As in this study purposive sampling technique was used and due to the time constraint, 100 samples were taken.

Data Collection and Analysis

A semi-structured survey was created. The questionnaire was created using the desired variables. The questionnaire asked about socio-demographics, disease features, and other information. A check list was also created. A pre-test session preceded the actual data gathering. Modifications were made before to the survey. Interviews and document reviews were used to acquire data. We examined and modified all data collected. Then the data were entered into the computer using SPSS. Chi-square was done after frequency run.

Results

Most of the patients were between the ages of 41 and 45. (36.0 percent). The percentage of patients aged 26 to 30 years, 31 to 35 years, and 36 to 40 years was relatively similar (18.0 percent, 20.0 percent and 22.0 percent respectively). Only 4.0 percent of participants were under the age of 25. This table shows that most of the patients were from the 41-45 age groups. This may be due to the fact that with increasing age there are increased chances of atherosclerosis of blood vessels.

Table 1: Age distribution of the patients

Age group (years)	No. of the patients	Percent (%)
<25	4	4.0%
26- 30	18	18.0%
31 -35	20	20.0%
36 -40	22	22.0%
41-45	36	36.0%
Total	100	100

More than half of the patients were male (54.0%). This may be due to the fact that our society is of male predominance, so most of the patients who come to the hospitals are usually male patients.

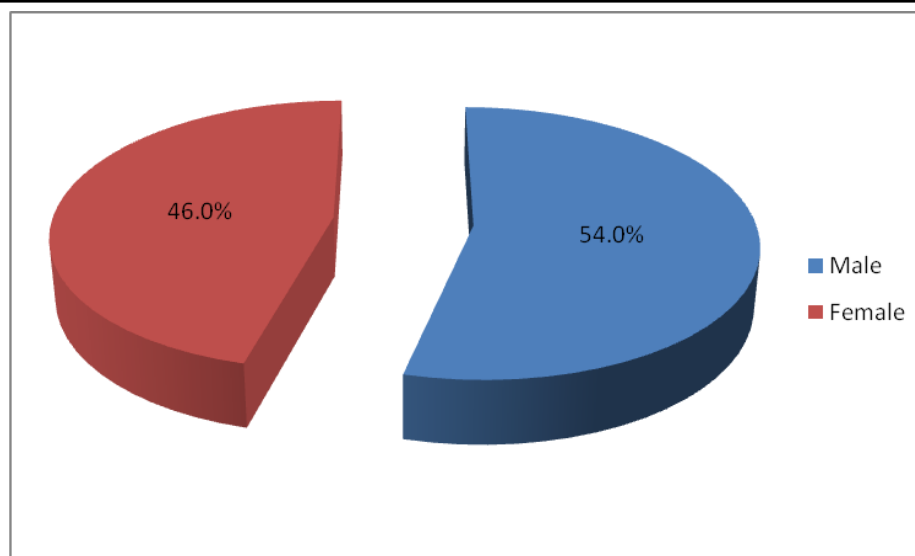


Fig 1: Sex distribution of the patients

Majority of the patients had valvular heart disease (65.0%). Among others 16.0% had myocardial infarction, 10.0% had myocardial ischemia and 9.0% had atrial fibrillation. This shows that

patients with Mitral Stenosis had a higher incidence of stroke. This is probably due to thromboemboli caused by MS.

Table 2: Proportion of different heart diseases

Diseases		No. of the patients n=100	Percent (%)
Myocardial infarction	Anterior	12	12.0
	Inferior	4	4.0
Myocardial Ischemia	Inferior ischemia	2	2.0
	Anterior ischemia	8	8.0
Valvular heart disease	Mitral stenosis	48	48.0
	Mitral stenosis with mitral regurgitation	14	14.0
	Mitral stenosis with aortic stenosis	3	3.0
Atrial fibrillation		9	9.0
Total		100	100.0

Most of the patients had ischemic type of stroke (91.0%). Only 9.0% had stroke due to intracerebral haemorrhage. In the study it was

seen that the patients who suffered stroke a greater number suffered ischaemic stroke.

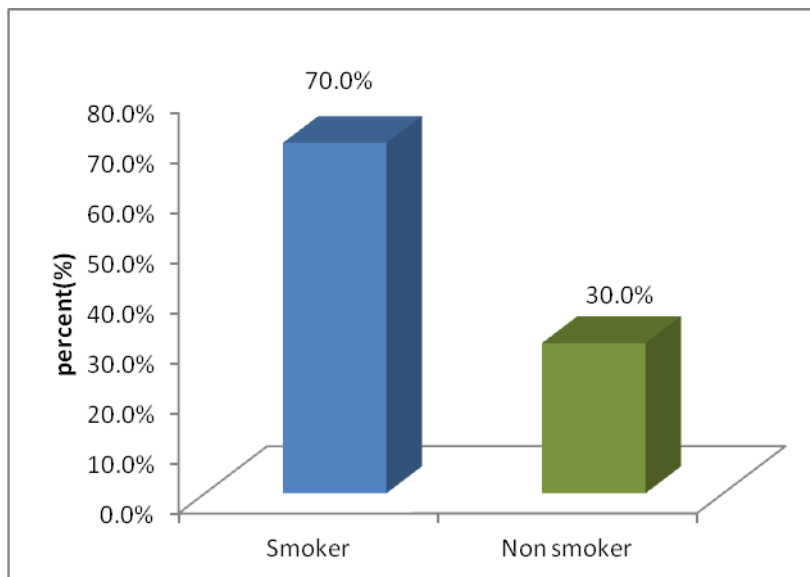


Fig 2: Smoking status of the patients

Smokers comprised 70.0 percent of all patients, while non-smokers comprised the remainder (30.0 percent). A greater incidence of stroke is found

among smokers compared to nonsmokers because smoking is a risk factor for atherosclerosis.

Table 3: Proportion of oral contraceptive user in female patients

Use of contraceptive	No. of patients n=100	Percent (%)
Current contraceptive user	26	56.5
Contraceptive used previously	4	8.7
Never used	16	34.8
Total	46	100.0

Among the female patients more than half were current contraceptive user (56.5%). Only 8.7% were past contraceptive user. Incidence of stroke

was higher in patients who were current contraceptive users.

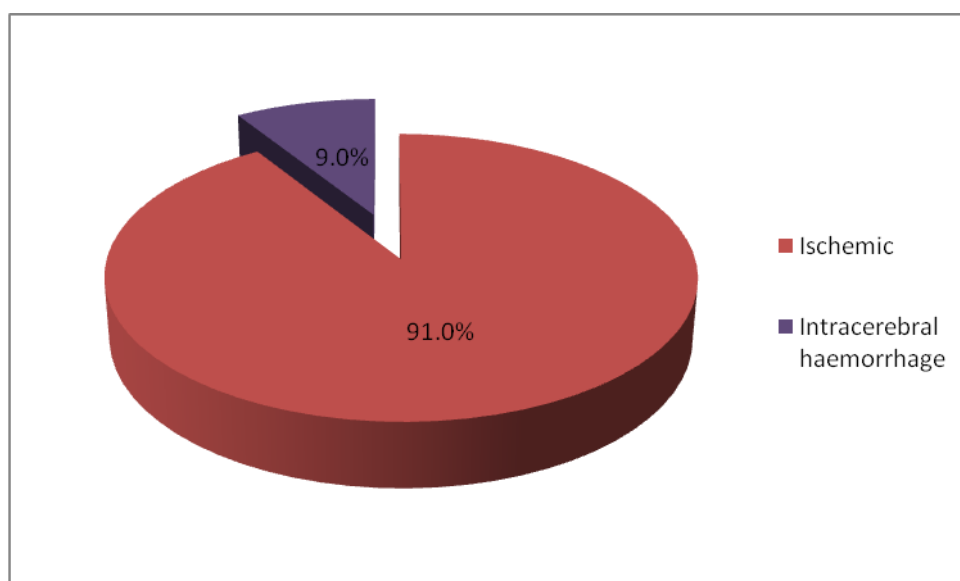


Fig 3: Types of stroke

Valvular heart diseases were more in ischemic stroke patients (67.0%) than intracerebral hemorrhagic stroke patients (44.4%). On the other hand proportion of Myocardial infarction (33.3%), myocardial ischaemia (22.2%) and atrial

fibrillation (11.1%) were more in intracerebral hemorrhagic patients than in ischemic stroke patients. In both types of stroke the greater contributor was valvular heart disease.

Table 3: Relation of stroke with cardiac disease

Cardiac disease	Stroke	
	Ischemic (n = 91)	Intracerebral Hemorrhage (n = 9)
Myocardial infarction	13(14.4%)	3(33.3%)
Myocardial Ischemia	8(8.8%)	2(22.2%)
Valvular Heart Disease	61(67.0%)	4(44.4%)
Atrial Fibrillation	8(8.8%)	1(11.1%)

Discussion

A cross sectional study was conducted to find out the relation of stroke with cardiac diseases in young patients, identify the risk factors associated with stroke in the young age group and socio demographic factors with stroke among the young stroke patients.

This study showed that among the patients majority were in 41 to 45 years age group (36.0%). The proportion of 26 to 30 years, 31 to 35 years and 36 to 40 years age group patients were very close (18.0%, 20.0% and 22.0% respectively). Only 4.0% were less than 25 years age. Majority of the patients lived in rural area (55.0%). Stroke incidence rose exponentially with increasing age.^[18] in his study of stroke in young adults also found similar picture & showed that only 4% occurred in <20 years & 36% in 41-45 years. Bell D et al^[19] (1990) studied 50 patients with stroke and found most of the incidence of stroke was between the ages of 50-69 years. Razzaq A A et al^[20] (2002) studied in 118 young stroke patient in South Asia. About three quarters of the patients were in the 35-44 years of age. The highest incidence of stroke was between 5th to 7th decades. A study done by Chowdhury S. Z.M^[21] also found peak incidence between 5th to 7th decades.

In this study more than half of the patients were male (54.0%). The present study coincides with study of Kurzke J F et al^[18] where it showed that frequency of stroke is 30.0% higher in men than

women. This study also differs with a previous study of Mannan & Alamgir^[22], male : female ratio 4:1 and showed that stroke incidence in male is 22.0% higher than the female in South Asia.

Near about one third of the patient had family history of stroke 32.0% followed by hypertension in 20.0%, diabetes mellitus in 16.0% and ischemic heart disease in 12.0% of the patients. Past history of Transient ischemic attack was in 10.0% and stroke was in 8.0% of the patients.

Current study showed that more than two thirds of the patients were smokers (70.0%) and rests were non smoker (30.0%). Multiple individual studies have demonstrated that the risk of stroke was increased among the cigarette smokers Donan et al have shown strong association between cigarette smoking and stroke. Similar study in Copenhagen and Finland had shown increase risk of stroke in smoker. An analysis from 32 studies, found that relative risk of ischemic stroke from smoker was 1.9 times more than that of non smoker.

In this study among the female patients more than half was current contraceptive user (56.5%). Only 8.7% used contraceptives previously. There is little doubt that, regular use of estrogen is associated with increased risk of stroke. According to sex variation study with two different variable the research found that out of 24 female patients, about 58.3% patients suffered from stroke who had strong history of regular use of oral contraceptive. The use of oral

contraceptive pill is associated with nine fold increase risk of cerebral infarction in women.

CT & MRI findings of the studied patients showed ischemic type of stroke in 91.0% cases. Only 9.0% had stroke due to intra cerebral haemorrhage.

Present study showed that majority of the patients had valvular heart disease (64.0%). Among others 16.0% had myocardial infarction, 10.0% had ischemic heart diseases and 8.0% had atrial fibrillation. The Framingham Heart study risk equation revealed that over 75.0% of stroke patients also had some form of cardiac diseases. IHD definitely augments the risk of stroke^[23].

Conclusion

Stroke is an important medical complication that may develop in individuals with cardiac disease in young patients. Stroke is a major cause of morbidity and mortality. When the cause of ischemic stroke in young adults is unclear it is worthwhile to take a second look at the heart.

References

1. Kissela, BM, Khoury, JC, Alwell, K Age at stroke: temporal trends in stroke incidence in a large, biracial population. *Neurology* 2012; 79: 1781–1787.
2. Singhal, AB, Biller, J, Elkind, MS Recognition and management of stroke in young adults and adolescents. *Neurology* 2013; 81: 1089–1097.
3. Arntz, RM, van Alebeek, ME, Synhaeve, NE The very long-term risk and predictors of recurrent ischaemic events after a stroke at a young age: The FUTURE study. *Eur Stroke J* 2016; 1: 337–345.
4. Virani S.S., Alonso A., Benjamin E.J., Bittencourt M.S., Callaway C.W., Carson A.P. Heart disease and stroke statistics—2020 update: A report from the American Heart Association. *Circulation*. 2020:E139–E596.
5. Krishnamurthi R.V., Moran A.E., Feigin V.L., Barker-Collo S., Norrving B., Mensah G.A., Taylor S., Naghavi M., Forouzanfar M.H., Nguyen G., Johnson C.O. Stroke prevalence, mortality and disability-adjusted life years in adults aged 20-64 years in 1990-2013: Data from the global burden of disease 2013 study. *Neuroepidemiology*. 2015;45(3):190–202.
6. Ekker M.S., Boot E.M., Singhal A.B., Tan K.S., Debette S., Tuladhar A.M., de Leeuw F.E. Epidemiology, aetiology, and management of ischaemic stroke in young adults. *Lancet Neurol*. 2018 Sep 1;17(9):790–801.
7. George M.G., Tong X., Bowman B.A. Prevalence of cardiovascular risk factors and strokes in younger adults. *JAMA neurology*. 2017 Jun 1;74(6):695–703
8. Kwon SU, Kim JS, Lee JH, Lee MC. Ischemic stroke in Korean young adults. *Acta Neurol Scand* ; (2000);101(1): 19–24.
9. Rosengren A, et al. Optimal risk factors in the population: prognosis, prevalence, and secular trends: data from Go'teborg population studies. *Eur Heart J* 2001; 22:136–44.
10. Yonemura K, Kimura K, Hasegawa Y, Yokota C, inematsu K, Yamaguchi T. Analysis of ischemic stroke in patients aged up to 50 years. *Rinsho Shinkeigaku* 2000; 40(9): 881–6.
11. Delvigne M, Vermeersch P, van denHeuvel P. Thrombus-in-transit causing paradoxical embolism in cerebral and coronary arterial circulation. *Acta Cardiol*2004; 59:669–72.
12. Miura K, et al. Relationship of blood pressure to 25-year mortality due to coronary heart disease, cardiovascular diseases, and all causes in young adult men: The Chicago Heart Association Detection Project in Industry. *Arch Intern Med* 2001;161:1501–8.
13. Riding G, Daly K, Hutchinson S, Rao S, Lovell M, McCollum C. Paradoxical cerebral embolisation. An explanation for

- fat embolism syndrome. *J Bone Joint Surg [Br]* 2004;86:95–8.
14. DeVeber G. Arterial ischemic strokes in infants and children: an overview of current approaches. *Semin Thromb Hemost* 2003;29:567-73.
 15. Iserin L. Cyanotic heart disease in the adult. *Arch Mal Coeur Vaiss* 2002; 95:1100–3.
 16. Stamler J, Stamler R, Neaton JD, et al. Low risk-factor profile and long-term cardiovascular and noncardiovascular mortality and life expectancy: findings for 5 large cohorts of young adult and middle-aged men and women. *JAMA* 1999;282:2012–18.
 17. Bevan H, Sharma K, Bradley W. Stroke in young adults. *Stroke* 2000;21:382-386.
 18. Bell DA, William B, Vladimir H, Keefe B. Antiphospholipid syndrome: Prevalence among patients with stroke & TIA. *Am J Med* 2000;88:593-97.
 19. Razzaq A, Khan B, Baig SM. Ischemic stroke in young adults of South Asia. *JPMA*. 2002;52:417.
 20. Chowdhury SZM. Study of Risk Factors in Cerebrovascular Disease- A study of 100 case. Dhaka:BCPS, 2001:48.
 21. Kurzke JF. Epidemiology of cerebrovascular disease. *Merritt's Neurology*. Philadelphia: LL W.2000;135-176.
 22. Alamgir SM, Mannan MA. Cerebrovascular disease (A report of 53 cases). *Bangladesh Med Res Coun Bull* 2005; 1 :45-50.
 23. Milne R, Gamble G, Whitlock G, Jackson R,. Framingham Heart Study risk equation predicts first cardiovascular event rates in New Zealanders at population level. *N Z Med J*. 2003;116:U662