APTI ijopp

Risk Assessment for Stroke – A Retrospective Study in a Tertiary Care Teaching Hospital

Kannan G*, Vasantha J, Vanitha R N, Thennarasu P, Christa D M, Uma Maheswara R C

Department of Pharmacy Practice, Sri Ramachandra College of Pharmacy, Sri Ramachandra University, Porur, Chennai-600 116.

Address for correspondence: Kannagg2@yahoo.ca

Abstract

Stroke is one of the major challenges facing medicine with a scaring statistics of being the third leading cause of mortality world wide after heart disease and cancer, and primary cause of serious long term disability. Identification and management of risk factors remains pivotal in reducing morbidity and mortality from stroke. A retrospective study was conducted with the objective of identifying various risk factors for stroke and assess the role of the risk factors for stroke in the South Indian population. A total of 120 patients with completed stroke or cerebrovascular accident were taken up for the study. The mean age of the patients was 62.6 ± 14.46 (range 25 to 90 years). There were 83 (69.02%) males (mean age 61.3±26.9) and 37 (30.83%) females (mean age 63.25±17). 32.5% patients (25 males & 14 females) were in the age group of 65-75 years. Out of 120 patients, 104 patients (86.7%) were hypertensive. Of these, 83 (79.8%) had a past history of hypertension with a mean systolic and diastolic BP of 153 ± 22.9 and 92.4 ± 12.5 mm Hg. 62 patients (51.7%) had a previous history of diabetes mellitus 49 patients (40.8%) in this study group had dyslipidemia. 18 patients (15%) had a prior history of stroke. 54 (45%) were chronic smokers and 16 male patients (13.3%) were alcoholics. Our findings strongly recommend that effective control of blood pressure, glucose and smoking cessation may be important avenues for stroke prevention in this population.

Key words: *stroke, incidence, prognosis, risk factors*

INTRODUCTION

Stroke refers to any damage to the brain or spinal cord caused by an abnormality of the blood supply. It is also defined as the abrupt or ictal onset of focal global neurologic symptoms caused by ischemia or hemorrhage within or around the brain resulting from diseases of the cerebral blood vessels[1,2]. Stroke accounts for 10-12% of all deaths in industrialized countries and about 88% of deaths attributed to stroke are among people over 65 years. According to WHO, fifteen million people suffer stroke worldwide each year, of these, five million die and another five million are permanently disabled[3]. In India, incidence is 1 per 1000 and higher in men than in women. 20-30% of stroke falls below the age of 40 years. Indians are at high risk of death due to stroke than Caucasians[4].

A number of non modifiable risk factors such as increasing age, male gender, ethnicity, family history of stroke and modifiable risk factors like hypertension, diabetes, hyperlipidemia, Coronary Heart Disease (CHD), smoking, obesity and alcohol abuse are associated with the increased incidence of stroke[5].

Indian Journal of Pharmacy Practice
Received on 13/07/2009 Modified on 17/07/2009
Accepted on 20/07/2009

Chances of having a stroke doubles for each decade of life after age 55 yrs. With increasing age, an exponential increase occurs in the frequency of stroke. Majority of ischemic strokes occur in individuals older than 65 years[6]. Stroke in patients younger than 45 years is correlated with more frequent cardiac origin embolism[7]. Stroke has an important hereditary component. A history of stroke or cardiovascular disease among first degree relatives is a risk factor. African Americans have a higher risk of death from stroke than caucasians[8]. HTN is one of the most powerful and prevalent factor for first stroke and also an independent risk factor for recurrent stroke and stroke after Transient ischemic attack (TIA). Risk is strongly related to both systolic and diastolic blood pressure. A rise in mean arterial pressure with every 10 mmHg confers about 20-30% increase in stroke risk[1]. DM is associated with an increased risk of ischemic stroke and increased mortality in patients with stroke. Hypertension and diabetes combination increase the risk drastically[9].

Association of smoking and stroke increase the risk of extracranial and intracranial atherosclerosis, especially in the young. Nicotine increases the heart rate and BP. Males and females are equally affected, the association

becomes weaker in the elderly. It is a strong risk factor for sub arachnoid hemorrhage (SAH) and ischemic stroke, and less associated with Intra cranial hemorrhage. Cigarette smokers have a sustained excess risk of stroke for some years. A person who smokes 20 cigarettes a day has six times the risk of stroke than a non smoker. It also increases the rate at which blood clots[10,11].

Alcohol ingestion as a risk factor for ischemic stroke remains controversial. A relationship between alcohol consumption and brain hemorrhage exists. Acute and chronic heavy use of alcohol correlates with the incidence of ischemic stroke and modest consumption have a protective effect. Moderate consumption raises HDL levels (good lipoprotein)[12].

Higher risk of stroke in obese is mediated by associated hypertension and diabetes. Obesity plays an important role in atherogenesis, thereby increases the risk of coronary and other heart diseases and increases the risk of cardiogenic brain embolism. Regular & moderate physical activity reduces the risk of stroke. Being inactive increases the risk of high blood pressure, high blood cholesterol, diabetes, heart disease and stroke [13]. Understanding the morbidity, mortality, and risk factors of stroke in Indians is important so that appropriate preventive interventions can be implemented. The present study was undertaken to assess risk factors for incidence of stroke in the Indian population.

METHODOLOGY

This retrospective study was conducted for a period of six months in the Department of Neurology of a tertiary care teaching hospital, with the approval of the institutional ethics committee and informed consent of the study population. The study population consisted of 120 completed stroke patients. Patients diagnosed with TIA were not included in the study.

From the case records, data such as demographic details (age, sex, BMI), signs and symptoms on admission, past history of hypertension, diabetes mellitus, hyper-lipidemia, stroke, type of stroke (ischemic or hemorrhagic), cardiovascular disorders, family history of stroke or cardio vascular disease, smoking history, alcohol abuse, systolic and diastolic blood pressure recorded at the time of admission, biochemical data such as lipid profile (total cholesterol, triglyceride, HDL and LDL cholesterol levels) and serum blood sugar levels (random and fasting blood sugar levels) and pharmacotherapy given, were collected and recorded in the proformas specially designed for the study.

Statistical Analysis:

The statistical significance of the risk factors were analyzed by univariate logistic regression analysis and Odds ratio using SPSS statistical software version (10.0).

RESULTS

A total of 120 patients with completed stroke or cerebrovascular accident were taken up for the study. The mean age of the patients was 62.6 ± 14.46 (range 25 to 90 years). There were 83 (69.02%) males (mean age 61.3±26.9) and 37 (30.83%) females (mean age 63.25±17). Stroke incidence was predominant in males. 32.5% patients (25 males & 14 females) were in the age group of 65-75 years (Table 1).

Among 120 patients, 93(77.5%) had ischemic stroke and 27(22.5%) had hemorrhagic stroke. A total of 10(8.3%) mortalities were recorded in this study. 7(5.8%) of the deaths were due to hemorrhage and 3(2.5%) were due to ischemia. Mortality was higher with hemorrhagic stroke.

Hypertension

Out of 120 patients, 104 patients (86.7%) were hypertensive. Of these, 83 (79.8%) had a past history of hypertension with a mean systolic and diastolic BP of 153 ± 22.9 and 92.4 ± 12.5 mm Hg. All the 83 patients were under antihypertensive treatment for control of hypertension and yet their BP was 153/ 92 mm Hg. 21(20.19%) patients were diagnosed to have hypertension on admission. Their mean systolic and diastolic BP was found to be 164 ± 37 and 97.6 ± 12.6 mmHg respectively. These patients were prescribed anti hypertensive treatment. The overall mean systolic and diastolic BP of 104 hypertensive patients were 154.33 ± 24.45 and 93.56 ± 12.69 mmHg respectively. The incidence of stroke correlated with elevated systolic and diastolic BP was found to be highly significant. (p value = 0.000).

Diabetes Mellitus

62 patients (51.7%) had a previous history of diabetes mellitus, of which, 35 were males and 27 were females. 32 patients (96.7%) had elevated RBS levels (>140mg/dl) with a mean value of 211.53mg/dl ± 73 mg/dl and 30 patients (77.41%) had elevated FBS levels (>110mg/dl) with a mean value 168.04mg/dl ± 41.5 mg/dl.

Dyslipidemia

49 patients (40.8%) in this study group had dyslipidemia with a distribution of 31 males and 18 females. Lipid profile in these patients were as follows; Cholesterol levels were elevated in 37 patients (75.5%), triglyceride levels in 23 patients (46.9%) and increased LDL levels in

45 patients (91.8%). HDL cholesterol levels were decreased in 17 patients (34.6%).

Past history of Cerebrovascular accident (CVA)

Out of 120 patients, 18 patients (15%) had a prior attack of CVA, of which, 16 were males and 2 were females and this was their second admission to the hospital. 85 % of the patients were diagnosed with first ever stroke.

Smoking and Alcoholism

54 male patients (45%) had a habit of smoking and 16 male patients (13.3%) were alcoholics. Smoking and alcoholism was comparatively higher in patients of younger age groups (< 45 years).

Prior history of cardio vascular disorders

36 patients (30%) had a previous history of cardiovascular disorders of which 26 were males and 10 were females. The incidence of various cardiovascular disorders in stroke patients were as follows: coronary artery disease in 17 patients (14.1%), Left Ventricular Hypertrophy in 11 patients (9.1%), Atrial Fibrillation in 4 patients (3.3%), Rheumatic Heart Disease in 3 patients (2.5%) and Congestive Heart Failure in 1 patient (0.8%).

Overall risk factor profile

In this study, hypertension (86.7%) was the profound causative risk factor for stroke in 104 patients, followed by DM in 62 patients (51.7%), smoking in 54 patients (45%) dyslipidemia in 49 patients (40.8%). The study also revealed the past history of cardio vascular disorders in 36 patients (30%), previous history of CVA in 18 patients (15%) and alcoholism in 16 patients (13.3%). On analysis of risk factors according to the type of stroke, hypertension still remained the most common risk factor for both ischemic and hemorrhagic stroke (Table 2).

The univariate logistic regression analysis and odds ratio (OR) were done to assess the contribution of various risk factors in the incidence of stroke. Advancing age, male gender, systolic BP and diastolic BP (hypertension), smoking and diabetes were significant risk factors for stroke in this study population. Based on odds ratio, hypertension was associated with 8 times risk (OR=8.16) for stroke. Smoking increased the risk of stroke by five fold (OR=4.66). Diabetes mellitus (OR = 1.781), dyslipidemia (OR= 1.610), past history of cardio vascular disorders (OR=1.66) and alcoholism (OR= 1.895) attributed a two fold risk for stroke. Female gender and previous history of CVA were not significant risk factors (Table 3).

Table 1. Age and Gender Distribution

Age in years	No of Patients (n=120)				Total	%
	Male (n=83)		Female(n=37)			
	n	%	n	%		
25-35	4	4.8	3	8.1	7	5.8
35-45	4	4.8	2	5.4	6	5.0
45-55	14	16.9	3	8.1	17	14.2
55-65	21	25.3	7	18.9	28	23.3
65-75	25	30.1	14	37.8	39	32.5
75-85	11	13.3	5	13.5	16	13.3
85-90	4	4.8	3	8.1	7	5.8

Table 2. Risk Factors and Type of Stroke

Risk factor	Ischemic (n = 93)		Hemorrhagic (n = 27)	
	N	%	N	%
Hypertension	78	83.8	26	96.3
Diabetes	51	54.8	11	40.7
Smoking	45	48.4	9	24.3
Dyslipidemia	44	47.3	5	18.5
Past history of Cardiac disorders	30	32.3	6	18.5
Past history of CVA	14	15.05	4	14.8
Alcoholism	14	15.05	2	7.4

Table 3. Univariate Logistic Regression Analysis of Risk Factors

Risk Factors	Odds Ratio	95% Confidence Interval		p value
		Lower	Upper	
Gender	0.240	0.132	0.438	0.000**
Hypertension	8.167	4.265	13.047	0.000**
DM	1.781	1.000	3.172	0.050*
Dyslipidemia	1.610	0.883	2.937	0.120
Alcohol	1.895	0.708	5.072	0.203
Smoking	4.663	2.330	9.331	0.000**
Past history of Cardio vascular disorders	1.666	0.609	4.557	0.320
Past history of CVA	1.019	0.306	3.398	0.976
Age	1.062	1.038	1.087	0.000**
Systolic BP	1.041	1.024	1.059	0.000**
Diastolic BP	1.069	1.036	1.103	0.000**

p value < 0.05 is statistically significant

DISCUSSION

Risk factor for stroke is characteristic of an individual or of a population, associated with an increased risk of disease. Despite significant advances in the understanding of its underlying pathophysiology and the development of more effective methods of the management, stroke continues to be a leading cause of mortality and physical disability world wide.

The basic risk factors for stroke are well known; they include hypertension, diabetes mellitus, and family history of stroke, ethnicity, obesity, and hyperlipidemia. Studies done in developed countries have shown that hypertension is one of the most powerful and prevalent risk factor for "first stroke" and also an independent risk factor for recurrent stroke and stroke after TIA. There is a continuous and linear relationship between blood pressure and risk of stroke[14].

Hypertension was the most common risk factor identified overall and for both types of stroke. About 86% of the study population had elevated systolic and diastolic blood pressures. Studies conducted in India[15] and other parts of the world such as Turkey[16], Israel[17], France[18], Ireland[19] and Nigeria[20] corroborates with our findings. Smoking was found to be the second major risk factor for stroke in this study, followed by diabetes and hyperlipidemia. In a study conducted by Bak, et al in Denmark[21], smoking was found to be a common risk factor, which was followed by hypertension and hyperlipidemia. Diabetes mellitus and history of cardiovascular diseases were less important risk factors in their study. Therefore, prevalence and rates of risk factors differ in different countries. Findings of the present study that, diabetes mellitus, hyperlipidemia and past history of cardio vascular diseases and alcoholism posed a two fold risk for stroke substantiates the report given by Jorgensen et al[22].

Gang Hu, et al have evaluated the joint effects of hypertension of different stages and history of type 2 diabetes on the incidence of stroke and mortality. They concluded that the combination increased the risk of stroke drastically as reported in our study. A study done by Joseph Redon et al reported that stroke risk was greater in hypertensives and concomitant risk factors imply an additional risk and this observation is in concordance with our study.

In our study, familial risk of stroke was not detected. Genetic predisposition did not play a significant role in the study. Most of the patients were in fifth and sixth decade of life with higher male preponderance, which may be due to the protective role of female sex hormones before menopause or that the females tolerate hypertension better than males. Most of the patients had first ever stroke. Adequate hypertension control may

prevent a substantial proportion of first ever stroke among the treated hypertensives.

This study was carried out in 120 patients with completed stroke or CVA and majority of them were males. Most of the patients had hypertension as a risk factor followed by diabetes mellitus, smoking and dyslipidemia. It was also found that advancing age, male gender, alcoholism and diabetes were associated with a high risk for stroke. Smoking and alcoholism were important risk factors observed especially in younger age groups.

Preventive Strategy for Stroke

Hypertension, tobacco smoking and diabetes are growing problems in the developing countries. Our findings suggest that smoking cessation, identification and treatment of elevated blood pressure, dyslipidemia and diabetes are critical measures for preventing stroke in this geographical region. To curb the rising trends of stoke, the principal risk factors hypertension, diabetes mellitus and hyperlipidemia need to be strictly brought under control. Change in dietary habits, complete cessation of smoking and alcohol consumption are mandatory measures to cut down the relative risk for the development of stroke. This will require public awareness campaigns and health education where pharmacist can play a pivotal role. Health screening surveys to identify hypertensives, diabetics and those with history of transient ischemic attacks should be done frequently. Adequate control of hypertension attenuates the risk of stroke in hypertensive diabetic patients.

CONCLUSION

This study reveals hypertension as the most common risk factor for stroke followed by smoking, diabetes and dyslipidemia. Regular and moderate degree of physical activity and tight control of hypertension, dyslipidemia and diabetes prevents a substantial proportion of stroke incidence. Pharmacists in collaboration with other health care professionals may contribute in achieving the above goal by establishing relationships with patients and ensure the appropriateness of dosage regimen, patients understanding of their therapy and the significance of regular and consistent monitoring and control.

REFERENCES

1. Louis R. Caplan. In: Caplan's stroke: A clinical approach, 3rd edition. Boston: Butterworth-Heinemann Publishers; 2000. 494 – 506.
2. Lewis P Rowland. In: Merritt's text book of Neurology, 7th edition. Philadelphia: Lea & Febiger; 1984.145-185.
3. Hatano S. Experience from a multicenter stroke register: A preliminary report. WHO Bull, 1976; 54: 541 – 553.
4. Nagaraja D, Gurumurthy SG, Taly A B, Subbakrishna K, Sridhararama Rao BS. Risk factors for stroke: Relative risk in young and elderly. Neurology India 1998;46:183–184.
5. Per Harmsen, George Lappas. Long term risk factors for stroke. Stroke 2006; 37: 1663–67.
6. Sacco RL. Risk factors, outcomes and stroke subtypes for ischaemic stroke. Neurology 1997; 49(Supplement 4):539–44
7. Tetsuya, Ey al Shahar, Lloyd E, et al. Risk factors for Ischaemic stroke subtype. Stroke 2006;37:2493-98
8. Tentschert S, Greiseneggar S. Association of parental history of stroke with clinical parameters in patients with ischemic stroke or transient ischemic attack stroke or transient ischaemic attack. Stroke 2003;34: 2114.
9. Jose L Ruiz-Sandoval, Samuel Romero. Hypertensive intracrebral haemorrhage in young people. Stroke 2006;37: 2946–50.
10. Bonita R, Scragg R, Stewart A, Jackson R, Beaglehole R. Cigarette smoking and risk of premature stroke in men and women. BMJ 1986; 293: 6-8.
11. Wolf PA, Agostino D. Cigarette smoking as a risk factor for stroke: The Framingham study. JAMA 1988; Feb 19, 259: 1025–29
12. Camargo CA Jr. Case-control and cohort studies of moderate alcohol consumption and stroke. Clin Chim Acta 1996;246:107–119.
13. Shinton R, Sagar G, Beevers G. Body fat and stroke: unmasking the hazards of overweight and obesity. J Epidemiol Community Health 1995; 49: 259-264.
14. Philip A Wolf. Prevention of stroke. Lancet 1998; 352 (suppl III):15-8.
15. Kaul S, Venketswamy P, Meena AK, Sahay R, Murthy JM. Frequency, clinical features and risk factors of lacunar infarction (data from a stroke registry in South India). Neurol India June 2000; 48(2):116-9.
16. Kumral E, Ozkaya B, Sagduyu A, et al. The Ege Stroke Registry: a hospital-based study in Aegean region, Izmir, Turkey. Cerebrovasc Dis 1998; 8:278-88.
17. Bornstein NM, Aronovich BD, Karepov VG, et al. The Tel-Aviv Stroke Registry: the consecutive 3600 patients. Stroke 1996; 27:1770-3.
18. Moulin T, Tatu L, Chavot D, et al. Besancom Stroke Registry: an acute stroke registry of 2,500 consecutive patients. Eur Neuro 1997; 38:10-20
19. McDonnell R, Fan CW, Johnson Z, Crowe M. Prevalence of risk factors for ischaemic stroke and

their treatment among a cohort of stroke patients in Dublin. Ir J Med Sci Oct-Dec 2000; 169:253-7.
20. Amu E, Ogunrin, Olubunmi, Danesi Mustapha. "Re –Appraisal of risk factor for stroke in Nigerian Africans. A prospective case control study". AJNS 2005; Vol 24:2.
21. Bak S, Bak L, Sorense JS. Prevalence of risk factors in cerebral ischemia. Ugeskr Laeger 1995 Jan 23;157: 444-6.
22. Jorgensen HS, Nakayama H, Raaschou HO, Olsen TS. Intracerebral hemorrhage versus infarction: stroke severity, risk factors and prognosis. Ann Neurol 1995; 38:45-50.
23. Gang Hu, Ciniza Sarti et al. The impact of history of hypertension & type 2 diabetes at base line on the incidence of stroke and stroke mortality. Stroke 2005;36: 2538–43
24. Josep Redon, Lius Calvo. Blood pressure and estimated risk of stroke in the elderly population of spain. Stroke 2007; 38: 1167–73.