ISCHEMIC STROKE: PREVALENCE OF MODIFIABLE RISK FACTORS IN MALE AND FEMALE PATIENTS IN PAKISTAN

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ABSTRACT

Stroke is the commonest neurological cause of morbidity and mortality all over the world being the third leading cause of death. Estimation of stroke risks in population is not only helpful for healthcare providers but also important to identify persons at elevated risk and to select proper treatments in clinical trials. The aim of the present study was to identify the prevalence of common modifiable risk factors for ischemic stroke in Pakistan. Patients of either sex above the age of 25 yrs who were admitted to Neurology Ward or came to OPD in Jinnah Post Graduate Medical Centre were included in the study. Type of stroke was identified by brain CT scans or MRI and risk factors for stroke and other details were noted on a proforma. Out of 55 patients studied for present study, 78% were males and 22% were females. Most of them belonged to low socioeconomic status and almost 50% were having family history of stroke. Most of the patients had multiple risk factors which included: hypertension (65%), smoking (32%), diabetes mellitus (36.3%), dyslipidemia (32.7%), coronary artery disease (9%), obesity (18%), epilepsy (16.3%) and left ventricular hypertrophy (3.6%). On the basis of these findings, it can be concluded that hypertension, smoking, dyslipidemia and diabetes mellitus are major risk factors for stroke and might be considered as main targets for primary and secondary prevention of stroke.

Keywords: Ischemic stroke, dyslipidemia, hypertension, obesity, diabetes mellitus, stroke risks.

INTRODUCTION

Stroke is a global health problem. It is the leading cause of adult disability and the second leading cause of mortality worldwide (World Health Report, 2003). Stroke is responsible for three million deaths (and rising) in developing countries (Murray and lopez, 1997) and is a major cause of mortality and morbidity in Asian countries. It is a leading cause of functional impairments, with 20% of survivors requiring institutional care after three months and 15%-30% being permanently disabled (American Heart association, 2003). Compared with the volume of prospective studies in coronary heart disease (CHD), there have been relatively fewer population studies investigating the precursors of stroke. Current treatments for patients with established stroke are relatively ineffective and risk factor interventions are the real hope of reducing stroke morbidity and mortality in populations (Gorelick, 1995; Adams *et al*., 2005). Randomized, controlled intervention studies have demonstrated significant prevention of stroke with management of hypertension (Chobanian *et al*., 2003) or hypercholesterolemia (Collins *et al*., 2004). Certain risk factors have consistently been identified as significant predictors of stroke outcome (mainly fatal stroke): age, hypertension, alcohol intake (inverse prediction), previous stroke, and atrial fibrillation (Shaper *et al*., 1991; Knuiman and Vu, 1996). Other risk factors much less consistently associated with stroke include smoking, diabetes, previous CHD, left ventricular hypertrophy, excessive alcohol intake, and family history of stroke (Shaper *et al*., 1991; Knuiman and Vu, 1996; Rabattu *et al*., 2001; Rodriguez *et al*., 2002). The relationship between serum cholesterol and stroke remains somewhat elusive (Prospective Studies Collaboration, 1995), possibly because of a negative association with hemorrhagic stroke on one hand (Iso *et al*., 1989; Yano *et al*., 1989) and a positive association with ischemic stroke on the other (Iso *et al*., 1989; Knuiman and Vu, 1996). The aim of the present study is to identify the prevalence of common modifiable risk factors (demographic & cardiovascular) for ischemic stroke in Pakistan.

METHODS

All patients of either sex above the age of 25 yrs who were admitted to Neurology ward or came to OPD in Jinnah Post graduate Medical Centre during the period from June 2006 to January 2007 were included in the study. All patients/relatives were explained about the criteria of study and after taking their consent, detail history was collected by the interviewer and physical examination was performed by the attending doctor. CT scans and MRI were the two diagnostic tests used to identify the patients. Patients with tuberculous meningitis, brain tumor, viral or bacterial encephalitis, multiple sclerosis and hemorrhagic stroke were excluded from the study. According to WHO definition, stroke is defined as rapid onset of a neurological deficit attributed to obstruction or rupture in the cerebral arterial system.

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Ischemic stroke was diagnosed when a focal deficit was present and an infarct was found on CT scan or no bleeding was observed in the brain image i.e. patients with clinical features of stroke but normal CT scans (Davis *et al*., 1998). A proforma was designed to record the demographic profile and risk factors in stroke patients. Risk factors included age, sex, body weight, body mass index (BMI), blood pressure measurement, history of smoking, a past history of stroke, family history of stroke and use of antidiabetic, antihypertensive or anti-hyperlipidemic drugs.

Family History: A positive family history of stroke was considered if a patient had first degree relative (parent or sibling) who had had an ischemic stroke (Fiegin *et al*., 1998).

Hypertension: Patients were considered to have hypertension if they either had hypertension and/or were treated for hypertension before stroke. Hypertension was diagnosed with systolic BP ≥ 140mmHg and diastolic BP ≥ 90mmHg (JNC-V, 1993).

Diabetes mellitus: Diabetes mellitus was considered to be present when subjects presented history of diabetes mellitus and/or were on diet/oral hypoglycemic drugs or received insulin treatment or had random blood sugar >200mg% during the hospital stay (Caroline and Mackerback, 1999).

Smoking: A "current smoker" was defined as a person who smoked at least one cigarette per day for the preceding three months or more or had tobacco in any form. "Ex-smoker," a person who smoked at least one cigarette per day for three months or more or had tobacco in any form at some period. "Never smoker," a person who did not meet the criteria for a current smoker or ex-smoker (You *et al*., 1995).

Dyslipidemia: Dyslipidemia was considered, when a patient had a diagnosis of it and/or was on diet or lipid lowering agents or had fasting blood cholesterol >200mg% in the hospital stay.

Obesity: Obesity in stroke patients was defined as BMI ≥ 25 kg/m^2 (Kenchaiah *et al*., 2002).

Data and statistical analysis: Quantitative variables were expressed as mean ± SEM. Qualitative variables were analyzed by finding their frequencies or percentages.

RESULTS

Total of 55 cases of ischemic stroke were included in the study with 78% male and 22% female patients; and male to female ratio of the study was 1.96:1. Mean age was 41. 3 years for all cases, while mean age in males and females was 40.8 and 43.1 years respectively. Most of the patients included in the study belonged to low class socioeconomic status (table 1). 41% of female patients were illiterate but most of male patients were college graduates. 17 (31%) patients out of total 55 were having family of history of stroke (table I). Mean BMI of the study population was 25.57kg/m^2. On the basis of BMI values ≥ 25kg/m^2, 91.6% females and 20.9% males were categorized as obese or overweight (table 3). Mean systolic and diastolic BP in males was 140/87 mmHg and in females was 133/84.9 mmHg. 29% males and 7% female patients were identified with both systolic/diastolic HTN (table 2). Most of the cases had prevalence of more than one risk factor of stroke (table 3). 74% of male patients were current smokers and 11.6% were identified as ex-smokers, no female smoker was found in the study population (table 3). Out of 20 diabetics with stroke (17 males; 3 females), 13 showed hypertension too. 50.9 % of patients in present study had previous history of stroke and this prevalence was same in both male (51%) and female (50%) patients.

DISCUSSION

Stroke is the main cause of adult disability and the third most common cause of mortality in the world. It is known that stroke incidence, prevalence and mortality vary widely in different populations. Studies such as the World Health Organization's MONICA (Monitoring of Trends and Determinants of Cardiovascular Disease) Project have shown that relative to Caucasians, Asians have a higher prevalence of stroke (Thorvaldsen *et al*., 1995). The burden of stroke in Asia is predicted to increase, both in absolute terms and as a proportion of total disease burden, due to rapid population aging and lifestyle changes (Taqui and Kamal, 2007). Present study on Pakistani population showed that prevalence of ischemic stroke was high (54.5%) in low socio economic group, 60% of male patients were from this group, however majority of the female (66%) patients of the study belonged to middle class socio economic status. 67% of male and 58% of female patients were married in our study. Majority of the patients (36%) were college graduates, but most of the female patients (42%) were illiterate.

Many previous studies showed that the risk of stroke doubles for each successive decade after age 55 years (Brown *et al*., 1989; Wolf *et al*., 1992). The cumulative effects of aging on cardiovascular system and the progressive nature of stroke risk factors over a prolonged period of time substantially increase stroke risk. The mean age of acquiring stroke in our study was 41.3 years which was lower than the other studies reported in Pakistan by Akhtar (2001) and much lower than studies in United States (Sacco *et al*., 1998). This difference is possibly because of better awareness and proper control of risk factors in United States or because of shorter life span in Pakistan.

Table 1: Demographic profile of study population

	Stroke Patients		
	Male	Female	Total
Number of subjects (%)	43 (78)	12 (22)	55
Age (range; years)	40.86±1.51 (range=26-60)	43.1 ± 3.29 (range = 29-60)	41.36 ± 1.37 (range = 26-60)
Married	29 (67.4)	7 (58.3)	36 (65.4)
Socioeconomic Status			
Upper	1 (2.3)	0	1(1.8)
Middle	16 (37.2)	8 (66.6)	24(43.6)
Low	26 (60.4)	4 (33.3)	30(54.5)
Educational Status			
Illiterate	3 (6.9)	5 (41.6)	8(14.5)
Primary	12 (27.9)	3 (25)	15(27.2)
Sec	10 (23.2)	2 (16)	12(21.8)
College	18 (41.8)	2 (16)	20(36.3)
Family History of Stroke	13 (30.2)	4 (33.3)	17(31)

Key: Age values are represented as mean ± SEM. Values in parenthesis are percentages. N = 55

Table 2: Cardiovascular profile of stroke patients

	Stroke Patients		
	Male	Females	Total
	n = 43	n =12	n = 55
Body Weight (Kg)	68 ± 1.4	62.5 ± 2.3	66.8 ± 1.24
Height (meters)	1.69 ± 0.005	1.38 ± 0.01	1.62 ± 0.01
BMI (Kg/m^2)	23.5 ± 0.44	32.8 ± 1.2	25.57 ± 0.68
Systolic BP (mmHg)	140.1 ± 1.85	133 ± 4.7	138.6 ± 1.8
Diastolic BP (mmHg)	87.0 ± 1.17	84.9 ± 2.7	86.5 ± 11.09
Systolic HTN ≥140mmHg	29 (67.4)	7 (58.3)	36 (65.4)
Diastolic HTN ≥ 90mmHg	29 (67.4)	7 (58.3)	36 (65.4)

Key: BMI = body mass index; BP = blood pressure; HTN = hypertension.
Data is expressed as Mean ± SEM. Values in parenthesis are percentages.

Hypertension affects at least 65 million persons in the United States and is a major risk factor for both cerebral infarction and intracerebral hemorrhage (Wolf, 1999; Fields *et al*., 2004). The higher the blood pressure, the greater the stroke risk (Lewington *et al*., 2002). Chobanian *et al* (2003) reported that control of high blood pressure contributes to the prevention of stroke as well as to the prevention or reduction of other target organ damage, including congestive heart failure and renal failure. Risk of stroke can be reduced by at least 38% by control of hypertension (MacMahon and Rodgers, 1996). Hypertension as a risk factor was present in 65.4% of our cases which was almost similar to 61% reported by Basharat *et al* (2002), 60% reported by Mehmood (2000) and 62% by Javed *et al* (1998) but less than 72% and 85% reported in United States (Sacco *et al*., 1998) and Russia (Feigin *et al*., 1998) respectively.

The serum cholesterol–stroke association remains an enigma. If low serum cholesterol concentration is associated with an increased risk of hemorrhagic stroke (Iso *et al*., 1989; Yano *et al*., 1989), increased cholesterol is associated with an increased risk of ischemic stroke (Iso *et al*., 1989; Knuiman and Vu, 1996). Studies in men subsequently showed increases in ischemic stroke rates at higher levels of total cholesterol, particularly for levels above 240 to 270 mg/dl (Iso *et al*., 1989; Leppala *et al*., 1999). The Asia Pacific Cohort Studies Collaboration found a 25% increase in ischemic stroke rates for every 1 mmol/L increase in total cholesterol (Zhang *et al*; 2003). Dyslipidemia was present in 32% of our patients which is higher than 11-23% reported in other studies from Pakistan (Ali *et al*., 1997; Mehmood, 2000). Higher prevalence of dyslipidemia in our stroke population could be due to smoking and underlying diabetes.

A growing body of evidence from large scale prospective studies has documented that increased body weight is associated with an increased risk of stroke in a dose response fashion (Kurth *et al*., 2002; Song *et al*., 2004).

Table 3: Frequency of risk factors of ischemic stroke in study population

	Stroke Patients		
	Male n = 43	Female n = 12	Total n = 55
Dyslipidemia	15 (34.8)	3 (25)	18(32.7)
Diabetes mellitus	17 (39.5)	3 (25)	20 (36.3)
Coronary artery disease	4 (9.3)	1(8.3)	5 (9.09)
Previous Stroke	22 (51.1)	6 (50)	28 (50.9)
Epilepsy	7 (16.2)	2 (16.6)	9 (16.3)
Left ventricular hypertrophy	2 (4.65)	0	2 (3.6)
Smoking	32 (74.4)	0	32 (58.1)
Obesity	9(20.9)	11(91.6)	20 (18.1)

Key: Values in parenthesis are percentages.

Some recent studies also showed that obesity and abdominal body fat distribution can be a strong predictor of stroke risk (Suk *et al*., 2003; Isozumi, 2004). In present study 18% cases were categorized as obese with a BMI ≥ 25 kg/m^2 however prevalence of obesity was quit high in females (91%) as compared to male patients (21%) of stroke. Obesity is an important component of metabolic syndrome and is associated with major health risk factors such as diabetes, hypertension and hypercholesterolemia (Mokdad *et al*., 2001; Fontaine *et al*., 2003). Diabetes was a risk factor in 36% of cases in present study which is more than found in other studies in Pakistan (Basharat *et al*., 2002) but less than 41% reported from Saudi Arabia (Awada and Al-Rajeh, 1999).

Cigarette smoking is a potent risk factor for ischemic stroke (Manolio *et al*., 1996; Rodriguez *et al*., 2002). Present study recorded 32% male patients with smoking which is lower than 53% reported by Basharat *et al* (2002) but higher than 24% & 42% reported elsewhere in Pakistan (Javed *et al*., 1998; Mehmood, 2000). Smoking increases stroke risk by producing acute effects on the risk of thrombus generation in narrowed arteries and chronic effects related to an increased burden of atherosclerosis (Burns, 2003). The high frequency of smoking in present study could be due to low socioeconomic status of the patients and they are more likely to be smokers as they adopt it as a leisure activity and are less likely to stop because of lack of proper awareness.

Results of present study were clearly showing that hypertension, dyslipidemia, diabetes mellitus and smoking are the important risk factors of ischemic stroke in Pakistan. Prevalence of stroke is high in poor socioeconomic demographics with single or multiple risk factors and this may be due to lack of proper awareness about these risk factors, non-affordability of medication or proper follow-up.

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