Original article

Risk factors of stroke

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Background: Modifiable risk factors of stroke are presumably poorly controlled in Nepalese population. This hospital-based study aims to assess the prevalence and control of these risk factors in stroke patients admitted to Tribhuvan University Teaching Hospital prior to the occurrence of stroke.

Method: The study was conducted among sixty-one patients admitted in Tribhuvan University Teaching Hospital. History and clinical examination were performed to gather relevant information. Necessary tests were run to confirm the diagnosis of stroke and to identify the presence or absence of risk factors.

Result: Hypertension, physical inactivity and smoking were the most common modifiable risk factors of stroke. Risk factors that could have contributed to the occurrence of the stroke were poorly controlled in these patients. The majority of the patients cited negligence and lack of knowledge for not seeking health care and/or not complying with medical advice.

Conclusion: Risk factors for stroke among patients admitted to Tribhuvan University Teaching Hospital are poorly controlled prior to the occurrence of stroke.

Key words: Stroke, Hypertension, Smoking

Introduction

Stroke remains the leading cause of adult mortality and serious long-term disability in many parts of the world.[1] Albeit no population-based studies seem to have been conducted in Nepal[2], adoption of western lifestyle and an aging population[3] places the Nepalese community at increased risk of stroke. Several risk factors predispose a person to stroke. These risk factors can be broadly divided into modifiable and non-modifiable risk factors. Non-modifiable risk factors include age, sex, race/ethnicity, and family history. Major modifiable risk factors include hypertension, cardiac disease, diabetes, hyperlipidemia, carotid stenosis, cigarette smoking, drinking, and sedentary life style.[4] Prevention of these risk factors remains an important approach to substantially reducing the incidence, recurrence, disability, and mortality of stroke.[4]

This study intends to find out the prevalence of these risk factors among the inpatients of Tribhuvan University Teaching Hospital and the level to which they were controlled prior to the occurrence of stroke.

Materials and Methods

This study was conducted during April 2008 to August 2008 among 61 stroke patients admitted to Tribhuvan University Teaching Hospital. History and clinical examination were performed to gather relevant information. CT scan of brain was done to confirm the diagnosis of stroke. Other necessary tests were run to identify the presence or

absence of risk factors. Hospital records were referred as and when necessary. A semi-structured guideline was used to facilitate collection of information about demography of patients, risk factors of stroke and their control among these patients. Patients were interviewed to assess their knowledge of the disease.

Results

A total of 61 patients were included in the study, of which 32 were males and 29 were females. The mean age of occurrence of stroke was 61 (Table 1). The majority of the patients were either Brahmin (29) or Chhetri (14). 11 patients were Newar, and the remaining seven were from various other castes. Almost all the patients followed Hinduism, except 8 patients who were Buddhist. All the patients were Nepalese.

Table 1: Age distribution of patients

Age(in years)	Number of Patients
<40	3
40-50	7
50-60	14
60-70	17
71 and above	20
Total	**61(100%)**

Ischemic strokes were nearly three times more common than hemorrhagic strokes (Table 2). All but one of the patients presented with a chief complaint of inability to move one side of their body. Only one patient had a chief complaint of inability to move his left lower limb. There were other associated focal neurological deficits in these patients: 19 patients had upper motor neuron facial palsy, 4 patients had aphasia, and one patient had involvement of cranial nerve XII. Altered sensorium was present in 32 patients.

Table 2: Type of stroke

Type of stroke	Number of Patients
Ischemic Stroke	48
Hemorrhagic Stroke	13
Total	**61(100%)**

Four patients had family history of stroke. One patient had previous history of a transient ischemic attack (TIA) whereas four patients had previous history of stroke. The patient with previous history of TIA was found to have carotid artery stenosis. His physician had prescribed several necessary medications for him, but he was taking his medications irregularly. Patients with repeated stroke were found to have presence of rheumatic valvular heart disease, atrial fibrillation, uncontrolled hypertension, smoking, drinking , uncontrolled diabetes, and hyperlipidemia. These patients were not taking their medications regularly and were not doing any regular exercise.

Thirty-five patients smoked whereas 26 patients did not. Twenty-nine patients consumed alcohol whereas 32 patients did not. No patient gave history of taking any illicit drug. Thirty-eight patients were not doing adequate exercise whereas 23 patients claimed to be doing adequate exercise.

Regarding the presence of medical illnesses known to contribute to stroke, 45 patients were found to have hypertension, and 21 patients had diabetes. Serum cholesterol level determinations revealed elevated cholesterol levels in 13 patients. Valvular heart disease was present in 5 patients of which 3 patients had atrial fibrillation. One patient each had heart block, ischemic heart disease, and carotid artery stenosis (Table 3).

Table 3: Modifiable risk factors for stroke

Modifiable risk factors for stroke	Number of Patients
Hypertension	45
Diabetes	21
Hypercholesterolemia	13
Heart diseases	5
Others	3
Total	**87(100%)**

Regarding the past history, only four patients had known history of hypertension in the past. All four were taking antihypertensive medications, but three of them were taking their medications irregularly. Thirty-seven patients had no knowledge about their blood pressure recording in the past (Table 4).

Table 4: Blood pressure level in the past

Blood pressure recording in the past 24 months(in mm Hg)	Number of Patients
e"160/e"100	1
>140/90	3
120-139/80-89	13
<120/80	7
Not known	37
Total	**61(100%)**

Similarly, 24 patients did not know about their blood sugar level in the past, while five patients had history of diabetes (Table 5). Of the latter, three patients were on regular insulin and two patients were on oral hypoglycemics. Their blood glucose, however, was not well controlled.

Table 5: Fasting plasma glucose level in the past

Fasting plasma glucose level in the past(in mmol/L)	Number of Patients
>7	5
5.6 to 6.9	6
<5.6	26
Unknown	24
Total	**61(100%)**

Twenty-eight patients referred to negligence for not seeking health care and/or not complying with medical advice, and 20 patients blamed their lack of adherence to lack of knowledge (Table 6).

Table 6: Most important reason for not being able to control risk factors

Most important reason for not being able to control risk factors	Number of Patients
Negligence	28
Lack of knowledge	20
Financial problems	10
Others	3
Total	**61(100%)**

On assessing the knowledge level of the patients about stroke and prevention and control of its risk factors, 28 patients were found to have poor knowledge level. Twenty-seven patients were deemed to have an acceptable knowledge level (Table 7).

Table 7: Level of knowledge about stroke

Knowledge about stroke	Number of Patients
Good	6
Acceptable	27
Poor	28
Total	**61(100%)**

Discussion

In our study, we found that the mean age of occurrence of stroke was 61, and stroke was more common in males. Previous studies done in Nepal have shown the mean age of occurrence of stroke to be between 58 and 62 years and males to be more commonly affected than females.[2,5-8] Age is indeed the most important risk factor for all stroke types.[9] For each successive ten years after age 55 the stroke rate more than doubles in both men and women. Stroke incidence rates are 1.25 times greater in men than women.[9]

We found that ischemic stroke was three times more common than hemorrhagic stroke. Various studies done previously have shown ischemic stroke to be 1.5 to 3 times more common than hemorrhagic stroke in Nepal.[2,5-8] This is consistent with the fact that ischemic stroke is more common than hemorrhagic stroke.[1] The majority of patients included in our study presented with hemiparesis. Altered sensorium and upper motor neuron facial palsy were the most common associated neurological deficits. These findings are similar to that of previous studies done in Nepal, which showed weakness of limbs, altered sensorium, and slurring of speech to be the most common symptoms.[2,5-8]

Hypertension (74%), physical inactivity (62%) and smoking (57%) were the most common modifiable risk factors among stroke patients in our study, followed by diabetes, hypercholesterolemia, and heart disease. In their study, Pathak V et al has shown smoking (61%) and hypertension (60%) to be the most common risk factors for stroke among patients admitted to Nepal Medical College.[5] Devkota KC et al, in a similar study in Nepal Medical College, has shown similar findings with smoking and hypertension present in 58% and 47% patients, respectively.[6] Naik M et al has shown that smoking and hypertension were present in 41% and 40% of patients, respectively, in a study done in eastern Nepal.[7] Scientific review has shown that hypertension, smoking, and physical inactivity increases the risk of stroke by a relative risk of 25-40%, 25%, and 25%, respectively. Control of hypertension has been shown to reduce the stroke incidence with achievement of 42% relative risk reduction.[4] Data are particularly strong in support of angiotensinogen converting enzyme inhibitors and angiotensinogen II receptor blockers.[1] It has been shown that cigarette smoking causes 10% of occlusive stroke. Relative risk of stroke for current smokers of cigarettes varies from 1.5 to 4 depending upon their age and sex.[1] Renfrew/Paisley in general population[10] and several observational studies[4] have shown a dose-response relationship between cigarette smoking and stroke. Ex-smokers were found to have stroke rates similar to patients who had never smoked.[10] Similarly, physical inactivity has been shown to increase the risk of stroke by a relative risk of 2.7.[4] Sedentary lifestyle is a risk factor for atherosclerosis.[11] Therefore, adequate exercise is likely to have protective effect for ischemic stroke.[12]

Alcohol consumption was seen in a significant proportion of stroke patients, but their exact role in the causation of stroke could not be determined because of difficulty in quantifying the amount of alcohol consumed. A meta-analysis has shown that alcohol consumption of less than 12 g/day (1 drink per day) is significantly associated with a decreased relative risk of total stroke, but alcohol

consumption of more than 60 g/day (5 drinks per day) is significantly associated with an increased relative risk of total stroke. The association between alcohol consumption and relative risk of ischemic stroke is J-shaped with the lowest risk among those consuming less than 12 g/day or 12 to 24 g/day and the highest risk among those consuming more than 60 g/d. Relative risk of hemorrhagic stroke, however, increases linearly with increasing alcohol consumption, and those consuming more than 60 g/day had the highest relative risk.[13]

Diabetic patients are at increased risk for all forms of ischemic stroke and are more likely to have hypertension and hyperlipidemia.[4] Whether or not tight control of blood sugar in patients with diabetes reduces stroke risk is, however, uncertain.[1] Diabetes was seen in 34% patients in our study.

Observational studies suggest that higher total and low-density lipoprotein cholesterol levels are associated with a greater risk of ischemic stroke, while lower cholesterol levels are associated with a greater risk of hemorrhagic stroke. Meta-analysis of randomized trials has found statin therapy to be associated with reduction in the risk of stroke.[4] Our study showed presence of hypercholesterolemia in 21% of our patients.

Five of our patients had heart disease with three patients having atrial fibrillation. Atrial fibrillation is arguably the most important cardiac risk factor for stroke.[14] The risk of stroke in the average patient with nonrheumatic atrial fibrillation is approximately 5% a year, and patients with valvular atrial fibrillation have 17-fold higher risk of acquiring stroke.[4] In our study, rheumatic valvular heart disease was the most common cause of atrial fibrillation, thus, placing patients at very high risk of stroke.

Family history of stroke and previous history of TIA/stroke were present in few patients. Control of risk factors of stroke in patients with previous history of TIA/stroke was found to be poor. Patients were not taking their medications properly and were not following what is ordinarily considered a healthy lifestyle.

A majority of the patients was unaware of the levels of their blood pressure and blood glucose in the past. Hence, their conditions, if any, were not diagnosed. This could have contributed to occurrence of stroke in these patients. A decided majority of the patients cited negligence and lack of knowledge for not seeking health care and not complying with medical advice. The knowledge level of the majority of the patients, indeed, was found to be poor as judged by a series of questions covering several aspects of the disease.

The findings in our study indicate that every physician should try to identify and treat the risk factors for stroke as well as focus on behavioral interventions such as counseling to promote healthy lifestyle and further compliance with medical advice. Such actions obviously require that the physician actually be concerned about the patient and be willing to put forth the effort to counsel and educate the patient—actions that will lead to far better compliance with the advice given. Community programs to detect and manage diseases such as hypertension, which often go unnoticed and untreated, can help reduce some of these risk factors.

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