Research Article

Study of the profile of stroke in a tertiary-care hospital in the sub-Himalayan region in north India

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Abstract

Background: Rapid urbanization of rural areas is predicted to increase the incidence of risk factors for vascular events such as stroke among the ruralites. A different culture, beliefs, terrain, and climatic conditions of Himachal Pradesh may have an impact on the profile of stroke.

Objectives: To study the profile and the various risk factors of stroke in the sub-Himalayan region of north India.

Material and Methods: It was an observational cross-sectional study conducted at the Department of Medicine, R.P. Government Medical College, Kangra, Himachal Pradesh, for a duration of 12 months, from June 2012 to May 2013. Consecutive patients presenting to the hospital with signs and symptoms of stroke were included in the study. Detailed history and clinical examination was carried out in all patients. CT scan, routine blood examination, and lipid profile were evaluated in all patients.

Results: Total number of patients who presented with stroke in a year was 374. It formed 4.0% of the total hospital admissions in medical wards. The mean age of stroke patients was 66.17 ± 12.9 years. Of the total patients, 254 (67.9%) were males and 120 (32%) were females; 127 patients (33.9%) presented between 6 am and 12 pm. The majority of patients presented in winter months, from November to January. Average delay in the presentation to hospital was 29 h. Only 79 (21.1%) patients presented within 3 h. Among the patients, 342 (91.4%) belonged to rural area, 61.4% had an infarct, and 38.6% had intracerebral bleed. The most common symptoms reported were weakness in 276 (73%) followed by speech abnormality in 53%. Hypertension as a risk factor was found in 174 (46.5%); 155 patients (41.4%) were smokers; and diabetes was present in 61 patients (16.4%). Average cholesterol level was 176 ± 54.99 mg/dl, and average triglyceride level was 339 mg/dl.

Conclusions: The major strength in our study was the predominance of rural population. The state has witnessed an increase in the incidence of stroke. Elderly population is predominantly affected. Average delay in presentation was 29 h, which is substantially high. Majority of the events occurred in winter months.

KEY WORDS: Stroke, sub-Himalayan, risk, rural hilly

Introduction

Stroke is one of the leading causes of mortality and morbidity worldwide. Rapid urbanization is predicted to increase the risk factors for vascular diseases such as stroke. Ability to forecast stroke has been challenging, making the detailed study of predisposing factors essential. Prevention still holds the key to reduce the impact of stroke. For planning prevention strategies, reliable information on profile of diseases in defined populations is necessary.

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Himachal Pradesh is a hilly state situated in the northwest of India. It has different culture, beliefs, climatic conditions, and terrain. The only data regarding incidence and pattern of various risk factors of stroke in Himachal Pradesh available are from a study conducted a decade ago. Since then, the state has witnessed rapid urbanization and lifestyle changes.

Dr. Rajendra Prasad Government Medical College (RPGMC) is located in Kangra district of Himachal Pradesh, which caters to approximately 60% of the population of the state. The population served is predominantly rural. The districts and other areas of Himachal Pradesh served by RPGMC are given in Figure 1. The hospital serves inhabited areas ranging from 600–4000 m above sea level.

Figure 1: The black marked area served by RPGMC, Kangra

This study was designed for better understanding in the present scenario of the clinical and risk factor profile of stroke in this hilly, rural area of the state. This will help us in planning the best strategies in terms of prevention and management of stroke.

Material and Methods

Consecutive patients presenting with signs and symptoms of stroke were included in the study. The study was conducted for a duration of 12 months (from June 2012 to May 2013). It was an observational cross-sectional study. The study was conducted at the Department of Medicine, RPGMC, which is a tertiary-care teaching institution. The study was approved by ethics committee of the institution. Those with neurological deficit caused by nonvascular causes were excluded from the study. Stroke occurrences in patients aged up to 45 years were defined as stroke in young.

Consecutive eligible patients of stroke and willing to participate were subjected to evaluation of history and focused examination, including a detailed neurological examination. Demographic profile of the patients, which included age, sex, and place of residence, was recorded. History regarding smoking, diabetes, and hypertension was also elicited. Focused examination was carried out to record blood pressure, heart rate, and waist circumference. Detailed systemic examination was conducted. CT scan was performed in all patients.

Blood sugar (random), ECG, urine routine examination, lipid profile, and renal function test were carried out in all patients; HbA_{1c} was performed if indicated. Special investigation (e.g., echocardiography) was also carried out, if indicated. The biochemical parameters were measured by Erba Mannheim XL-300, a fully automatic analyzer.

Results

A total of 374 consecutive patients with clinical diagnosis of stroke were included in the study. Total number of admissions in medicine ward during the same duration was 9150, which formed 4.0% of stroke patients admitted in medical wards.

Mean age of patients was 66.17 ± 12.9 years. Mean age of men was 66.28 years and of women was 65.95 years; 254 (67.9%) of the total patients were males and 120 (32%) were females. The male/female ratio was 2.1:1. Thirty-one (8.2%) patients were below 45 years of age (stroke in young). Of these, 74% were males and 26% were females.

Time of onset of symptoms of stroke is given in Table 1. The patients predominantly presented in morning hours. The seasonal variation in the onset of stroke is given in Figure 2. Predominantly, patients presented from the month of November to January.

Average delay of presentation to hospital was 29 h; 79 (21.1%) patients presented within 3 h and 172 (45.95%) patients presented within 6 h of the event.

Of the total, only 32 (8.5%) patients belonged to urban area and 342 (91.4%) belonged to rural area.

Symptoms of patients with stroke are depicted in Table 2. The difference in the symptoms of intracranial bleed and infarct is shown in Figure 3.

Of the total, 258 (68.9%) patients were nonvegetarians and 116 (31.09%) were vegetarians. More number of patients consumed animal fat (55.8%) as compared to vegetable fat (44.1%). Rice (67.1%) was more common staple food in their diet as compared to wheat (32.8%).

Table 1: Time of onset of symptoms

Time of onset	Number of patients (%)
12:00 am to 6:00 am	67 (17.9)
6:00 am to 12:00 pm	127 (33.9)
12:00 pm to 6:00 pm	108 (28.8)
6:00 pm to 12:00 am	49 (13.1)

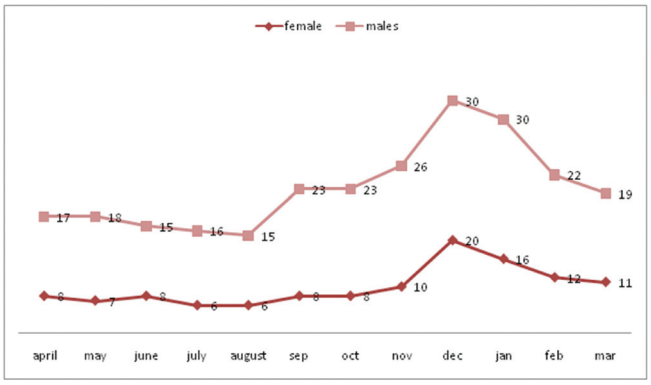

Figure 2: Seasonal variation in onset of stroke

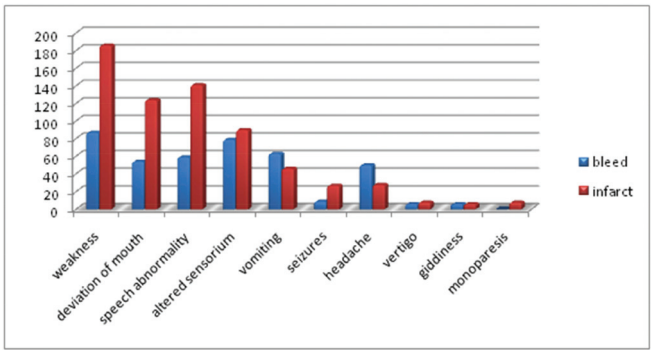

Figure 3: Difference of symptoms between infarct and intracerebral bleed

The risk factors along with difference in the number of infarct and intracerebral bleed is depicted in Table 3.

Average waist circumference was found to be 91.1 ± 10.7 cm. In men, it was 91.1 cm and in women, it was 91.3 cm.

Average random blood glucose at presentation was 208 ± 74.5 mg/dl in patients with diabetes as compared to 140 mg/dl in total patients with stroke. In diabetic patients with stroke, the average fasting blood sugar level was 194.6 mg/dl and average HbA_1c was 11.15%.

Average cholesterol level was 176 ± 54.99 mg/dl. In patients with infarct, it was 178.3 mg/dl and in patients with intracranial bleed, it was 176.5 mg/dl. Of the total patients, 131 (35.0%) had cholesterol level more than 200 mg/dl.

Average low-density lipoprotein cholesterol (LDL-C) level was 108 ± 45.4 mg/dl in all patients. In patients with infarct, it was 111 mg/dl and in patients with intracranial bleed, it was 103 mg/dl. Of the total patients, 119 (31.8%) had LDL-C levels more than130 mg/dl.

Average high-density lipoprotein (HDL) level was 54 ± 20.9 mg/dl. Of these, patients with infarct had average of 52.9 mg/dl and those with intracranial bleed had average levels of 57.5 mg/dl. Of the total, 109 patients (29.1%) had HDL-C levels less than 40 mg/dl.

Table 2: Distribution of symptoms in stroke patients

Symptoms	Number (%)
Weakness	276 (73)
Mouth deviation	178 (47.5)
Speech abnormality	200 (53)
Altered sensorium	177 (47.3)
Headache	86 (22.9)
Vomiting	121 (32.3)
Seizures	36 (9.6)
Vertigo	14 (0.03)
Giddiness	12 (0.03)
Monoparesis	8 (0.02)

Average triglyceride level was 339 mg/dl. The patients with infarct had an average level of 350 mg/dl and the patients of intracranial bleed had an average level of 324 mg/dl. A total of 260 (69.5%) patients had triglycerides more than 150 mg/dl. Dyslipidemia seen in patients with infarct and intracerebral hemorrhage is shown in Table 4.

Of the total patients, 160 (47%) had lesions on the left side and 178 (53%) had lesions on the right side. Fourteen patients had bilateral lesions. Total 307 (82%) patients had anterior circulation stroke and 67 (18%) had posterior circulation stroke. The lobes involved are shown in Table 5.

Table 3: Distribution of risk factors between infarct and intracranial bleed

Risk factor	Infarct (Total 230)	ICB (Total 144)
Hypertension	109 (47.3%)	65 (45.1%)
Diabetes	53 (23%)	8 (5.5%)
Smoking	95 (41.3%)	60 (41.6%)
IHD	22 (9.5%)	0
RHD	10 (4.3%)	0
AF	19 (8.2%)	0
Prior stroke	29 (12.6%)	8 (5.5%)
Drugs	4 (1.7%)	0

AF, atrial fibrillation; ICB, intracerebral bleed; IHD, ischemic heart disease; RHD, rheumatic heart disease

Table 4: Dyslipidemia in patients of stroke

Lipids abnormality	ICB, *n* (%)	Infarct, *n* (%)
Raised cholesterol	40 (27.7)	91 (39.5)
Raised triglycerides	80 (55.5)	180 (78.2)
Raised LDL-C	38 (26.3)	81 (35.2)
Low HDL-C	28 (19.4)	81 (35.2)

ICB, intracerebral bleed; LDL, low-density lipoprotein; HDL, high-density lipoprotein

Table 5: Site of lesion in various types of stroke

	Infarct, *n* (%)	ICB, *n* (%)
Parietal	140 (60.1)	53 (36.8)
Frontal	86 (37.3)	19 (13.1)
Temporal	88 (38.2)	77 (53.4)
Occipital	67 (29.1)	28 (19.4)
Cerebellum	10 (4)	6 (4)

ICB, intracerebral bleed

Discussion

In this study, stroke patients formed 4.0% of all the patients admitted to medical wards. According to Dhamija and Dhamija,[2] cases of stroke account for 0.9%–4.5% of total medical admissions. According to Dalal,[5] it forms 1.5% of all admissions to hospital and 4.5% of all medical admissions. Another study from Himachal, which was undertaken a decade ago by Mahajan *et al*.,[1] reported stroke to be the cause of 3.3% of all admissions in medical wards. Hence, the incidence of stroke in hospital admissions is at par with that reported in the studies from other parts of India but is higher than that in the study conducted earlier in Himachal.[1]

In this study, 230 (64%) patients had an infarct as compared to 131 (35%) patients who had intracerebral hemorrhage. Sridharan[3] reported that 83.6% patients had an infarct and 11.6% had intracerebral hemorrhage. Hence, our study showed increased incidence of intracerebral bleeding as compared to other studies but is at par with earlier study from Himachal Pradesh.

This study showed predominance of anterior circulation stroke, which is also observed in earlier study from Himachal Pradesh.

Incidence of stroke increased with age. Maximum patients were in the age group of 60–80 years (54.4%). Stroke in young (i.e., $<$45 years old) included only 31 patients (8.2%). Average age at presentation was 66.3 years. In a study conducted by Sridharan[3], the median age of stroke patients was 67 years. Stroke in young patients was seen in only 18 (3.8%) patients in this population-based study. The mean onset of stroke for men in India ranges from 63 to 65 years and 57–68 years for women.[5,3,6] The mean age of presentation in this study is more than the average age reported in an earlier study.[1] Twenty-five percent of cases were seen in 70–80 years age group as compared to 15% in the earlier study.[1] Hence, there is an increase in the age of presentation of stroke in the state.

There was male preponderance in the study with 68% men and 32% women. Male/female ratio was 2.1:1. In India, men are more likely to have a stroke than women.[7] This is in accordance with the findings of the study by Mahajan *et al*.[1]

Our study frequently showed the time of presentation to be between 6 am and 12 pm. The incidence of stroke for both ischemic and hemorrhagic strokes has been shown to be more during the hours between 8 am and 12 noon.[8] A study conducted in Chandigarh showed that the maximum events occurring between 4 am and 8 am, and 12 noon and 4 pm. Minimum events were seen between 12 midnight and 4 am.[9] Hence maximum number of patients presented in the morning hours.

Average delay in hours of presentation to hospital was 29 h in our study, which is substantially high. A study from south India reported that 30% of stroke patients reached the hospital within 3 h.[10] In a study carried out by Srivastava and Prasad,[11] the average delay in admission was 7.6 h, and only 25% reached the hospital within 3 h. A higher delay in our study could be due to different beliefs in alternative medicine, unrecognized symptoms, difficult terrain, climatic conditions, and unavailability of transportation. This issue needs to be addressed in further studies.

Majority of patients presented in winter months ranging from November to February. The climatic conditions and transportation are more difficult in winter months, which may further add to the delay in presentation.

The predominance of rural, economically poor population may have an impact on the use of thrombolytic therapy because of cost concerns.

Weakness was the most common symptom followed by speech impairment, and deviation of face. Presentation other than these symptoms may not be recognized as stroke and cause delay in treatment. The symptoms were at par with the observations of other studies from India[12] and an earlier study from Shimla.[1]

Of the total patients, 175 (46.7%) were with hypertension. Razdan *et al*.[13] conducted a study in south Kashmir and found hypertension to be present in 58.24% of the cases. In a study conducted by Mahajan *et al*[1] in Himachal Pradesh, hypertension was present in 62% and was a most significant risk factor. So, our study showed statistically, a significantly lower incidence of hypertension amongst stroke patients as compared to study done by Mahajan *et al*.[1]

61 patients were known cases of diabetes which formed 16.3% of the total patients of stroke. Among these, 53 (86.8%) patients had infarct and 8 (13.1%) had intracranial bleed. At a stroke unit in Vijaya Hospital, Chennai, diabetes mellitus was seen in 8% of the patients.[14] In a study conducted by Mahajan *et al*,[1] diabetes was found to be present in 9% of the total patients. Diabetes mellitus has also been seen in higher percentage of patients in our study.

Of the total patients, 159 (42.5%) were smokers. In a study conducted by Mahajan *et al*.[1], 60% patients had smoking as a risk factor. In a study conducted in Kashmir, of the total patients with stroke, 70.3% were smokers.[13] Hence, the incidence of smoking was seen to be statistically lower in our study (p = 0) as compared to the other study from the hill state.[1]

Total 19 (5%) patients had a history of atrial fibrillation and all of these were having infarct on CT. Out of total, 10 (2.6%) patients had rheumatic heart disease and all of these had infarct. In an earlier study conducted by Mahajan *et al*.[1], 6% patients had rheumatic heart disease. Hence, rheumatic heart disease as a risk factor is less commonly seen in our

study (p = 0.05) as compared to the earlier study from Shimla. This may be because of a decline in the incidence of rheumatic heart disease in the present scenario. In this study, dyslipidemia with increased levels of triglycerides formed a significant risk factor for stroke.

Conclusion

The state has witnessed significant changes in the lifestyle of the population during the past decade. The incidence of stroke as part of total hospital medical admissions has increased to 4%, and the number of patients presented in a year has also risen. This should alert the policy-makers and also primary physicians regarding the prevention of stroke. The age of presentation has also risen from the mean of 57.88 years to 66.17 years. Hence, the patient education, awareness, and prevention programs should predominantly target the elderly population. In both the studies, it was found that men were predominantly affected. The time of onset of stroke was more often seen to be in morning hours, which gives an opportunity for the attendants to recognize the symptoms and present the patients early to the hospital. The delay in presentation is substantially high (i.e., 29 h) in our study and needs to be addressed. Majority of the cases occurred in winter months, which further emphasizes the importance of providing specialized logistic support during these months of difficult weather conditions. Hypertension, smoking, and diabetes were the important risk factor associated with stroke in this study. Intervention regarding these factors needs to be undertaken. As majority of the patients in this study were of rural background with poor socioeconomic status, it will have an impact on the management of ischemic stroke with costly thrombolytic therapy. Hence, government funded programs needs to be implemented for effective management of ischemic stroke.

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