Incidence and Risk Factors of Stroke: A Hospital Based Study in Jammu Province of J & K, India

Rayaz Jan MD1,*, Davinder Singh Jamwal MD2, Rajiv Kumar Gupta MD3, Parveen Singh4

1Senior Resident, PG Department of Community Medicine, Govt. Medical College, Jammu 180001, India
2Professor and Head, Chintpurni Medical College, Punjab 145001, India
3Associate Professor, PG Department of Community Medicine, Govt. Medical College, Jammu 180001, India
4Post Graduate, Scholar, PG Department of Community Medicine, Govt. Medical College, Jammu 180001, India

Abstract  Background: Stroke previously thought to be a major public health problem in developed nations is showing an alarming upward trend in developing countries also. WHO projects that burden of disease, in case of stroke would predominantly be in developing nations over the next two-three decades. Not much work has been done in this region of North India on stroke, so a hospital based study was planned to know the incidence and risk factors associated with the disease in Jammu region of J & K State, India. Materials and Methods: A study of all the indoor hospitalized cases of newly diagnosed acute stroke was conducted in the neurology and general medicine wards of Government medical college Hospital (GMCH) Jammu for the period of one year w.e.f November 1st 2010 to October 31st 2011. The relevant information was collected by using the predesigned and pretested questionnaire during the study period. The data was collected, collated and interpreted using appropriate stastical tests. Results: The incidence of first ever stroke cases was estimated to be 0.55% (209/37530) i.e. 209 cases of first ever stroke among total admissions of 37530. This incidence was 1.25% (209/16645) when denominator was used for admissions specific to indoor general medicine patients. The incidence worked out to be 49.76% (209/420) when denominator was used for neurology specific indoor patients. Incidence was found to be more in people aged >50 years of age group. Out of various risk factors studied hypertension was found to be the most commonly associated risk factor. Conclusion: The study shows incidence is more in the population of >50 years of age group and hypertension is the leading risk factor associated with the disease.

Keywords  Stroke, Incidence, Risk factors

1. Introduction

Stroke has been defined as rapidly developing clinical symptoms and signs of focal or at times global loss of cerebral function with symptoms lasting more than 24 hours or leading to death with no apparent reason, other than that of vascular origin. [1]

Stroke is a major cause of morbidity and mortality worldwide and poses serious medical, socio-economic and rehabilitation problems. The tragedy of stroke lies in the fact that it does not always kills rapidly. Studies on stroke epidemiology about incidence, prevalence and case fatality have mostly been conducted among the developed countries. Because of the increase in prevalence of hypertension, changing life styles and demographic shift caused by increasing life expectancy which has resulted in increase in elderly population in India, more and more people are at risk of stroke [2]. In India the incidence of stroke is 200/lac population and nearly 2% of all hospitals cases, 4.5% of medical and 20% of neurological admissions in India are due to stroke [3]. WHO estimates suggest that by 2050, 80% stroke cases in the world would occur in low & middle income countries with India & China bearing the major burden. Stroke is the 3rd common cause of mortality after heart disease and cancer in the USA and is responsible for neurological disability as well. [4] WHO estimate for year 2020 predicts that stroke will be second cause of death after ischemic heart disease, both in developing and developed countries. [5] Annually, fifteen million people worldwide suffer from stroke. Of these, five million die and another five million are left permanently disabled, placing a burden on family and community. [6] The current hospital based study was conducted in the Government Medical College Hospital Jammu. Limited published data is available regarding the incidence and risk factors of the stroke in this part of the India. So it was in this context that a study was planned with the aim to find the incidence among the hospitalized patients who suffered a first ever acute stroke in Government medical college Hospital Jammu and to find out the association of following risk factors with acute stroke like Age, Sex, Socio-economic status, Hypertension, diabetes and physical
activity.

2. Materials and Methods

The study of all the newly diagnosed hospitalized cases of acute stroke was conducted in the Neurology & general medicine wards of Government Medical College Hospital, Jammu for the period of one year w.e.f November 1, 2010 to October 31, 2011.

Jammu & Kashmir state is known as crown of India and is located in the Sub-Himalayan mountains. It shares a border with the states of Himachal Pradesh and Punjab to the south and as an international border with China in the north and east, whereas the line of control separates it from Pakistan-controlled territories of Azad Kashmir and Gilgit-Baltistan in the west and northwest respectively as shown in Fig 1. The state of Jammu and Kashmir consists of three regions: Jammu, Kashmir valley and Ladakh. Jammu is the winter capital of the state and GMCH is the tertiary care hospital located in the heart of Jammu city. Total population of Jammu Province is approximately 53, 50, 811 (census 2011) [7] distributed among 10 districts. It is expected that majority of the cases of acute stroke are referred or come on their own to avail the treatment facilities at this hospital.

Permission from the ethical committee of the Govt. medical college, Jammu was sought before conducting the study. The patient or his/her relatives were explained the purpose of the study before he or she was administered the questionnaires.

On a daily basis, the researcher visited emergency department of Govt. Medical College and Hospital, Jammu & enquired about, if any case of acute stroke had been admitted on the previous day or is currently admitted in the emergency ward, as all the cases of acute stroke are referred to the emergency ward of the GMC Hospital. If there was a new acute stroke case admitted then researcher would record his/her full name, age, sex, address & phone number, if available. After initial work-up, the patient is routinely shifted to the medical ward. After 2-3 days of stabilization of the patient in the ward, the researcher would record the required information & in case the patient in the ward was still found in unstable condition, then researcher would visit after he/she stabilizes. In case the patient was not able to give information him/herself, then the information was extracted from the close relative of the patient. The relevant information was collected by using the predesigned & pretested questionnaire.

All the relevant information regarding age, sex, place of residence, family composition & socio-economic status (“Modified Uday Pareek Scale” for rural patients & “Kappuswamy’s Scales” for urban patients) and life style factors including smoking, alcoholism & physical activity was elicited.

Each patient was asked about his/her physical activity & was categorized into sedentary worker, moderate worker, heavy worker, as per recommendations of WHO expert Committee [8]. It recommends professionals like doctors, lawyers, teachers, architects, etc to be placed in “sedentary category” and person in light industry, students, building workers (excluding heavy labourers) farm workers, soldiers not in active service etc to be placed in “moderate category”. Similarly agricultural workers, unskilled labourers, rickshaw pullers etc were placed in “heavy category”.

Further, history was taken regarding previous ailments that is the presence of hypertension, diabetes, previous history of stroke and if any of these was present then details regarding the onset of disease, treatment status etc. were recorded. As per WHO classification, blood pressure levels of ≥ 140/90 mmHg were taken to qualify as hypertensive. The systolic and diastolic pressure were measured at least three times over a period of at least 3 minutes and the lowest reading recorded. [9] Similarly the person was diagnosed as diabetic in accordance with WHO criterion for fasting blood glucose level (≥ 126) [10]

All the patients were examined clinically which included general physical examination & systemic examination besides laboratory investigations & radiological investigations.

Height & Weight of all the subjects were taken, (height was taken in cms & weight in kilograms) with standardized steel measuring tape & weighing machine respectively.

After general physical examination, further each hospitalized patient of first ever acute stroke was examined systematically, i.e. respiratory System, CVS, CNS and per abdomen. All relevant investigations conducted in the ward were recorded.

The information & data thus collected was compiled & analyzed using standard appropriate statistical methods.

3. Results

The incidence of first ever stroke cases was estimated to be 0.55% (209/37530) i.e. 209 cases of first ever Stroke among total admissions of 37530. This incidence was 1.25% (209/16645) when denominator was used for admissions specific to indoor general medicine patients. The incidence worked out to be 49.76% (209/420) when denominator was used for neurology indoor admissions.

4. Discussion

In the current hospital based study of stroke, authors found an incidence of 0.55%. Regarding indoor patients, 1.25% of the total admissions to general medicine and 49.76% of admissions to neurology ward were stroke specific. In the current study, age group of >50 years was the worst sufferer and hypertension was found to be the predominant risk factor. A population based study by Subhash K (2007) [11] reported that incidence of stroke has increased from 13/lac/year (1968-71) to about 105/lac/year.

The results found in the current study were corroborated by various other authors like Siddique AN (2009) [12],

Diaz-Guzman J et al (2012) [16] in their study in Spain reported that incidence of stroke and transient ischemic attack was moderate when compared to other western and European countries, thus reflecting that stroke is a major public health problem in the developed world.

Our results are in contrast to study conducted by Dalal P.N (1982) [3] in which stroke patients were 2% of all hospital cases, 4.5% of medical and 20% of neurological admissions.

The incidence in our study was more in the age group > 50 years i.e. 77.52% (162/209) population as compared to age group < 50 years i.e. 22.48% (47/209). This shows that as the age increases the risk of suffering from stroke also increases. Similar results were reported by Siddique AN (2009) [12] where in stroke was the most common in 51-60 years age group. But contrasting results were reported by Sethi P.K. (2002) [17] in his study where stroke prevalence was more in < 40 years age group.

In the present study, patients from rural areas slightly outnumbered urban patients. Similar distribution was reported by Siddique AN (2009) [12], which shows that occurrence of non-communicable disease is not only limited to urban areas but also shifting towards rural areas. The likely reason for this distribution may be that urban people with high socio-economic status may prefer to go to private hospitals because of usual perception that health care is not better in govt. hospitals. Most of the patients in the current study from both rural and urban areas belonged to upper and middle socio-economic status. This shows that stroke, a type of non-communicable disease tends to occur in well to do families. It is well known fact that people from high socioeconomic status tend to have sedentary life style and hence are at greater risk of developing lifestyle diseases.

In the current study sedentary life style, which is a known risk factor for stroke, was also found to be more prevalent in the stroke cases i.e. 65.56% (137/209). This shows that patients who were more active had less risk of stroke. This is in accordance with the findings of study conducted by Fernando R A (1997) [18] on sedentary life style and risk of stroke. Investigators also found that prevalence of sedentary lifestyle differed in both sexes. It was more in females 86.31% (82/95) as against only 48.24% (55/114) in males.

Of the various risk factors studied, hypertension was found to be the leading risk factor associated with stroke incidence. In the present study a high percentage that is 80.87% (169/209) study subjects were found to be hypertensive. Regarding sexwise distribution of hypertension as co-morbid condition to stroke, more males 82.45% (94/114) then females 78.94% (75/95) were found to be suffering from hypertension. Out of total hypertensive stroke cases, 13.15% (15/114) of males and 7.3% (7/95) of females were newly diagnosed cases of hypertension. This is reported in number of other studies also including one done by Banargee et al (2006) [19]. In a study done by Dhamija R K et al (2000) [14] it was seen that hypertension is associated with 34% of case of stroke. Framingham heart study and various other studies which includes national studies like Bhattacharya (2005) [20], Nayak et al (1997) [13], Bhuvanshwari K et al (1994) [21] and international studies like Khan H et al (2006) [22], Roger X (1997) [23], WHO MONICA Project (1997) [24], report increased risk of stroke in hypertensive subjects.

Hypertension was more common in cases > 50 years of age. However there was a difference in age distribution of cases among males and females. As the age group increased chances of having both hypertension and stroke separately and together also increased.

Diabetes is another important risk factor associated with stroke. In the present study only 21.05% (44/209) of study subjects were diabetic. While majority i.e.78.95% (165/209) were non-diabetic. There was a difference in sex wise distribution of diabetic status. Proportion of females having diabetes was more i.e. 30.05% (29/95) than males 13.15% (15/114). Framingham and other studies like Dhamija R K (2000) [14], Khan F Y (2008) [25], Henning Mast (1995) [26], Craig J (1997) [27] reported diabetes and hypertension together a major risk factor for stroke incidence.

In the current study, 8.77% (10/114) of males and 15.78% (15/95) of females were found to be suffering from both the co-morbid conditions that is hypertension and diabetes. Similar results were also found in study by Roger X et al (1997). [23]

5. Summary and Conclusions

As seen from many population based studies the prevalence of stroke has been increasing so is the prevalence of many risk factors for stroke. Hypertension was found to be the most important risk factor associated with stroke. Previous experience showed that effective treatment of hypertension had decreased incidence of stroke. Other risk factors like age, sex, socioeconomic status, physical activity were positively associated with occurrence of stroke. However diabetes was found to be less prevalent in stroke cases.

This calls for the strengthening of undergoing National Programme for Prevention and Control of Diabetes, Cardiovascular disease and Stroke, which highlights the importance of control for various disease causing risk factors, so that stroke incidence which is one of the major morbidity and mortality causing non-communicable disease can be curtailed (cut down) to a greater extent.

Limitations

In Jammu division of J & K state there is only one tertiary care institute, therefore many of the acute stroke case from faraway places may not reach hospital early. Also some of patients from Jammu and adjoining districts may have opted for private hospitals or gone out of Jammu and Kashmir State for specialized treatment. This may have reduced the number of stroke patients captured by our study, thus reflecting a
lower incidence of the disease in the studied population. However, it is expected that these figures will show an upward trend due to progressively aging populations.

Appendix

![Political Map of India](image)

**Figure 1.** Political Map of India Showing various states and boundaries with neighboring countries. (G-B Gilgit-Baltistan, POK Pakistan occupied Kashmir, J & K Jammu & Kashmir, H P Himachal Pradesh)

**Table 1.** Hospital based incidence of first ever acute stroke cases in study population in Jammu province

<table>
<thead>
<tr>
<th>S. No</th>
<th>Total Admissions (A)</th>
<th>Total Stroke (B)</th>
<th>Incidence (A/B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hospital (General Medicine, Surgery, Orthopedics, Ophthalmology) 37530</td>
<td>209</td>
<td>0.55%</td>
</tr>
<tr>
<td>2</td>
<td>General Medicine 16645</td>
<td>209</td>
<td>1.25%</td>
</tr>
<tr>
<td>3</td>
<td>Neurology 420</td>
<td>209</td>
<td>49.76%</td>
</tr>
</tbody>
</table>

The incidence of first ever stroke cases was estimated to be 0.55% (209/37530) i.e. 209 cases of first ever Stroke among total admissions of 37530. This incidence was 1.25% (209/16645) when denominator was used for admissions specific to indoor general medicine patients. The incidence worked out to be 49.76% (209/420) when denominator was used for neurology specific indoor patients.

The current study showed that incidence of stroke is more in males that is 54.54% (114/209) Vs 45.45% (95/209) females (figure.2).
A total of 58.37% (122/209) cases in the studied subjects belonged to rural areas. They were further categorized on the basis of Modified Uday Pareek scale into different socio-economic status groups (Figure 3).

41.62% (87/209) cases during the course of study were found to be residing in urban areas. On the basis of Kuppuswamy scale, it was seen that majority of these cases that is 85.05% (74/87) are rich belonging to upper, upper-middle and lower middle class, where as only 14.94% (13/87) are poor belonging to upper lower and none of the cases from lower socio economic class. The results reveal that people belonging to upper strata of society are more likely to be afflicted with the disease.
Table 2. Distribution of first ever stroke cases on the basis of their physical activity

<table>
<thead>
<tr>
<th>Physical activity</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary category</td>
<td>55 (48.24)</td>
<td>82 (66.31)</td>
<td>137 (65.56)</td>
</tr>
<tr>
<td>Moderate category</td>
<td>31 (27.19)</td>
<td>12 (12.64)</td>
<td>43 (20.58)</td>
</tr>
<tr>
<td>Heavy Category</td>
<td>28 (24.57)</td>
<td>1 (0.95)</td>
<td>29 (13.86)</td>
</tr>
<tr>
<td>Total</td>
<td>114 (100)</td>
<td>95 (100)</td>
<td>209 (100)</td>
</tr>
</tbody>
</table>

*Classified according to WHO expert committee

Majority that is 65.56% (137/209) stroke cases belonged to sedentary category on the basis of their physical activity, moderate and heavy category comprised 20.56% (43/209) and 13.86% (29/209) respectively of the studied subjects. These findings imply that persons leading an active life style were less prone to the disease.

Table 3. Distribution of first ever stroke cases on the basis of sex and blood pressure status

<table>
<thead>
<tr>
<th>Blood pressure status</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertensive</td>
<td>94 (82.45)</td>
<td>75 (78.95)</td>
<td>169 (80.87)</td>
</tr>
<tr>
<td>Non-Hypertensive</td>
<td>20 (17.55)</td>
<td>20 (21.05)</td>
<td>40 (19.13)</td>
</tr>
<tr>
<td>Total</td>
<td>114 (100)</td>
<td>95 (100)</td>
<td>209 (100)</td>
</tr>
</tbody>
</table>

In the current study it was found that hypertension was a major risk factor for stroke 80.87% (169/209) cases had history of hypertension. Out of 169 hypertensive cases, 82.45% (94/169) were males and rest were female patients that is 78.95% (75/169).

Table 4. Distribution of first ever stroke cases according to diabetes status of the study subjects

<table>
<thead>
<tr>
<th>Diabetes status</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic</td>
<td>15 (13.15)</td>
<td>29 (30.53)</td>
<td>44 (21.05)</td>
</tr>
<tr>
<td>Non-Diabetic</td>
<td>99 (86.85)</td>
<td>66 (69.47)</td>
<td>165 (78.95)</td>
</tr>
<tr>
<td>Total</td>
<td>114 (100)</td>
<td>95 (100)</td>
<td>209 (100)</td>
</tr>
</tbody>
</table>

It was found that majority of the acute stroke cases were non-diabetic that is 78.95% (165/209) and only 21.05% (44/209) were diabetic.

Table 5. Age wise distribution of first ever cases of stroke

<table>
<thead>
<tr>
<th>Age group in years</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50 years</td>
<td>18 (15.79)</td>
<td>29 (30.52)</td>
<td>47 (22.48)</td>
</tr>
<tr>
<td>&gt;50 years</td>
<td>96 (84.21)</td>
<td>66 (69.48)</td>
<td>162 (77.52)</td>
</tr>
<tr>
<td>Total</td>
<td>114 (100)</td>
<td>95 (100)</td>
<td>209 (100)</td>
</tr>
</tbody>
</table>

There are 209 first ever cases of acute stroke, as seen in the table 5 above comprising of 114 males and 95 females. Majority of them were > 50 years of age group i.e. 77.52% (162/209) and 22.48% (47/209) were < 50 years of age group.

REFERENCES

Incidence and Risk Factors of Stroke: A Hospital Based Study in Jammu Province of J & K, India


