International Journal of Advances in Medicine
*Kumar RB et al. Int J Adv Med. 2018 Aug;5(4):1036-1040*
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: http://dx.doi.org/10.18203/2349-3933.ijam20183143

**Original Research Article**

# Risk factor analysis among patients with stroke: a cross sectional study at a tertiary care hospital

**Rajiv Kumar B.[1], U. Kishan[2]*, Arun Kumar N.[3]**

[1]Department of General Medicine, ESIC Medical College, Sanath Nagar, Hyderabad, Telangana, India
[2]Department of General Medicine, Malla Reddy Institute of Medical Sciences, Suraram, Hyderabad, Telangana, India
[3]IMO Grade-I, ESIC Medical College, Sanath Nagar, Hyderabad, Telangana, India

**Received:** 31 May 2018
**Accepted:** 28 June 2018

***Correspondence:**
Dr. U. Kishan,
E-mail: drkishanmdgenmed@gmail.com



ABSTRACT

**Background:** Study of risk factors of stroke is very important in different settings to confirm their existence and to take necessary steps to prevent them especially in elderly so that incidence of stroke can be brought down. The objective of the present study is to perform the risk factor analysis among patients with stroke.
**Methods:** A hospital based cross sectional study was carried out at a tertiary care hospital from June 2015 to March 2016. A total of 40 patients diagnosed with stroke were included in the present study. Detailed information and all necessary investigations were carried out. Risk factor analysis was done, and categorization was done for certain risk factors.
**Results:** The predominant age group was 6-60 years. The age ranged from 1 month to 67 years. The Male: Female ratio was 14:9. The common etiologies were congenital, post infective and intracranial bleed in 26.1% (n=6) each. Favourable outcome was seen in 82.6% of cases. The failure rate was 17.4%. Most no of cases with favourable outcome was seen in 6-60 years age group, whereas >60 years age group had the most no of cases with poor outcome. The overall mortality rate was 21.6% (n=5). Wound related complication was seen in 1 patient (4.3%). Two (8.7%) patients required VP shunt post ETV. The cause of mortality was aspiration pneumonitis in 3 cases, CSF metastasis and wound infection in 1 cases each.
**Conclusions:** The leading cause as well as risk factor for stroke was found to be hypertension followed by alcohol and smoking.

**Keywords:** Alcohol, Hypertension, Risk factors, Stroke, Smoking

## INTRODUCTION

Globally the prevalence of stroke has been estimated at 1.8 million as per the reports published by the "American Heart Association." This number is 50% of that of the figures of coronary heart disease. Equal number of cases of rheumatic heart diseases is also estimated.[1] The chance that an elderly person over the age of 70 years will suffer from stroke is estimated as one case of stroke for every 20 persons over the age of 70 years. This data was derived from the famous Framingham study.[2] Among all cases of the stroke, around 50% are due to thrombotic episodes, stroke caused due to embolic episodes are around 30% and some 10-15% are attributed to the hemorrhage in the cerebrum.[3] There is paucity of data regarding incidence of stroke in India. This may be due to the lack of nationwide representative sample. Most studies originating from India are hospital-based studies where the results cannot be generalized on large population on national level. But one population-based study carried out in Vellore states that of the total admissions in the hospital, stroke was responsible for 0.9-

4.5% of all hospital admissions. The study also found that stroke due to thrombotic or embolic episodes together constituted 57.3-82.7% of the stroke total cases whereas hemorrhage in the cerebrum was responsible for 13.6-17.9% of all the stroke cases.[4] One more study from Rohtak reported that the yearly incidence of stroke was 33 per one lakh population.[5] There are many risk factors for the stroke, but the most common risk factor was hypertension as evidenced from many decades.[6]

Recently there has been much work done on the identification of risk factors of stroke and it has been found that apart from hypertension, smoking, alcohol, increasing age, race etc are important predictors of stroke.[7] In view of the above present study was planned to study the risk factors of stroke. Study of risk factors of stroke is very important in different settings to confirm their existence and to take necessary steps to prevent them especially in elderly so that incidence of stroke can be brought down.

## METHODS

A hospital based cross sectional study was carried out at a tertiary care hospital from June 2015 to March 2016. A total of 40 patients diagnosed with stroke were included in the present study. Detailed information and all necessary investigations were carried out. Risk factor analysis was done, and categorization was done for certain risk factors.

Institutional Ethics Committee permission was taken, and informed consent was obtained from the patients included in the present study. Risk factor data was collected in person either from the patient if the patient was able to give the information or from the nearest relative available at the time of the study. This information was recorded in the pre-tested, predesigned, semi structured questionnaire which was developed based on the extensive review of literature for the present study.

A patient was considered as having hypertension if he produced documentary evidence of treatment for hypertension, if the patient gave history of hypertension, if the patient is a known case of hypertensive retinopathy, or if there was an evidence of ECG based left ventricular hypertrophy or if LVH was diagnosed based on the echocardiography.

Patient was asked about the history of alcohol consumption related to frequency, duration and quantity. If the quantity was more than 120 g of ethanol, then that patient was classified as taking the excess alcohol. CAGE questionnaire 8 was used to assess the problem drinking. As per this questionnaire if the answer to two or more than two questions was positive then it was considered as problem drinking.

The questions included in the CAGE questionnaire were like if the patient any time felt a need to reduce the quantity of alcohol, if other people criticized his drinking habit, if he felt guilty about his drinking or was anytime ever the patient had to take morning drink to remove the hangover.

Blood pressure was recorded when the patient was admitted to the hospital using standard techniques. Mean arterial blood pressure was calculated by adding one third of pulse pressure to the value of diastolic blood pressure. Thorough clinical examination was carried out for all patients with special emphasis on the central nervous system examination to assess for any neurological deficit.

All patients were screened for lipid profile with special emphasis on serum total cholesterol. Mean values of serum total cholesterol were calculated and categorized as per age and sex. Other parameters assessed in all patients were smoking, diabetes mellitus, Anti-coagulation therapy, Presence of ischemic heart disease, History of stroke in first degree relatives, Aspirin use, Presence of renal disease. The data was analyzed using proportions, chi square test, and p value. For mean and standard deviation, we used student's t test and a p value of less than 0.05 was taken as statistically significant. F ratio was also used.

## RESULTS

Males were more affected in 60% of the cases than females who constituted 40% among the study subjects. Age wise, males in the age group of 50-69 were twice affected than the males in the age group of 35-49 years or more than 70 years. This may be due to the fact that males above 70 have already died due to stroke and hence they are representing less number.

Among females, age-wise very few in younger age group of 35-49 and most in the age group of 50-69 years and again lesser above 70 years of age. Lesser numbers found above 70 years of age is due to increased mortality among them.

**Table 1: Distribution of patients with respect to age and sex.**

| Age (Years) | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| 35-49 | 6 | 15 | 2 | 5 | 8 | 20 |
| 50-69 | 12 | 30 | 8 | 20 | 20 | 50 |
| >70 | 6 | 15 | 6 | 15 | 12 | 30 |
| Total | 24 | 60 | 16 | 40 | 40 | 100 |

The prevalence of stroke was found to be more in males i.e. 60% compared to only 40% in females.

But this difference was not found to be statistically significant. Mean age was similar in both males and females and there was no significant difference among them. Thus, we can say that sex cannot be considered as a risk factor of stroke. Hypertension ranked number one as

the risk factor of stroke as it was found in 70% of the cases in the present study. This was followed by alcohol consumption as the second most common risk factor due to presence in 40% of the study cases. Smoking ranked number three with 25% of the patients and diabetes as fourth most common risk factor for stroke as it was found in 10% of the cases in the present study. Other factors like anti-coagulation therapy, presence of ischemic heart disease, History of stroke in first degree relatives, aspirin use, and Presence of renal disease were found to constitute remaining proportion of risk factors.

**Table 2: Sex distribution and mean age as per sex.**

| Sex | Number | Percentage | $X^2$ and p value | Mean±2SD | T value and p value |
|---|---|---|---|---|---|
| Male | 24 | 60 | | 61.54±12.61 | |
| Female | 16 | 40 | 1.60; p = 0.206 | 62.06±9.91 | T = 0.019; p < 0.890 |
| Total | 40 | 100 | | 61.75±11.47 | |

But the most common risk factors were hypertension, alcohol, smoking and diabetes. As hypertension was found to be the most common risk factor, we decided to categorize the hypertensive patients based on their regularity of the treatment. It was found that majority i.e. 75% have Discontinued/Irregular treatment/No treatment/Treatment unknown. Only three patients were found to be taking regular treatment.

**Table 3: Distribution of patients with respect to risk factors.**

| Risk factors | Number | % |
|---|---|---|
| Hypertension | 28 | 70 |
| Alcohol consumption | 16 | 40 |
| Smoking | 10 | 25 |
| Diabetes mellitus | 4 | 10 |
| Anti-coagulation therapy | 3 | 7.5 |
| Presence of ischemic heart disease | 3 | 7.5 |
| History of stroke in first degree relatives | 3 | 7.5 |
| Aspirin use | 2 | 5 |
| Presence of renal disease | 2 | 5 |

Hence if the patients do not take regular treatment for hypertension, then they are more likely to develop stroke. Alcoholics were categorized as per the CAGE questionnaire. It was found that majority i.e. 75% were positive as per the CAGE questionnaire in the present study. Only 25% were negative.

**Table 4: Categorization of hypertensive patients.**

| Category | Number | % |
|---|---|---|
| Regular treatment | 3 | 10.7 |
| Discontinued/irregular treatment/no treatment/treatment unknown | 21 | 75 |
| Newly diagnosed | 4 | 14.3 |
| Total | 28 | 100 |

It was found that as the age increased the mean serum cholesterol level also increased up to the age of 69 years and afterwards it declined. But this association was not found to be statistically significant. The mean serum cholesterol level was higher in males compared to females.

**Table 5: Categorization of alcoholics as per CAGE questionnaire.**

| CAGE questionnaire | Number | % | Chi square | P value |
|---|---|---|---|---|
| Positive | 12 | 75 | 4.00 | < 0.046 |
| Negative | 4 | 25 | | |

**Table 6: Mean Serum cholesterol level (mg/dl) in patients according to age group.**

| Age (years) | Mean Sr. Cholesterol | Standard deviation | F ratio | P value |
|---|---|---|---|---|
| 35-49 | 181.14 | 23.49 | 0.575 | 0.568 |
| 50-69 | 188.65 | 19.93 | | |
| > 70 | 185.35 | 18.94 | | |
| Overall | 186.18 | 16.05 | | |

**Table 7: Mean Serum cholesterol level (mg/dl) in patients according to sex.**

| Sex | Mean Sr. Cholesterol | Standard deviation | T value | P value |
|---|---|---|---|---|
| Male | 184.16 | 16.63 | 0.947 | 0.337 |
| Female | 189.21 | 15.16 | | |
| Overall | 186.18 | 16.05 | | |

But this difference was not found to be statistically significant as p value was more than 0.05. We attempted to study the risk factor differences as per sex for the stroke. It was found that with regard to hypertension there were no differences among the sexes as the prevalence of hypertension was 70.1% in males and 68.7% in females. But with regard to alcohol and smoking, it was found that these risk factors were profoundly greater in males compared to females. This is obviously due to high prevalence of smoking and alcohol among them.

As per the age, it was found that hypertension was more common in the older age group compared to the younger age group but smoking and alcohol were equally distributed.

**Table 8: Risk factor distribution among sex.**

| Sex | N | Risk factors | | | | | |
|---|---|---|---|---|---|---|---|
| | | Hypertension | | Alcohol consumption | | Smoking | |
| | | No. | % | No. | % | No. | % |
| Male | 24 | 17 | 70.1 | 12 | 50 | 9 | 37.5 |
| Female | 16 | 11 | 68.7 | 4 | 25 | 1 | 6.25 |

**Table 9: Major risk factors distribution among different age groups.**

| Age (years) | N | Risk factors | | | | | |
|---|---|---|---|---|---|---|---|
| | | Hypertension | | Alcohol consumption | | Smoking | |
| | | No. | % | No. | % | No. | % |
| 35-49 | 8 | 5 | 62.5 | 5 | 62.5 | 2 | 25 |
| 50-59 | 20 | 13 | 65 | 6 | 30 | 4 | 20 |
| > 70 | 12 | 10 | 83.3 | 5 | 41.6 | 4 | 33.3 |

## DISCUSSION

Males were more affected in 60% of the cases than females who constituted 40% among the study subjects. Age wise, males in the age group of 50-69 were twice affected than the males in the age group of 35-49 years or more than 70 years. This may be due to the fact that males above 70 have already died due to stroke and hence they are representing less number. Among females, age-wise very few in younger age group of 35-49 and most in the age group of 50-69 years and again lesser above 70 years of age. Lesser numbers found above 70 years of age is due to increased mortality among them. Kumaravelu et al in their study found that majority i.e. 64% were above the 50 years of age. But Qureshi et al reported still higher percentage of 85% of patients above the age of 50 years.[9,10] Thacker et al noted this proportion as 84% and Daverat et al noticed this percentage among 87% of the patients.[11,12] Thus, stroke is commonly found in people above the age of 50 years.

The prevalence of stroke was found to be more in males i.e. 60% compared to only 40% in females. But this difference was not found to be statistically significant. Mean age was similar in both males and females and there was no significant difference among them. Thus, we can say that sex cannot be considered as a risk factor of stroke. Archana et al in their study found that the prevalence of stroke was 62.3% among males compared to only 37.2% in females and this finding is comparable to the finding of the present study.[13] Daverat et al also reported similar figures i.e. 68% in males and 32% in females. Juvela et al have observed similar proportion of males as 61.5% compared to 38.5% among females.[12,14] Qureshi et al also noted similar ratio of 58% in males and 42% in females.[10] Hypertension ranked number one as the risk factor of stroke as it was found in 70% of the cases in the present study. This was followed by alcohol consumption as the second most common risk factor due to presence in 40% of the study cases. Smoking ranked number three with 25% of the patients and diabetes as fourth most common risk factor for stroke as it was found in 10% of the cases in the present study. Other factors like anti-coagulation therapy, presence of ischemic heart disease, History of stroke in first degree relatives, aspirin use, and Presence of renal disease were found to constitute remaining proportion of risk factors. But the most common risk factors were hypertension, alcohol, smoking and diabetes. Similar findings were given by Qureshi et al, Calandre et al, Archana et al, and Juvela et al.[10,13-15]

As hypertension was found to be the most common risk factor, we decided to categorize the hypertensive patients based on their regularity of the treatment. It was found that majority i.e. 75% have discontinued/irregular treatment/no treatment/treatment unknown. Only three patients were found to be taking regular treatment. Hence if the patients do not take regular treatment for hypertension, then they are more likely to develop stroke. Qureshi et al also noted in their study on risk factors for stroke that those stroke patients with hypertension most of them were not on regular treatment.[10] Alcoholics were categorized as per the CAGE questionnaire. It was found that majority i.e. 75% were positive as per the CAGE questionnaire in the present study. Only 25% were negative. Alcoholics taking higher amount of alcohol were found to be strongly associated with risk of stroke. Juvela et al also reported similar findings in their case control study and they stated that persons with positive CAGE increased the risk of stroke.[14] It was found that as the age increased the mean serum cholesterol level also

increased up to the age of 69 years and afterwards it declined. But this association was not found to be statistically significant. The mean serum cholesterol level was higher in males compared to females. But this difference was not found to be statistically significant as p value was more than 0.05. Konishi et al [16] study does not agree with the findings of the present study as they reported that low cholesterol levels were associated with stroke in the Japanese population. This difference in the findings of the two studies may be attributed to the racial differences and the differences in the food habits.

We attempted to study the risk factor differences as per sex for the stroke. It was found that with regard to hypertension there were no differences among the sexes as the prevalence of hypertension was 70.1% in males and 68.7% in females. But with regard to alcohol and smoking, it was found that these risk factors were profoundly greater in males compared to females. This is obviously due to high prevalence of smoking and alcohol among them. As per the age, it was found that hypertension was more common in the older age group compared to the younger age group but smoking and alcohol were equally distributed. Similar findings were reported by Qureshi et al and Juvela et al also reported that hypertension was the leading risk factor for stroke.[10,14]

## CONCLUSION

The leading cause as well as risk factor for stroke was found to be hypertension followed by alcohol and smoking. All these are easily preventable and manageable. Stroke incidence can be drastically reduced if these three factors can be prevented or controlled.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. William B, Adams HP. American Heart Association, Heart and Stroke Facts. Dallas, 1993.
2. Walf PA, Adams AT, Manley MD, Dorothy F. Probability of stroke: a risk profile from Framingham study. Stroke. 1991;22:312-5.
3. Mohr JP, Edwards K, Munish S. The Harvard co-operative registry: A prospective registry of cases hospitalized with stroke. Neurology. 1978;28:754.
4. Sunder Rao PS. Some aspects of epidemiology of stroke in South India. Proj. 1st All India workshop conference on stroke. Vellore. 1996:25-31.
5. Padma MV, Bajaj SS. Risk factor profile in Northern India, Project work at stroke clinic at Neuroscience centre AIMS, Recent concepts in stroke. 1999.
6. Furlan AJ, Whisnant JP, Elveback LR. The decreasing incidence of primary intra-cerebral hemorrhage: A population study. Ann Neurol 1979;5:367-73.
7. Abbott RD, Gebel JM, Broderick JP. Risk of stroke in male cigarette smokers. N Engl J Med 1986;315:171.
8. Ewing JA. Detecting alcoholism: The CAGE questionnaire. JAMA. 1984;252:1905-7.
9. Kumaravelu S, Johri S, Mukerji JD, Pradhan AB. Intra-cerebral haemorrhage. JAPI. 2001;49:49.
10. Qureshi AI, Suri MAK, Safdar K, Ottenlips JR, Janssen RS, Frankel MR. Intra-cerebral hemorrhage in blacks: risk factors, subtypes, and outcome. Stroke. 1997;28:961-4.
11. Thacker AK, Radhakrishanan K, Maloo JC. Clinical and computed tomography analysis of intra-cerebral haemorrhage. JAPI. 1991;39:317-9.
12. Daverat P, Castel JP, Dartigues JF, Orgogozo JF. Death and functional outcome after spontaneous intra-cerebral haemorrhage. A prospective study of 166 cases using multivariate analysis. Stroke. 1991;22:1-6.
13. Archana V, Mallick A, Misra S. Clinical and radiological profile of intra-cerebral haemorrhage JAPI. 2002;50:1578.
14. Juvela S, Hillbom M, Palomaki H. Risk factors for spontaneous intra-cerebral haemorrhage. Stroke. 1995;26:1558-64.
15. Calandre L, Arnal C, Ortega JF, Bermijo F, Felgeroso B, Delser T et al. Risk factors for spontaneous cerebral hematomas: case-control study. Stroke. 1986;17:1126-8.
16. Konishi M, Iso H, Komachi Y, Lida M, Shimamoto T, Jacobs DR et al. Associations of serum total cholesterol, different types of stroke, and stenosis distribution of cerebral arteries. The Akita pathology study. Stroke. 1993;24:954-64.

**Cite this article as:** Kumar RB, Kishan U. Kumar AN. Risk factor analysis among patients with stroke: a cross sectional study at a tertiary care hospital. Int J Adv Med 2018;5:1036-40.