A Cross-Sectional Study of Risk Factors in Patients with Ischaemic Stroke Presenting to a Tertiary Care Health Centre in Andhra Pradesh

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ABSTRACT

BACKGROUND
Stroke is a leading public health problem; it is second to heart disease worldwide as a cause of death and long-term disability. The treatment of patients with ischaemic stroke is still not very well understood; so, prevention of stroke is a better option. The incidence of stroke can be reduced by adequate control of risk factors. This study intends to assess the most common risk factors in patients with ischaemic stroke and its prognosis.

METHODS
Sixty-five patients with ischaemic stroke who met the inclusion criteria were evaluated with a comprehensive clinical history, a detailed physical examination and relevant investigations. Progress during the hospital stay was also recorded.

RESULTS
At the end of the study, it was noted that the incidence of stroke in males was 58.4 % (95 % CI 0.86 % to 0.90 %). 50.9 % (95 % CI 0.76 % to 0.92 %) of stroke occurred in people aged above 60 years. The most common risk factors were smoking (46.2 %), hypertension (38.46 %), dyslipidemia (18.46 %), alcohol consumption (15.39 %), diabetes mellitus (13.09 %), heart diseases (10.7 %), tobacco chewing (9.23 %), history of recent delivery (1.6 %) and family history of stroke (1.6 %). It was also noted that 72.3 % of patients who had multiple risk factors, of which 7 % had a complete recovery, while 22.2 % of patients with single risk factor had a complete recovery.

CONCLUSIONS
It was found that stroke was more common in males when compared to females, and increasing age (> 60 years) was associated with an increased incidence of stroke. The most common modifiable risk factors were smoking, hypertension, dyslipidemia, alcohol consumption and diabetes mellitus. The most common non modifiable risk factors were increasing age, male sex and family history of stroke. Prognosis depends on the number of risk factors present. It was also found that increasing age, hyperglycemia, and multiple risk factors were associated with poor prognosis.

KEYWORDS
Stroke, Risk-Factors, Prognosis

BACKGROUND

Ischaemic cerebrovascular disease (ischaemic stroke) is a leading public health problem. Every 53 seconds, someone in the United States has a stroke. Annually, approximately 750,000 Americans have an initial or recurrent ischaemic stroke. Stroke incidence is even higher in most other countries. Rates are particularly high in Asia and Eastern Europe. Changes in the rates of stroke vary considerably among regions; for example, the incidence of stroke is declining in Western Europe and North America while it is rising in Eastern Europe. Although definitive data from many third-world countries are not available, stroke likely is a major health care problem in these nations. Stroke is a rising problem in the developing world. With the advancing life expectancy of people in developing countries, the importance of ischaemic stroke will grow as a worldwide problem.[1,2]

For India, community survey has shown a crude prevalence rate for hemiplegia in the range of 200 per 100000 persons, nearly 1.5 percent of all urban hospital admissions, 4.5 % of all medical cases and around 20 % of all neurological cases.[3]

Stroke is second to heart disease as a worldwide cause of death. In the United States, stroke is the third most common cause of death, following heart disease and cancer. Annually, 150,000 Americans die of stroke, and it contributes to the death of another 140,000 people.[1]

A transient ischaemic attack (TIA) is an acute loss of focal brain or monocular function with symptoms lasting less than 24 hrs. which is thought to be due to the inadequate cerebral or ocular blood supply as a result of arterial thrombosis, embolism or low flow, associated with the arterial, cardiac or haematological disease.[4]

A stroke is rapidly developing clinical symptoms and signs of focal and at times global {applied to patients in a deep coma and those with subarachnoid haemorrhage (SAH)} loss of brain function with symptoms lasting more than 24 hrs. or leading to death, with no apparent cause other than that of vascular origin.[4]

Thus, the definition of stroke is clinical, and laboratory studies including brain imaging, are used to support the diagnosis. The clinical manifestations of stroke are highly variable because of the complex anatomy of the brain and its vasculature.[5]

Objectives
1. To evaluate the risk factors in patients with ischaemic stroke.
2. To find out the prognosis of ischaemic stroke with reference to risk factors.

METHODS

The present observational cross-sectional study included patients with ischemic stroke who were admitted in the intensive care unit and ward under the Department of Medicine at Katuri Medical College and Hospital, Guntur,

during the period (June 2017 – Sept. 2018). Informed consent was taken before enrolment. Sixty-five patients were enrolled in the study. The criteria for selection of patients were as follows.

Inclusion Criteria
Patients with evidence of ischaemic stroke. Ischaemic stroke is diagnosed if the following criteria are present symptoms and signs suggestive of acute loss of focal or global cerebral function. Evidence of ischemia on computed tomography (CT) scan of the head.

Exclusion Criteria
Patients with focal epilepsy, migraine and structural brain lesions (such as tumours). Patients with evidence of haemorrhage on CT scan of the head. Stroke secondary to infection and connective tissue disorders. Only the patients who met the above inclusion criteria and did not have any exclusion criteria were included in the study.

The patients enrolled in the study were subjected to a detailed clinical history and physical examination. Clinical history was obtained from the attenders when the patient had speech disturbances.

The prognosis was studied with regard to the outcome during the hospital stay moreover, it was classified as follows
- Complete recovery
- Partial recovery
- No recovery (no improvement)
- Death

The risk factor profile of each patient was evaluated during the stay. In the study:
- Hypertension was defined as a BP recording of > 140 / 90 mmHg on three separate occasions, taken on three different days. Patients who are already on antihypertensive medications were also taken as hypertensive.
- Dyslipidemia was taken as serum cholesterol > 200 mg / dl, low-density lipoprotein (LDL) cholesterol > 130 mg / dl and high-density lipoprotein (HDL) cholesterol < 35 mg / dl in females and < 40 mg / dl in males.
- Patients were included as suffering from heart diseases if they had ischemic heart disease, congestive heart failure, rheumatic heart disease, atrial fibrillation or evidence of left ventricular hypertrophy on ECG or Echocardiography.
- Smoking, tobacco chewing and alcohol intake were based on the clinical history of past and present consumption of these substances.
- Diabetic patients were diagnosed as per the American Diabetic Association Guidelines. Patients on antidiabetic medications were also considered as people with diabetes.
- A family history of stroke was entertained if the first degree relatives of the patients suffered from a stroke.
- Patients were considered obese if their body mass

index (BMI) was ≥ 30.

Sample Size

In the present cross-sectional study, sample size was calculated using the following formula

$$N = \frac{(za)^2[p*q]}{d^2}$$

(Where the symbol ^ means 'to the power of'; * means 'multiplied by')
Za; the value of z corresponding to this is 1.96 (from the standard normal variable tables finally.

$$N = \frac{(1.96)^2[p*q]}{d^2}$$

(Where the symbol ^ means 'to the power of'; * means 'multiplied by')

p: The prevalence of the condition / health state.
q: When p is in percentage terms: (100-p)
d (or l): The precision of the estimate.
By using the above formula estimated sample size is 62 patients. So the present study of 65 patients was sufficient for the present observational cross-sectional study.

Statistical Analysis

Statistical analysis was done using International Business Machines Statistical Package for the Social Sciences (IBM SPSS) Statistics V.24.0. Various risk factors like hypertension diabetes mellitus, smoking and other variables were reported using descriptive statistics. Age at onset was compared across gender using t-test and value of $P < 0.05$ was considered statistically significant.

RESULTS

In the present study, 65 cases of acute ischaemic stroke who met inclusion and exclusion criteria were analyzed with regards to the risk factors, individually and in combination and they were correlated with the outcome.

	Total	Expired	Complete Recovery	Partial Recovery	No Recovery
Male	38 (58.46 %)	4 (10.52 %)	6 (15.78 %)	16 (42.12 %)	12 (31.57 %)
Female	27 (41.54 %)	4 (14.81 %)	3 (11.11 %)	8 (29.62 %)	12 (44.44 %)

Table 1. Sex Distribution

In the 38 male patients, four patients (10.52 %) expired, six patients (16.78 %) had a complete recovery, 16 patients (42.12 %) had a partial recovery, and 12 (31.57 %) had no recovery. In the 27 female patients, four patients (14.81 %) expired, three patients (11.11 %) had a complete recovery, eight patients (29.62 %) had a partial recovery, and 12 patients (44.44 %) had no recovery.

The patients were grouped into the following age groups. 20 - 29 years, 30 - 39 years, 40 - 49 years, 50 - 59 years, 60 - 69 years, and more than 70 years.

Four patients (6.15 %) were between 20 - 29 years of age, six patients (9.23 %) were between 30 - 39 years of age, nine patients (30.84 %) were between 40 - 49, 13 patients (20 %) were between 50 - 59 years, 22 patients (33.85 %) were between 60 - 69 years and eleven patients (16.92 %) were more than 70 years.

In the 20 - 29 years age group, one patient (25 %) had no recovery and two patients (50 %) had a complete recovery, no death occurred in this age group.

In 30 - 39 years age groups, four patients (66.66 %) had partial recovery and one patient (16.66 %) had a complete recovery, and one patient did not recover.

In the 40 - 49 years age group, three patients (33.33 %) had no recovery and partial recovery was seen in 3 other patients (33.33 %). One patient (11.11 %) had a complete recovery, and two patients (22.22 %) expired.

In the 50 - 59 age group, one patient (7.71 %) had a complete recovery, and one patient expired. Seven patients (53.93 %) had a partial recovery and four patients (30.74 %) had no recovery.

In the 60 - 69 age group, three patients (13.63 %) expired. Four patients (18.18 %) had completed recovery, six patients (27.17 %) had partial recovery and nine patients (40.98 %) had no recovery.

In the age group for more than 70 years, two patients (18.18 %) expired, three patients (27.28 %) had a partial recovery, and six patients (54.54 %) had no recovery.

Age in	Total	Expired	Complete Recovery	Partial Recovery	No Recovery
20 - 29	4 (6.15 %)	0	2 (50 %)	1 (25 %)	1 (25 %)
30 - 39	6 (9.23 %)	0	1 (16.60 %)	4 (66.66 %)	1 (16.66 %)
40 - 49	9 (13.84 %)	2 (22.22 %)	1 (11.11 %)	3 (33.33 %)	3 (33.33 %)
50 - 59	13 (20 %)	1 (7.71 %)	1 (7.71 %)	7 (53.93 %)	4 (30.74 %)
60 - 69	22 (33.85 %)	3 (13.63 %)	4 (18.18 %)	6 (27.17 %)	9 (40.98 %)
≥ 70 yrs.	11 (16.92 %)	2 (18.18 %)	0	3 (27.28 %)	6 (54.54 %)

Table 2. Age Distribution

Risk Factors	No. of Patients	Percentage
Hypertension	25	38.46
Diabetes mellitus	09	13.09
Smoking	30	46.2
Tobacco chewing	06	9.23
Dyslipidemia	12	18.46
Alcohol	10	15.39
Heart diseases	7	10.76
History of recent delivery	1	1.6
Family history of stroke	1	1.6

Table 3. Risk Factors Observed in Ischemic Stroke Patients

Among 65 patients, 25 (38.46 %) patients had hypertension, 30 patients (46.20 %) were smokers, 6 patients (9.23 %) chewed tobacco, 12 patients (18.46 %) had dyslipidemia, 9 Patients (13.09 %) had diabetes mellitus, 10 patients (15.39 %) had alcoholism, 7 patients (10.76 %) had heart diseases, 1 patient (1.6 %) had recent delivery and 1 patient (1.6 %) had family history of stroke.

Out of 65 patients, 25 patients (38.46 %) had a history of hypertension. Among 25 patients who presented with hypertension three patients (12 %) expired, eleven patients (44 %) had partial recovery, three patients (12 %) had a complete recovery and eight patients (32 %) had no recovery. Forty patients who did not give a history of hypertension, five patients (12.5 %) expired, six patients (15 %) had a complete recovery, 13 patients (32.5 %) had partial recovery, and 16 patients (40 %) had no recovery.

	Total		Expired		Complete Recovery		Partial Recovery		No Recovery	
	No.	%	No.	%	No.	%	No.	%	No.	%
No. of cases with history of	25	38.46	3	12	3	12	11	44	8	32
No. of cases without history of hypertension	40	61.5	5	12.5	6	15	13	32.5	16	40
Table 4. Hypertension										

	Total	Expired		Complete Recovery		Partial Recovery		No Recovery	
		No.	%	No.	%	No.	%	No.	%
No. of cases with	9	2	22.2	0	0	3	33.3	4	44.4
No. of cases without	56	6	7.71	9	16.7	21	37.5	20	35.7
Table 5. Diabetes Mellitus									

Out of 65 patients, 9 (13.84 %) had diabetes mellitus. Among nine patients, 2 (22.22 %) expired, complete recovery was not noted in this category of patients. 3 (33.33 %) patients had a partial recovery, and 4 (44.44 %) had no recovery. Among 56 patients who were non-diabetes, 6 (7.07 %) patients expired, 9 (18.7 %) had a complete recovery, 21 patients (37.5 %) had a partial recovery, and 20 patients (35.7 %) had no recovery.

Among 65 patients, six patients (9.23 %) gave a history of tobacco chewing. Among them, four patients (6.66 %) had a partial recovery, and two patients (53.33 %) had no recovery. Among 59 non-tobacco chewers, 9 (15.25 %) had a complete recovery, 20 (33.9 %) had a partial recovery, 22 (37.29 %) had no recovery, and eight patients (13.56 %) expired.

Among 65 patients, 12 patients (18.46 %) had dyslipidemia. Among these patients, three patients (25 %) expired, five patients (41.66 %) had a partial recovery, and four patients (33.33 %) had no recovery. Complete recovery was not noted in any of them.

Out of 65 patients, 53 patients did not show dyslipidemia. Among these patients, nine patients (16.9 %) had a complete recovery, 19 patients (38.84 %) had a partial recovery, and 20 patients (37.53 %) had no recovery. Five patients (9.43 %) expired in this group.

Heart Diseases
Among 65 patients, seven patients had heart diseases (10.76 %) which consisted of atrial fibrillation (AF), valvular heart disease, rheumatic heart disease (RHD), ischemic heart disease (IHD), left ventricular hypertrophy (LVH). Among them two patients (28.57 %) expired, one patient (14.28 %)

had a complete recovery, and four patients (57.14 %) had partial recovery. Fifty-eight patients were without any heart disease; in this group, eight patients (13.86 %) had a complete recovery, 20 patients (34.48 %) had a partial recovery, and 24 patients (41.37 %) had no recovery. Six patients (10.34 %) expired in the group. Out of the 65 patients, one patient (1.6 %) gave a family history of stroke. No recovery was seen in that patient.

Multiple Risk Factors and Its Outcome
Among 65 patients, 47 patients (72.3 %) had multiple risk factors like age ≥ 60 years, hypertension, smoking, diabetes, etc. among these, six patients (12.76 %) expired, Sixteen patients (34.04 %) had no recovery, 20 patients (30.76 %) had a partial recovery, and five patients (7 %) had complete recovery. Among the 18 patients (27.6 %) who had one or no risk factors, two patients (11.11 %) expired, four patients (22.22 %) had a complete recovery, four patients (22.22 %) had a partial recovery, and eight patients (44.44 %) had no recovery.

Clinical Presentation of Ischaemic Stroke
When all 65 patients were analyzed concerning the clinical presentation, motor weakness was the most common manifestation being present in 49 patients (i.e., 75.39 %). Speech disturbance was the next frequent presentation found in 20 patients (20.7 %). Unconsciousness followed by headache was there in 10 and 9 patients, respectively. Vomiting and convulsions were present in 2 patients each. None of the patients in this series presented with sensory disturbance.

DISCUSSION

In the present study which involved 65 patients of ischaemic stroke admitted in the ICU attached to our institute, we examined the prediction of stroke outcome in relation to sex, age, smoking, tobacco chewing, hypertension, heart disease (valvular heart diseases, coronary artery diseases, atrial fibrillation etc.), diabetes, dyslipidemia and obesity. It was consistent with previously published studies, smoking, hypertension and dyslipidemia were the most common risk factors.

In the present study, ischaemic stroke was predominant in males. This is consistent with Bogousslavsky.[6] study and P M Dalal study.[6] In the present study, 33 patients (50.7 %) were aged above 60 years, and five patients (62.5 %) who expired were from this group. In the present study, 25 patients (38.46 %) were hypertensive. It was consistent with the Sridharan study.[7] Nine patients (13.09 %) had diabetes in the present study, and this was consistent with the Feigin study.[2] 30 patients (46.2 %) included in this study were smokers, this was higher when it is compared to the other studies like Bansal[8] study, Feigin[2] Sridharan[7] study. Six patients (9.23 %) were tobacco chewers in the present study. This was consistent with the Bansal study.[8] In the present study, 12 patients (18.46 %) were suffering from

dyslipidemia which was higher when compared with the Bansal study.[8] Ten patients (15.39 %) were alcoholic, and this was consistent with the Bansal study.[8] Seven patients (10.76 %) suffered from heart ailments in the present study. This was much lower when compared to Bansal study.,[8] Feigin.[2] and Shridharan[7] study. One patient (1.6 %) had a family history of stroke in the present study, this was much lower than the Bansal study and Feigin study. Obesity has been much less significant risk factor in the present study, which is consistent with Davia Rastenyte study.[9] Hyperglycemia is an adverse prognostic factor. In the present study of the nine diabetic patients, there are four diabetic patients (44.44 %) who had no recovery. 3 patients (33.33 %) had partial recovery.

Increasing age was also an adverse prognostic factor with nine patients (40.98 %) in the age group 60 - 69 years and six patients (54.54 %) in the age group > 70 years having no recovery. In the present study, 47 patients (72.3 %) were associated with multiple risk factors; they had higher morbidity (complete recovery 7 %) than the 18 patients (27.69 %) who had a single risk factor (complete recovery 22.22 %).

CONCLUSIONS

Commonest modifiable risk factors in ischaemic stroke are hypertension, smoking, dyslipidemia, alcohol consumption and diabetes mellitus. Commonest nonmodifiable risk factors are increasing age, male sex and family history of stroke. Prognosis depends on the number of risk factors present. Multiple risk factors are associated with poorer prognosis. Increasing age and hyperglycemia are also associated with poor prognosis. Treatment or prevention of modifiable risk factors can reduce the mortality and morbidity of stroke.

In the present study, males have a higher incidence of stroke when compared to females (Male: Female = 1.4:1). Increasing age (≥ 60 years) is associated with an increased risk of stroke and also poorer prognosis. Multiple risk factors were associated with poorer prognosis. Diabetes mellitus is associated with a poorer prognosis. In the present study a higher incidence of smoking and dyslipidemia was seen when compared to other studies. The incidence of heart diseases and a family history of stroke was much lower in this study when compared to other studies.

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