



Relationship Between Various Risk Factors and Functional Outcome in Stroke Patients – A Hospital Based Study

KEYWORDS

Risk factors in stroke, ischemic stroke, Barthel index score, modified Rankin Scale score

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ABSTRACT *Introduction:* Hypertension, Diabetes Mellitus, Hyperlipidaemia and Smoking are major atherogenic risk factors for stroke across the globe. In India, a multicentre, prospective, hospital-based case-control study in the West Central region revealed that diabetes mellitus, hypertension, tobacco use and low haemoglobin rather than hypercholesterolemia were the most important risk factors of ischemic stroke and the functional outcome with multiple comorbidities are poor. We wanted to study the relation between various risk factors and the functional outcome in a tertiary care hospital in western India.

Methodology: Study was conducted at a tertiary care centre over a period of 1 year. Patients presented with cerebrovascular accidents due to ischemia within one week (acute ischemic stroke) were evaluated at enrolment and during follow up at 12 weeks by the same observer. All the patients were given standard care as per the guidelines of American Stroke Association. Primary outcome was to assess the relationship between the risk factors and functional outcome in acute ischemic stroke on admission and at the end of 03 months.

Results: Fifty eight patients (n=58) met the eligibility criteria. The mean age of study population was 57.10 + 12.54 years. The males and females in the study group were 42 and 16 respectively. Seventeen (29.3%) patients had T2 DM, 24 (41.4%) patients had hypertension, 6(10.3%) patients with dyslipidaemia and 13 (22.4%) patients were smokers. Out of 17 patients with Type 2 DM, 16 (94.17%) using BI and 9 (52.9%) using MRS score had poor functional outcome during follow up at 03 months but were statistically not significant(p>0.05). Out of 24 hypertensive patients, 22 (91.7%) using BI and 14 (58.3%) using MRS score had poor functional outcome at 03 months. The difference between the outcomes however was also not significant (p=>0.05). All patients (100.0%) having dyslipidaemia had a poor functional outcome at follow up by using BI (p = 0.581) & 5 (83.3%) patients had poor outcome by MRS scale which was statistically significant(p=0.012). Out of 13 (22.4%) patients who were smokers, all patients (100.0%) had very poor functional outcome at follow up by using BI (p=0.178) & 9 (69.2%) patients had poor functional outcome by using MRS score which was found to be significant (p<0.05).

Conclusion: The prevalence of stroke in patients with risk factors (hypertension, T2DM, dyslipidaemia & smoking) is high. Similarly most of them have adverse functional outcome. In our study, all patients with risk factors had statistically significant poor functional outcome using BI score and was statistically not significant (>0.05). However the same was statistically significant(<0.05) using MRS score except in Type 2 Diabetes Mellitus & Hypertension where it was statistically not significant. Our study also demonstrated that stroke functional outcome can be predicted from the baseline as well as at follow up by using MRS scales score.

INTRODUCTION

Ischemic Stroke caused by cerebral artery occlusion leading to infarction of brain tissue with acute loss of neurons, astroglia and oligodendroglia, is the most important vascular central nervous system (CNS) disorder in industrial nations and remains a leading cause of death and disability.¹

The Framingham Heart Study and other international prospective epidemiological studies identified the major atherogenic risk factors for stroke as hypertension, diabetes mellitus, hyperlipidaemia, and smoking. In India, a multicentre, prospective, hospital-based case-control study in the West Central region by Dalal revealed that diabetes mellitus, hypertension, tobacco use and low haemoglobin rather than cholesterol level were the most important risk factors of ischemic stroke². Cross sectional community based case control study for risk factor analysis in Kolkata demonstrated that hypertension was the most important risk factor for stroke with odds ratio of 5.04 (95% CI 4.16-5.92) in women and 21.87 (95% CI 18.69-25.05) in men. It is well known that smoking and tobacco use is greater among the rural populations in India.³ Hypertension is an important and consistent

conventional risk factor for stroke. Diabetes has been reported to be an independent risk factor for ischemic stroke. Lifestyle factors such as smoking and tobacco use have been reported to be important for both ischemic and haemorrhagic strokes.⁴ The functional outcome adversely affected in presence of modifiable risk factors in isolation or in combinations. Although other non-modifiable risk factors like age, sex do affect the outcome⁵, this is not studied in this.

In clinical trials, the Barthel Index (BI) and the Modified Rankin Scale (MRS) are commonly used scales to assess the functional outcome.⁶ In BI the items can be divided into a group that is related to self-care (feeding, grooming, bathing, dressing, bowel and bladder care, and toilet use) and a group related to mobility (ambulation, transfers, and stair climbing) with a maximum score of 100 and minimum score of 0 representing fully independent in physical functioning and totally dependent bedridden state/death respectively. In MRS scale, mental as well as physical adaptations to the neurological deficits are incorporated. The scale consists of grades, from 0 to 6, with 0 corresponding to no symptoms and 6 corresponding to death.

MATERIALS AND METHODS

Patient population & data collection: Study was conducted at a tertiary care center in western India over 1 year. From the admission list of previous years, it was estimated that, on an average, there are 70 patients admitted to this hospital in a year. Thus all patients presenting to this centre during the study period with cerebrovascular accidents were included in the study. A total of 69 patients were admitted and recruited for the study during the study period. Eleven patients were not meeting the eligibility criteria. Fifty eight patients fulfilling the eligibility criteria were studied. Six died during the follow up of the study. Informed consent was taken from each patient/patient's next of kin (NOK), enrolled in the study. The diagnosis of CVA was confirmed in each case by neuroimaging (plain CT Scan Head/MRI Brain) apart from the clinical evaluation.

Outcome Measures : Patients screened were evaluated at enrolment (within 7 days of onset) and during follow up at 04 weeks and 12 weeks after stroke by the same observer employing the same criteria used at the time of presentation using (a) Modified Rankin Scale (MRS) & (b) The Barthel's index (BI). All the patients were given standard care as per the guidelines of American Stroke Association. The improvement was recorded during follow-up, utilizing same stroke scales as used at the time of baseline. BI of ≥ 90 was taken as good functional outcome & MRS of ≤ 3 was taken as good functional outcome. Primary outcome was to study the relation between the risk factors and functional outcome.

Analysis Methods: Statistical analyses were performed after all of the participants had completed the 12 weeks evaluation. Statistical analysis using SPSS statistical software package version 11.0 (SPSS Inc, Chicago IL, USA) was carried out.

Inclusion criteria: All ischemic stroke patients >18 yrs of age & all cases of CVA of < 7 days duration.

Exclusion criteria: Transient Ischemic Attack (TIA), Intracranial/ Subarachnoid Haemorrhage (ICH/SAH), Seizures, Head injury and recurrent stroke.

RESULTS

A total of 69 patients were screened for the study and 58 patients met the eligibility criteria and were taken for the same. 11 patients did not meet the eligibility criteria, out

of which 1 had TIA, 1 had seizure, 8 had haemorrhagic stroke and 1 had recurrent stroke. The overall mortality during 12 weeks amounted to 10.3% and was higher in men (6.9%) than women (3.4%).

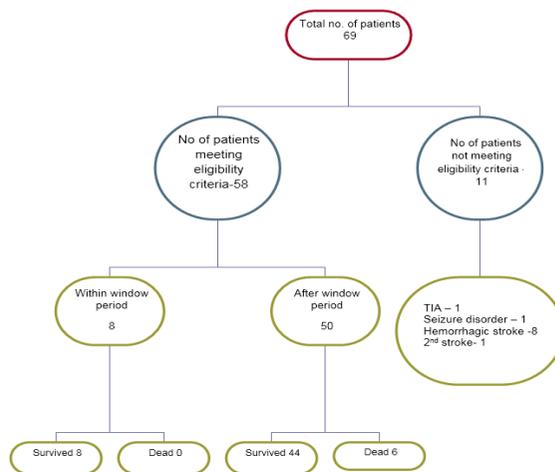


Figure 1: Distribution of participants

The mean age of study population was 57.10 ± 12.54 . The mean age of males was 58.16 ± 12.07 years and that for females was 54.31 ± 13.07 year. There were 42 males and 16 females in the study group as depicted below. Four modifiable risk factors were analysed in this study. They were (a) Diabetes mellitus (b) Hypertension (c) Dyslipidaemia and (d) Smoking. Seventeen (29.3%) patients had T2 DM, 24 (41.4%) patients had hypertension, 6(10.3%) patients with dyslipidaemia and 13 (22.4%) patients were smokers. Two patients who were smoker, they also had hypertension and hence included in both group.

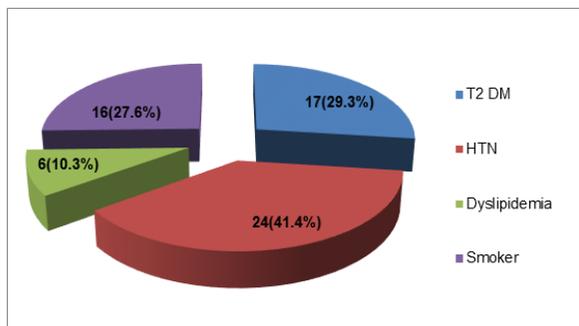
The risk factors except for Type 2 Diabetes mellitus were found to be significantly ($p < 0.05$) higher in age group > 30 years than for those < 30 yrs. The frequencies and percentage of modifiable risk factors are given in Table 1. Seventeen (29.3%) had diabetes mellitus, 24(41.4%) had hypertension, 6 (10.3 %) patients had dyslipidaemia and 16 (27.6%) patients were smokers.

Table 1: Association of risk factors of Ischemic stroke in different age groups

Age Group	Sex*		DM		HTN*		Dyslipidemia*		Smoker*	
	M	F	Yes	No	Yes	No	Yes	No	Yes	No
<30	2 (4.8)	1 (6.3)	-	3 (7.3)	-	3 (8.8)	-	3 (5.8)	-	3 (6.7)
31-40	-	3 (18.8)	-	3 (7.3)	-	3 (8.8)	-	3 (5.8)	-	3 (6.7)
41-50	7 (16.7)	2 (12.5)	2 (11.8)	7 (17.1)	1 (4.2)	8 (23.5)	-	9 (17.3)	1 (7.7)	8 (17.8)
51-60	11 (26.2)	3 (18.8)	2 (11.8)	12 (29.3)	9 (37.5)	5 (14.7)	1 (16.7)	13 (25.0)	5 (38.5)	9 (20.0)
61-70	18 (42.9)	3 (18.8)	10 (58.8)	11 (26.8)	10 (41.7)	11 (32.4)	1 (16.7)	20 (38.5)	5 (38.5)	16 (35.6)
>70	4 (9.5)	4 (25.0)	3 (17.6)	5 (12.2)	4 (16.7)	4 (11.8)	4 (66.7)	4 (7.7)	2 (15.4)	6 (13.3)
Total	42 (100)	16 (100)	17 (100)	41 (100)	24 (100)	34 (100)	6 (100)	52 (100)	13 (100)	45 (100)

*P (Chi square trend) <0.05

Figure 2: Distribution of risk factors



Seventeen (29.3%) of stroke patients were T2 DM on presentation while 41 (70.7%) patients were not having T2 DM and the difference between them were found to be not significant (p=0.163). Out of 17 stroke patients with Type 2 DM, 16 (94.17%) patients using BI and 9 (52.9%) patients using MRS score had poor functional outcome at 12 weeks

but were statistically not significant.

Table 2: Type 2 Diabetes Mellitus and functional outcome

Risk	BI			p	MRS			p
	Poor	Good	Total		Poor	Good	Total	
T2 DM	16(94.1)	1(5.9)	17(100.0)	p=0.415	9(52.9)	8(47.1)	17(100.0)	p=.218
Yes	16(94.1)	1(5.9)	17(100.0)		30(73.2)	11(26.8)	41(100.0)	
No	34(82.9)	7(17.1)	41(100.0)		39(67.2)	19(32.8)	58(100.0)	
Total	50(86.2)	8(13.8)	58(100.0)					

Twenty four (41.4%) of stroke patients were hypertensive while to 34 (58.6%) were normotensive and the difference between them were found to be significant (p<0.05). Out of 24 hypertensive patients, 22 (91.7%) patients using BI and 14 (58.3%) patients using MRS score had poor functional outcome at 12 weeks. The difference between the outcomes however was not significant.

Table 3: Primary hypertension and functional outcome

Risk	BI		p	MRS			p
	Poor	Good		Poor	Good	Total	
Hypertension	22(91.7)	2(8.3)	p=0.449	14(58.3)	10(41.7)	24(100.0)	p=0.265
Present	22(91.7)	2(8.3)		25(73.5)	9(26.5)	34(100.0)	
Absent	28(82.4)	6(17.6)		39(67.2)	19(32.8)	58(100.0)	
Total	50(86.2)	8(13.8)					

Six (10.3%) patients with dyslipidaemia and 52 (89.6%) patients with normal lipid profile developed stroke. The difference between them were found to be significant (p<0.05). All patients (100.0%) having dyslipidaemia had a poor functional outcome at follow up by using BI (p = 0.581). Five (83.3%) patients had poor functional outcome by using MRS score and the difference was found statistically significant (p=0.012).

Table 4: Dyslipidemia and functional outcome

Risk	BI		p	MRS			p
	Poor	Good		Poor	Good	Total	
Dyslipidemia	6(100.0)	-	p=.581	5(83.3)	1(16.7)	6(100.0)	p=.012
Present	6(100.0)	-		14(26.9)	38(73.1)	52(100.0)	
Absent	44(84.6)	8(13.8)		19(32.8)	39(67.2)	58(100.0)	
Total	50(86.2)	8(13.8)					

Thirteen (22.4%) stroke patients were smokers compared to 45 (77.5%) patients who were non-smokers (p<0.05). All patients (100.0%) who were smokers had very poor functional outcome at follow up by using both BI (p=0.178). Nine (69.2%) smoker patients had poor functional outcome by using MRS score and the difference was found to be significant (p<.005).

Table 5: Smoking and functional outcome

Risk	BI		p	MRS			p
	Poor	Good		Poor	Good	Total	
Smoker	13(100.0)	-	p=.178	9(69.2)	4(30.8)	13(100.0)	p=.003
Yes	13(100.0)	-		10(22.2)	35(77.8)	45(100.0)	
No	37(82.2)	8(17.8)		19(32.8)	39(67.2)	58(100.0)	
Total	50(86.2)	8(13.8)					

DISCUSSION

The Barthel Index and Modified Rankin Scale are the two traditional functional outcome assessment tools in stroke survivors. To measure post stroke disability, researchers and practitioners often use basic ADL measures. They used the MRS as a reference to categorize the BI scores because they were interested primarily in developing a scheme that

converts basic ADL measures to a global disability measure that presents clinically distinct disability levels.⁷⁻⁸

Compared with non-diabetic stroke patients, patients with T1DM or T2DM were more likely to have hypertension and stroke attributable to small vessel disease. In addition, when compared with non-diabetic patients, those with T2

DM more often had obesity, Peripheral arterial disease (PAD), history of TIA, and stroke attributable to large-artery atherosclerosis, and T2 DM patients were also more likely to be older and male than were the non-diabetic patients.⁹ However our study did not show any adverse outcome amongst people who are diabetic at the time of presentation. Similar results were obtained by Fiorelli.¹⁰

Hypertension is the single most important risk factor for all types of stroke: ischemic stroke, intra cerebral haemorrhage, and aneurysmal subarachnoid haemorrhage. Epidemiologic studies over the past 30 years have demonstrated a dramatic reduction in the incidence and mortality of all stroke types with good control of hypertension, and it appears that all effective antihypertensive agents have similar efficacy in their ability to reduce stroke risk. In addition, it appears that acute treatment of hypertension in the setting of intra cerebral haemorrhage and subarachnoid haemorrhage is beneficial, but it is still uncertain in the setting of ischemic stroke what level of blood pressure will result in the best possible outcome.¹¹ In our study out of 24 hypertensive patients 22 (91.7%) patients using BI score and 14 (58.3%) patients using MRS score had poor functional outcome.

Smoking correlated with higher NIHSS scores on admission for small-vessel occlusion.¹² Our study observed that, all 13 (100.0%) patients who were smoker had very poor functional outcome at follow up by using both BI score and nine (69.2%) smoker patients had poor functional outcome by using MRS score. It was also observed in our study that, risk factor like dyslipidaemia was associated with poor outcome.

CONCLUSION

Conclusion: The prevalence of CVA in patients with risk factors (hypertension, T2DM, dyslipidaemia & smoking) is high. Similarly most of them have adverse functional outcome. However in our study, all patients with risk factors had statistically significant poor functional outcome compared to patients without these risk factors except in Type 2 Diabetes Mellitus & Hypertension where it was not statistically significant. However larger well designed controlled studies with more number of patients are required to establish this conclusion. Our study also demonstrated that stroke functional outcome can be predicted from the baseline as well as follow up BI and MRS scales scores.

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