

Study of clinical profile of stroke in diabetic and non-diabetic patients at tertiary care hospital

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Abstract

Background: Cerebrovascular events are the third most common cause of mortality after coronary disease and cancer. Epidemiologic studies have shown that diabetes is a well-established independent but modifiable risk factor for stroke, both ischemic and hemorrhagic stroke. Present study was done at our tertiary care center to assess the clinical profile, pattern of stroke and correlate level of HBA1C with type of stroke and prognosis in diabetic and non-diabetic patients. **Material and Methods:** Present study was hospital based cross-sectional observational study, conducted in patients of > 18 years age, either gender, with clinical diagnosis of cerebrovascular events which is further supported by clinical examination, NCCT brain. Patients were evaluated for clinical profile and divided as diabetic group and non-diabetic group. **Results:** Hypertension was significantly the most common risk factor present in Diabetic group compared to Non-diabetic group (74.1% vs. 38.7%; p<0.05). The most common type of stroke in both groups was ischemic stroke (77.7% and 72.5% respectively) while the incidence of hemorrhagic stroke in Diabetic and Non-diabetic was 22.3% and 27.5% respectively. 16 (18.8%) patients in Diabetic group died while 69 (81.2%) patients were discharged. 12 (15%) patients in Non-diabetic group died while 68 (85%) patients were discharged. **Conclusion:** Commonest modifiable risk factors in stroke are hypertension, smoking, dyslipidemia, alcohol consumption, and diabetes mellitus. Commonest non-modifiable risk factors are increasing age and male sex. Diabetes is an independent risk factor for stroke.

Keywords: stroke, Diabetes, hypertension, smoking, dyslipidemia, alcohol consumption,

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INTRODUCTION

Cerebrovascular events are the third most common cause of mortality after coronary disease and cancer. The World Health Organization (WHO) defines stroke as 'rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting for 24 hours or more, or leading to death with no apparent cause other than of vascular origin.'¹ Among all CVAs, 80% are ischemic, rest are hemorrhagic.^{1,2} Epidemiologic studies have shown that diabetes is a well-established independent but modifiable risk factor for stroke, both

ischemic and hemorrhagic stroke.³ Emerging Risk Factors Collaboration showed that the adjusted hazard ratios (HRs) with diabetes were 2.27 (1.95–2.65) for ischemic stroke, 1.56 (1.19–2.05) for hemorrhagic stroke and 1.84 (1.59–2.13) for unclassified stroke.⁴ Individuals with diabetes are more likely to suffer from hypertension, myocardial infarction (MI) and high cholesterol than individuals without diabetes. Even prediabetes (defined as impaired glucose tolerance or a combination of impaired fasting glucose plus impaired glucose tolerance) has been linked to a greater risk of stroke.⁵ Hence the present study was done at our tertiary care center to assess the clinical profile, pattern of stroke and correlate level of HBA1C with type of stroke and prognosis in diabetic and non-diabetic patients.

MATERIAL AND METHODS

Present study was hospital based cross-sectional observational study, conducted in Department of General Medicine, SRTR GMC Ambajogai, India. Study duration was of 18 months. Study was approved by institutional ethical committee.

Inclusion criteria: Patients of > 18 years age, either gender, with clinical diagnosis of cerebrovascular events which is further supported by clinical examination, NCCT brain willing to participate

Exclusion criteria: Patients in whom proper clinical history cannot be elicited. Patients with Transient ischemic events. Patients who refuse to give consent for participation

An informed consent was taken in written from patients or patient’s attendant. At admission, detailed history regarding temporal profile of stroke and risk factors such as hypertension, DM, smoking, alcohol intake and previous strokes were recorded. Detailed neurological and other system examinations were done and recorded. Severity of stroke was assessed as per the NIHSS at admission and at the end of 1 week (on the day of discharge); appropriate laboratory testing and imaging were also done and treated as per the standard protocol in intensive care unit and general wards by a single observer and classified as patients with/without DM.

165 patients were evaluated for clinical profile and divided into following two groups:

1. Diabetic: 85 diabetic patients with stroke.

2. Non-- diabetic: 80 non-diabetic patients with stroke.

All patients were examined in detail along with clinical examination, radiological investigations, HbA1C and lipid profile. d4DM was confirmed on the basis of history, history of receiving oral hypoglycemic drugs or insulin, suggestive of diabetes or previous reports of blood sugar or glycosylated hemoglobin (HbA1C) confirming the diagnosis of diabetes according to the World Health Organization criteria. Persons not known to have DM admitted with high blood sugar levels underwent repeat blood sugar (48 h after admission) and HbA1C estimation. Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Quantitative data is presented with the help of Mean and Standard deviation. Comparison among the study groups is done with the help of unpaired t test as per results of normality test. Qualitative data is presented with the help of frequency and percentage table. Association among the study groups is assessed with the help of Fisher test, student ‘t’ test and Chi-Square test. ‘p’ value less than 0.05 is taken as significant.

RESULTS

Majority of the patients in Diabetic Group were in the age groups of 41-50 years and 71-80 years (20%) followed by 61-70 years (17.6%) and mean age was 59.26 ± 15.88 years. Majority of the patients in Non-diabetic Group were in the age group of 71-80 years (21.2%) followed by 41-50 years (17.6%) and mean age was 59.85 ± 14.94 years. There was no significant difference between the groups as per Student t-test ($p > 0.05$).

There was male preponderance in both groups (63.5% and 36.5% respectively) while female patients constituted 36.5% and 36.2% respectively of the study population. There was no significant difference between the groups as per Chi-Square test ($p > 0.05$). The most common clinical presentation in both groups was Hemiplegia (76.4% and 75% respectively) followed by Speech Involvement (36.5% and 38.7% respectively), Altered Sensorium (11.8% and 23.7% respectively), Convulsions (8.2% and 10% respectively), Instability of gait (7.1% and 6.2% respectively), Headache (3.5% and 3.7% respectively) and Vomiting (0% and 2.5% respectively).

Table 1: Distribution of patients according to Age

Age (years)	Diabetic		Non-- diabetic	
	N	%	N	%
31-40 years	13	15.3%	11	13.7%
41-50 years	17	20%	16	20%
51-60 years	14	16.5%	13	16.2%
61-70 years	15	17.6%	16	20%
71-80 years	17	20%	17	21.2%
>80 years	9	10.6%	7	8.9%
Gender				
Male	54	63.5%	51	63.8%
Female	31	36.5%	29	36.2%
Clinical Presentation				
Hemiplegia	65	76.4%	60	75%
Speech Involvement	31	36.5%	31	38.7%
Altered Sensorium	10	11.8%	19	23.7%
Convulsions	7	8.2%	8	10%
Instability of gait	6	7.1%	5	6.2%
Headache	3	3.5%	3	3.7%
Vomiting	0	-	2	2.5%

Hypertension was significantly the most common risk factor present in Diabetic group compared to Non-diabetic group (74.1% vs. 38.7%; $p < 0.05$). Diabetes Mellitus, Smoking and Alcohol cases was higher in Diabetic group compared to Non-diabetic group although it did not reach statistical significance (28.7% vs. 24.5%, 55.3% vs. 53.8% and 28.2% vs. 21.2%). Dyslipidemia and Past H/o of Coronary Artery Disease (CAD) were more prevalent amongst Non-diabetic group but this difference was statistically not significant as per Chi-Square test (16.5% vs. 20% and 14.1% vs. 16.2%; $p > 0.05$).

Table 2: Distribution of patients according to Risk Factors

Risk Factors	Diabetic		Non-diabetic		p Value
	N	%	N	%	
Hypertension	63	74.1%	31	38.7%	<0.05
Diabetes Mellitus	23	28.7%	21	24.5%	>0.05
Dyslipidemia	14	16.5%	16	20%	>0.05
Past H/o of Coronary Artery Disease	12	14.1%	13	16.2%	>0.05
Smoking	47	55.3%	43	53.8%	>0.05
Alcohol	24	28.2%	17	21.2%	>0.05

The mean SBP (141.84±14.74 mmHg vs. 128.16±14.87 mmHg; $p < 0.05$), DBP (105.73±9.23 mmHg vs. 78.05±10.33 mmHg; $p < 0.05$), FBS (160.24±11.64 mg/dl vs. 106.30±19.44 mg/dl; $p < 0.05$), PPBS (211.85±16.09 mg/dl vs. 115.48±36.77 mg/dl; $p < 0.05$), HbA1c (8.08±1.19% vs. 5.55±1.16%; $p < 0.05$) and Triglycerides (217.84±36.18 mg/dl vs. 147.90±39.02 mg/dl; $p < 0.05$) were significantly higher and HDL (38.91±6.38 mg/dl vs. 50.31±6.05 mg/dl; $p < 0.05$) was significantly lower in Diabetic Group compared to Non-diabetic group as per Student t-test ($p < 0.05$). The mean Creatinine (0.65±0.18 mg/dl vs. 0.81±0.19 mg/dl), Cholesterol (189.28±12.69 mg/dl vs. 190.84±13.51 mg/dl) and LDL (103.84±31.12 mg/dl vs. 102.72±28.24 mg/dl) were comparable and statistically not significant as per Student t-test ($p > 0.05$).

Table 3: Baseline parameters of patients

Parameters	Diabetic		Non-diabetic		p Value
	Mean	SD	Mean	SD	
SBP (mmHg)	141.84	14.74	128.16	14.87	<0.05
DBP (mmHg)	105.73	9.23	78.05	10.33	<0.05
FBS (mg/dl)	160.24	11.64	106.30	19.44	<0.05
PPBS (mg/dl)	211.85	16.09	115.48	36.77	<0.05
HbA1c (%)	8.08	1.19	5.55	1.16	<0.05
Creatinine (mg/dL)	0.65	0.18	0.81	0.19	>0.05
Cholesterol (mg/dL)	189.28	12.69	190.84	13.51	>0.05
Triglycerides (mg/dL)	217.84	36.18	147.90	39.02	<0.05
LDL (mg/dL)	103.84	31.12	102.72	28.24	>0.05
HDL (mg/dL)	38.91	6.38	50.31	6.05	<0.05

The most common type of stroke in both groups was ischemic stroke (77.7% and 72.5% respectively) while the incidence of hemorrhagic stroke in Diabetic and Non-diabetic was 22.3% and 27.5% respectively. There was no significant difference between the groups as per Chi-Square test ($p > 0.05$).

Table 4: Distribution of patients according to Type of Stroke

Type of Stroke	Diabetic		Non-diabetic		p Value
	N	%	N	%	
Ischemic	66	77.7%	58	72.5%	>0.05
Hemorrhagic	19	22.3%	22	27.5%	

In Diabetic group, the mean age of patients with ischemic and hemorrhagic stroke was comparable (58.23±16.38 years vs. 62.84±13.76 years). Similarly, in Non-diabetic group, the mean age of patients with ischemic and hemorrhagic stroke was comparable (58.45±14.99 years vs. 63.55±14.51 years). It was observed that between both groups there was no significant difference in the mean age of patients with ischemic stroke and hemorrhagic stroke as per Student t-test ($p > 0.05$).

Table 5: Association of Age and Type of Stroke in patients

Age (years)	Ischemic		Hemorrhagic		p Value
	Mean	SD	Mean	SD	
Diabetic	58.23	16.38	62.84	13.76	>0.05
Non-diabetic	58.45	14.99	63.55	14.51	>0.05
p Value	>0.05		>0.05		

16 (18.8%) patients in Diabetic group died while 69 (81.2%) patients were discharged. 12 (15%) patients in Non-diabetic

group died while 68 (85%) patients were discharged. There was no significant difference between the groups as per Chi-Square test ($p>0.05$).

Table 6: Distribution of patients according to Outcome

Outcome	Diabetic		Non-diabetic		p Value
	N	%	N	%	
Died	16	18.8%	12	15%	>0.05
Discharged	69	81.2%	68	85%	
Total	85	100%	80	100%	

DISCUSSION

India is undergoing a rapid health transition with rising burden of coronary heart disease (CHD). Current estimates from epidemiologic studies from various parts of the country indicate prevalence of CHD to be between 7% and 13% in urban and 2% and 7% in rural populations.² Due to sedentary life style and lack of optimum physical activity, patient may not even experience exercise induced symptoms till they are severe and can lead to catastrophic events. It can be avoided if proper preventive steps are taken.^{6,7} Ischemic heart disease occurs due to atherosclerotic plaque deposits undergoing hemodynamic changes. Pathogenesis actually involves interplay of dyslipidemia with oxidative damage and inflammation of the vascular endothelium leading to atherosclerosis.⁸ Stroke is becoming an important cause of premature death and disability in low- income and middle-income countries like India, largely driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors and the current treatment for patients with established stroke is relatively ineffective. Approximately 50% of patients are left with permanent disability. Effective risk factor intervention offers a real hope of reducing stroke morbidity and mortality. Our study found out that stroke affected more in males as compared to females. This is similar to the studies of Subhash A *et al.*,⁹ Kumar GS *et al.*,¹⁰ Eshwarappa P *et al.*,¹¹ MahaLakshmi AK *et al.*,¹² Zafar A *et al.*,¹³ and Abdalghbar AA *et al.*,¹⁴ Subhash A *et al.*,⁹ found mean age in diabetic stroke patients was 57.5 ± 12.7 years and in non-diabetic stroke patients were 61.3 ± 12.9 years. Males outnumbered females in both the groups. Maximum patients were in the age group of 60–69 years (40%) in diabetic stroke and 60–69 (27.5%) in the non-diabetic group. Kumar GS *et al.*,¹⁰ found maximum patients affected by stroke belonged to the age group of 55 to 64 years (30%) followed by age group of 65 to 74 years (26%). Eshwarappa P *et al.*,¹¹ found mean age in diabetic stroke patients was 56 ± 9.93 and in non-diabetic stroke patients was 59.92 ± 13.26 . Maximum patients were in the age group from 45-54 (42%) in diabetic stroke and 55-64 (23%) in non- diabetic group and the difference was not statistically significant. MahaLakshmi

AK *et al.*,¹² found mean age in Diabetic stroke patients was 56.8 ± 9.74 and in Non-Diabetic stroke patients was 60.5 ± 30.1 . Maximum patients were in the age group from 45-54(36%) in Diabetic stroke and 65-74(24%) in Non-Diabetic group. The most common clinical presentation in both groups in the present study was Hemiplegia (76.4% and 75% respectively) followed by Speech Involvement (36.5% and 38.7% respectively), Altered Sensorium (11.8% and 23.7% respectively), Convulsions (8.2% and 10% respectively), Instability of gait (7.1% and 6.2% respectively), Headache (3.5% and 3.7% respectively) and Vomiting (0% and 2.5% respectively). This is comparable to the studies of Eshwarappa P *et al.*,¹¹ and MahaLakshmi AK *et al.*,¹² Eshwarappa P *et al.*,¹¹ noted history of motor weakness as their most common presenting complaint (>85% in both the groups had hemiparesis/ hemiplegia and 10% had monoparesis/ monoplegia). History of cranial nerve involvement was in 27% in diabetics and 30% in nondiabetics. Visual disturbance was present in 10% of diabetic patients. Speech disorder was present in 27% of diabetics and 30% of non-diabetics. MahaLakshmi AK *et al.*,¹² study on clinical profile of stroke and outcome in diabetics and non-diabetics observed Stroke patients in both study groups presented with history of motor weakness as their most common presenting complaint (90% in both the groups had hemiparesis/hemiplegia and 10% had monoparesis/ monoplegia). History of cranial nerve involvement was in 26% of diabetics and 28% of non- diabetics. Visual disturbance was present in 10% of diabetic patients. Speech disorder was present in 24% of diabetics and 26% of non-diabetics. Altered sensorium was present in 44% of diabetics and 38% of non-diabetic patients. Other complications like headache and unsteadiness of gait, convulsions was present in 10% of diabetics and 8% of non- diabetics. It was observed in the present study that hypertension was significantly the most common risk factor present in Diabetic group compared to Non-diabetic group (74.1% vs. 38.7%; $p<0.05$). Eshwarappa P *et al.*,¹¹ (67 % vs. 27%; $p<0.05$). Subhash A *et al.*,¹⁰ (75 % vs. 42.5%; $p<0.05$) and MahaLakshmi AK *et al.*,¹² (70 % vs. 34 %; $p<0.05$) noted similar observations in their studies.

Hypertension is the single most important factor for all vascular diseases, in general, cardiac and

cerebral, in particular, closely followed by DM. DM hastens atherosclerosis, and atherosclerosis promotes hypertension. Therefore, the prevalence of stroke is higher in diabetics and hypertensives. Eshwarappa P *et al.*,¹¹ noted that, hemorrhagic strokes were more frequent in the non-diabetics and ischemic strokes in the diabetic stroke groups and the difference was statistically significant. The most common type of stroke in both groups in our study was ischemic stroke (77.7% and 72.5% respectively) while the incidence of hemorrhagic stroke in Diabetic and Non-diabetic was 22.3% and 27.5% respectively. There was no significant difference between the groups as per Chi-Square test ($p>0.05$). This finding was like the studies of Subhash A *et al.*,⁹, Kissela BM *et al.*,¹⁵ and MahaLakshmi AK *et al.*,¹² In the present study, in Diabetic group, the mean age of patients with ischemic and hemorrhagic stroke was comparable (58.23 ± 16.38 years vs. 62.84 ± 13.76 years). Similarly, in Non-diabetic group, the mean age of patients with ischemic and hemorrhagic stroke was comparable (58.45 ± 14.99 years vs. 63.55 ± 14.51 years). It was observed that between both groups there was no significant difference in the mean age of patients with ischemic stroke and hemorrhagic stroke. Mulneir HE *et al.*,¹⁶ study on Risk of stroke in people with type 2 diabetes contrasted our study by showing increased risk of stroke in younger patients and more predominantly among females. Women often did not seek health care and believed in natural cure or native medicine. This possibly explains the significant decrease in the female gender. It was observed in the present study that 16 (18.8%) patients in Diabetic group died while 69 (81.2%) patients were discharged. 12 (15%) patients in Non-diabetic group died while 68 (85%) patients were discharged. There was no significant difference between the groups as per Chi-Square test ($p>0.05$). Similar observations were noted in the studies of Eshwarappa P *et al.*,¹¹ Subhash A *et al.*,⁹ Kumar GS *et al.*,¹⁰ and MahaLakshmi AK *et al.*,¹² Hypertension was more common in the diabetics than in the non-diabetics. Hyperglycemia at stroke onset is associated with higher risk of poor outcome independent of the other variables. Treatment or prevention of modifiable risk factors can reduce the mortality and morbidity of stroke. Eshwarappa P *et al.*,¹¹ noted that 65 % had fair recovery in diabetic group as compared to 80% in non- diabetic group. 25% had poor recovery in diabetic and 10% had poor recovery in non- diabetic group. Death was seen in 10% of patients in both the groups. Overall outcome was better in the non- diabetic stroke patients. Subhash A *et al.*,⁹ reported poor stroke outcome was higher in people with diabetes. 37.5% of stroke patients with diabetes had a poor outcome compared to 22.5% of stroke patients without

diabetes. and not statistically significant. MahaLakshmi AK *et al.*,¹² study reported 64% had fair recovery in diabetic group as compared to 80% in non-diabetic group. 24% had poor recovery in diabetic and 10% had poor recovery in non-diabetic group. Death was seen in 12% of diabetic and 10% non-diabetic patients. Overall outcome was better in the non-diabetic stroke patients. It was observed in our study that hypertension was significant risk factor for stroke among patients in diabetic group. This is similar to the studies of Eshwarappa P *et al.*,¹¹ Subhash A *et al.*,⁹ and Abdalghar AA *et al.*,¹⁴ Larsen JR *et al.*,¹⁷ noted higher carotid artery stenosis in patients with abnormal HbA1c. 11 Patients with AIS, the severity of stroke was higher in patients with abnormal HbA1c.¹⁷ HbA1c has been shown to be a biochemical marker and a good predictor of vascular disruption in patients with diabetes.^{18,19} It has also been shown to associate well with diabetic complications.²⁰ However, its prognostic value in the acute neurological conditions such as stroke is still not well-substantiated. HbA1c levels may influence severity in patients with stroke. So HbA1c level may be is an important predictor to evaluate the neurological impairment in patients of stroke with diabetes. Though stroke has several risk factors diabetes is undoubtedly a risk factor and there is a definite and increased risk of acquiring either an ischemic and hemorrhagic stroke which is definitely large and worse causing significant neurological damage with prolonged hospital stay and poor recovery when compared to the general population. The influence of diabetes mellitus as an independent predictor of the incidence of ischemic stroke is well recognized and relates to a variety of causes. Early diagnosis, treatment including lifestyle modification and prevention of diabetes may reduce the development of stroke and its complications and it presents a major challenge for health care professionals facing an epidemic of both diabetes and stroke.

CONCLUSION

Commonest modifiable risk factors in stroke are hypertension, smoking, dyslipidemia, alcohol consumption, and diabetes mellitus. Commonest non-modifiable risk factors are increasing age and male sex. Diabetes is an independent risk factor for stroke. Stroke in diabetes differs from that of stroke in non-diabetics with respect to age, sex, stroke type, stroke severity, prevalence of risk factors, and outcome. Dyslipidemia and Past H/o of Coronary Artery Disease (CAD) were more prevalent amongst non-diabetic group.

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