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Original Research Paper

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COMPARATIVE EVALUATION OF CLINICAL FEATURES, RADIOLOGICAL FINDINGS, AND OUTCOMES IN DIABETIC VS. NON-DIABETIC PATIENTS WITH ACUTE ISCHEMIC STROKE

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ABSTRACT

Acute ischemic stroke (AIS) is a major cause of morbidity and mortality globally. Diabetes mellitus (DM) is a well-established independent risk factor for stroke, associated with increased stroke severity and poorer outcomes. This study aimed to compare the clinical features, radiological findings, and outcomes of AIS in diabetic and non-diabetic patients. **Methods:** This prospective, observational study was conducted at MGM Medical College and Hospital, Navi Mumbai, from May 2022 to 2024. The study included 110 patients diagnosed with AIS, divided into diabetic (n=55) and non-diabetic (n=55) groups. Data collected included demographic variables, clinical presentation, risk factors, radiological findings, and outcomes assessed using the National Institutes of Health Stroke Scale (NIHSS) and the Modified Rankin Scale (mRS). Statistical analysis was performed using SPSS Version 26.0, with a p-value of <0.05 considered statistically significant. **Results:** Diabetic patients showed a higher prevalence of risk factors, including hypertension (43.6% vs. 23.6%, $p<0.01$), obesity (45.5% vs. 23.6%, $p<0.01$), and dyslipidemia (61.8% vs. 36.4%, $p<0.01$). Smoking was significantly more prevalent in non-diabetic patients (30.9%) compared to diabetic patients (7.3%), with a p-value of 0.02. Stroke severity was higher in diabetics, with 25.5% presenting with severe strokes compared to 9.1% of non-diabetics ($p=0.04$). Diabetic patients had significantly lower ejection fractions (47.69 ± 8.66% vs. 54.21 ± 8.37%, $p<0.01$) and higher carotid intima-media thickness (0.96 ± 0.24 mm vs. 0.85 ± 0.23 mm, $p<0.01$). Mortality was higher in diabetic patients with poor glycemic control (25.0%) than those with good control (7.0%, $p<0.01$). **Conclusion:** Diabetic patients with AIS had more severe strokes, poorer functional outcomes, and higher mortality, particularly with poor glycemic control. Effective management of cardiovascular risk factors and stringent glucose control are critical in improving outcomes for this high-risk population.

KEYWORDS : Acute Ischemic Stroke, Diabetes Mellitus, Glycemic Control, Stroke Severity, Vascular Risk Factors

INTRODUCTION

Acute ischemic stroke (AIS) is a leading cause of morbidity and mortality worldwide, contributing significantly to disability-adjusted life years (DALYs) lost [1]. The pathophysiology of AIS involves the sudden reduction of blood flow to a specific region of the brain, leading to neuronal injury and loss of function. Diabetes mellitus (DM), a known independent risk factor for stroke, is associated with a two- to four-fold increased risk of ischemic stroke [2]. The interplay between diabetes and stroke presents a unique challenge, as diabetic patients often exhibit atypical clinical presentations, increased stroke severity, and poorer functional outcomes [3].

Diabetic patients with AIS tend to have distinct clinical profiles characterized by higher incidences of hypertension, dyslipidemia, and atrial fibrillation compared to their non-diabetic counterparts [4]. Furthermore, hyperglycemia in acute settings is a predictor of poor outcomes, regardless of prior diabetic status, as it exacerbates ischemic injury through oxidative stress, inflammation, and impaired cerebrovascular reactivity [5]. Radiologically, diabetic patients may present with larger infarct volumes, higher rates of hemorrhagic transformation, and delayed reperfusion outcomes [6]. Management strategies for AIS in diabetic patients are often complicated by the presence of comorbidities and the need for glycemic control [2]. Studies have shown that diabetic patients have a higher risk of complications such as infections, delayed recovery, and prolonged hospital stays [7]. Evaluating the differences in clinical features, radiological findings, and outcomes between diabetic and non-diabetic patients with AIS is crucial for tailoring treatment protocols and improving prognostic assessments [7].

The aim of this study was to compare the clinical features and investigative findings of non-diabetic and diabetic patients in acute ischemic stroke. The objectives included analyzing the clinical presentation, laboratory parameters, and radiological profiles of both diabetic and non-diabetic patients to identify variations in disease manifestation. Additionally, the study sought to compare these factors between the two groups to understand the influence of diabetes on ischemic stroke, aiding in better diagnosis, management, and treatment strategies.

METHODOLOGY

This prospective, observational study was conducted at MGM Medical College and Hospital, Navi Mumbai, between May 2022 to May 2024. The study aimed to compare the clinical presentation, radiological findings, and outcomes of acute ischemic stroke (AIS) in diabetic and non-diabetic patients. A total of 100 patients diagnosed with AIS were included in the study, with 50 diabetic (Group A) and 50 non-diabetic (Group B) patients enrolled through simple random sampling. Ethical approval was obtained from the Institutional Ethics Committee, and informed consent was obtained from all participants.

Clinical data collected included demographic variables, presenting symptoms, vascular risk factors, and stroke severity assessed using the National Institutes of Health Stroke Scale (NIHSS) at admission. Radiological parameters included the size of infarct, presence of hemorrhagic transformation, and cerebral vessel status assessed through imaging studies. Outcome measures were evaluated using the Modified Rankin Scale (mRS) at discharge and after 30 days, assessing functional independence and recovery. Additional parameters such as hospital stay duration, in-hospital complications, and mortality rates were also recorded.

Data were analyzed using IBM SPSS Statistics 26.0. Descriptive statistics summarized the data, while chi-square and Student's t-tests compared diabetic and non-diabetic groups. A p-value <0.05 was considered statistically significant.

RESULTS

The study compared the clinical features, radiological findings, and outcomes between diabetic and non-diabetic

patients with acute ischemic stroke. The results are presented in terms of demographic variables, clinical parameters, laboratory findings, and functional outcomes, highlighting significant differences between the two groups.

The gender distribution was identical in both groups, with 27.3% females (15 out of 55) and 72.7% males (40 out of 55) in each group, resulting in an overall male predominance of 72.3%. The p-value of 1.00 indicates no statistically significant difference in gender distribution between the groups. The mean age of diabetic patients was 61.29 ± 9.33 years, while non-diabetic patients had a mean age of 64.16 ± 9.55 years, with no significant difference observed (p = 0.113). Among diabetic patients, the duration of diabetes varied, with 20.0% having diabetes for ≤5 years, 40.0% for 6-10 years, and another 40.0% for more than 10 years. (Table 1)

Overall, the presenting symptoms were largely comparable between diabetic and non-diabetic groups. (Table 1)

The most common symptom in both groups was one-sided weakness, observed in 67.3% of diabetics and 72.7% of non-diabetics, with no significant difference between the groups (p = 0.67). Dysarthria was also prevalent, affecting 41.8% of diabetics and 40.0% of non-diabetics (p = 0.84). The occurrence of loss of consciousness (LoC) was similar between groups, with 21.8% in diabetics and 25.5% in non-diabetics (p = 0.82). Other symptoms, including headache (5.5% vs. 7.3%, p = 0.69), vomiting (5.5% vs. 1.8%, p = 0.308), and convulsions (0.0% vs. 5.5%, p = 0.24), showed no statistically significant differences.

Table 1. Comparison of study parameters between diabetic and non-diabetic group

	Diabetic (n=55)	Non-diabetic (=55)	Total (n=110)		p-value
Gender	Female	15 (27.3%)	15 (27.3%)	30 (27.3%)	1.00
	Male	40 (71.7%)	40 (72.7%)	80 (72.3%)	
Age (years)	61.29±9.33	64.16±9.55	62.725±9.44		0.113
Duration of diabetes	<=5	11 (20.0%)	--	11 (20.0%)	--
	6-10	22 (40.0%)	--	22 (40.0%)	--
	>10	22 (40.0%)	--	22 (40.0%)	--
Presenting Symptoms					
Headache	3 (5.5%)	4 (7.3%)	7 (6.4%)		0.69
One sided weakness	37 (67.3%)	40 (72.7%)	77 (70.0%)		0.67
Dyarthria	23 (41.8%)	22 (40.0%)	45 (40.9%)		0.84
LoC	12 (21.8%)	14 (25.5%)	13 (23.6%)		0.82
Vomiting	3 (5.5%)	1 (1.8%)	4 (3.6%)		0.308
Convulsions	0 (0.0%)	3 (5.5%)	3 (2.7%)		0.24
Risk factors					
Hypertension	24 (43.6%)	13 (23.6%)	37 (33.6%)		<.01
Alcohol	11 (20.0%)	10 (18.2%)	21 (19.1%)		1.00
Smoking	4 (7.3%)	13 (23.64%)	17 (15.5%)		0.02
Tobacco	9 (16.4%)	16 (29.1%)	25 (22.7%)		0.17
Obesity	25 (45.5%)	13 (23.6%)	38 (34.5%)		<.01
Dyslipidemia	34 (61.8%)	20 (36.4%)	54 (49.1%)		<.01
Other factors					
2D Echo	Ejection Fraction (%)	47.69 ± 8.66	54.21 ± 8.37	50.95 ± 8.52	<.01
CIMT (mm)	0.96 ± 0.24	0.85 ± 0.23	0.905 ± 0.24	<.01	
Circulation involved	Anterior	43 (78.2%)	47 (85.5%)	90 (81.8%)	0.45
	Post-erior	12 (21.8%)	8 (14.5%)	20 (18.2%)	
Concentric LVH on 2-D echo	No	42 (76.4%)	50 (90.9%)	92 (83.6%)	0.069
	Yes	13 (23.6%)	5 (9.1%)	18 (16.4%)	
Investigations					
HbA1c (%)	7.13 ± 1.31	5.80 ± 0.48	6.47 ± 0.90		<.01
TC (mg%)	186.93 ± 46.20	166.53 ± 46.20	176.73 ± 46.20		0.024
HDL (mg%)	46.73 ± 8.88	49.93 ± 8.88	48.33 ± 8.88		0.062
LDl (mg%)	106.76 ± 37.95	101.66 ± 37.95	104.21 ± 37.95		0.48
Triglycerides (mg%)	150.85 ± 65.12	131.25 ± 63.39	141.05 ± 64.26		0.043
Hospital stay (days)	14.01 ± 3.43	10.29 ± 3.55	12.15 ± 3.49		<.01

Hypertension was significantly more prevalent among diabetics (43.6%) compared to non-diabetics (23.6%), with a statistically significant p-value of <0.01. Obesity also showed a significant difference, affecting 45.5% of diabetics versus 23.6% of non-diabetics (p < 0.01). Dyslipidemia was notably higher in diabetic patients (61.8%) compared to non-diabetic patients (36.4%), with this difference also reaching statistical significance (p < 0.01). Smoking was notably more prevalent in non-diabetics (23.64%) compared to diabetics (7.3%), with a statistically significant p-value of 0.02. Other risk factors, including alcohol consumption (20.0% in diabetics vs. 18.2% in non-diabetics, p = 0.808), and tobacco use (16.4% vs. 29.1%, p = 0.17), did not show significant differences between the two groups. These findings suggest that hypertension, obesity, and dyslipidemia are significantly associated with diabetes in stroke patients. (Table 1)

The mean ejection fraction was significantly lower in diabetic patients (47.69 ± 8.66%) compared to non-diabetic patients (54.21 ± 8.37%), with a statistically significant p-value of <0.01. CIMT was higher in diabetics (0.96 ± 0.24 mm) than in non-diabetics (0.85 ± 0.23 mm), also showing a significant difference (p < 0.01). The involvement of anterior circulation was slightly higher in non-diabetics (85.5%) than in diabetics (78.2%), while posterior circulation involvement was more common in diabetics (21.8%) compared to non-diabetics (14.5%); however, this difference was not statistically significant (p = 0.45). Regarding concentric LVH on 2-D echo, a higher percentage of diabetic patients (23.6%) had LVH compared to non-diabetic patients (9.1%), but this difference did not reach statistical significance (p = 0.069). These findings highlight that diabetic patients with stroke are more likely to have reduced cardiac function and increased vascular thickness, indicating a higher cardiovascular risk profile. (Table 1)

The mean HbA1c level was significantly higher in diabetic patients (7.13 ± 1.31%) compared to non-diabetic patients (5.80 ± 0.48%), indicating poor glycemic control among diabetics (p < 0.01). The total cholesterol (TC) was also significantly higher in diabetics (186.93 ± 46.20 mg%) compared to non-diabetics (166.53 ± 46.20 mg%) with a p-value of 0.024. Although the high-density lipoprotein (HDL) levels were lower in diabetics (46.73 ± 8.88 mg%) than in non-diabetics (49.93 ± 8.88 mg%), this difference was not statistically significant (p = 0.062). Low-density lipoprotein

(LDL) levels were comparable between the groups (106.76 ± 37.95 mg% in diabetics vs. 101.66 ± 37.95 mg% in non-diabetics, p = 0.48). Triglycerides were significantly elevated in diabetics (150.85 ± 65.12 mg%) compared to non-diabetics (131.25 ± 63.39 mg%), with a p-value of 0.043. The mean hospital stay was notably longer for diabetic patients (14.01 ± 3.43 days) compared to non-diabetic patients (10.29 ± 3.55 days), showing a statistically significant difference (p < 0.01). These findings suggest that diabetic patients not only present with poorer metabolic profiles but also experience prolonged hospitalization. (Table 1)

Table 2. Comparison of Diabetics and Non-Diabetics as per severity of stroke, mRS Score and Mortality

		Diabetic (n=55)	Non-diabetic (=55)	Total (n=110)	p-value
Stroke Severity (NIHSS)	Mild	32 (58.2%	37 (67.3%	69 (62.7%)	0.04
	Moderate	9 (16.4%)	13 (23.6%)	22 (20.0%)	
	Severe	14 (25.5%)	5 (9.1%)	19 (17.3%)	
mRS Score	1	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.04
	2	14 (25.8%)	17 (30.9%)	31 (28.18%)	
	3	26 (47.3%)	23 (41.8%)	49 (44.5%)	
	4	4 (7.27%)	11 (20.0%)	15 (13.63%)	
	5	5 (9.1%)	2 (3.6%)	7 (6.4%)	
	6	6 (10.9%)	2 (3.6%)	8 (7.27%)	
Mortality	Yes	6 (10.9%)	2 (3.6%)	8 (7.3%)	0.067
	No	49 (89.1%)	53 (96.4%)	102 (92.7%)	

Table 2 shows that diabetic patients with acute ischemic stroke had significantly higher stroke severity, with 25.5% experiencing severe strokes compared to 9.1% of non-diabetics (p = 0.04). Functional outcomes, measured by the mRS score, indicated poorer outcomes in diabetics, with a higher proportion scoring 4 or above. Although mortality was higher in diabetic patients (10.9%) than in non-diabetic patients (3.6%), this difference was not statistically significant (p = 0.067). These results suggest that diabetic patients tend to have more severe strokes and worse functional outcomes.

Table 3 compares mortality rates among diabetic patients with acute ischemic stroke based on glycemic control. Mortality was significantly higher in patients with poor glycemic control (HbA1c ≥ 6.5%), with 25.0% mortality compared to only 7.0% in those with good glycemic control (HbA1c < 6.5%). The survival rate was higher among patients with good glycemic control (93.0%) compared to those with poor control (75.0%). The p-value of <0.01 indicates a statistically significant association between poor glycemic control and increased mortality.

Table 3. Comparison of Diabetics and Non-Diabetics as per mortality

Glycaemic Control (HbA1c)	Mortality (n=6)	Survival (n=49)	Total (n=55)	p-value
Poor (HbA1c >=6.5%)	3 (25.0%)	9 (75.0%)	12 (100.0%)	<.01
Good (<6.5%)	3 (7.0%)	40 (93.0%)	43 (100.0%)	

DISCUSSION

This study evaluated the clinical features, radiological findings, and outcomes of diabetic and non-diabetic patients with acute ischemic stroke (AIS). The findings revealed that diabetic patients had a higher prevalence of risk factors such as hypertension, obesity, and dyslipidemia, consistent with previous studies highlighting the increased cardiovascular risk in diabetic populations [8]. These risk factors likely contribute to the higher stroke severity and poorer outcomes observed in diabetic patients, as indicated by the National Institutes of Health Stroke Scale (NIHSS) and Modified Rankin Scale (mRS) scores.

The study found that diabetic patients were more likely to present with severe strokes (25.5%) compared to non-diabetics (9.1%), with a significant difference in stroke severity (p = 0.04). This aligns with existing literature suggesting that hyperglycemia exacerbates neuronal damage during ischemic events, leading to worse clinical presentations [9]. The lower ejection fraction and higher carotid intima-media thickness (CIMT) in diabetics further support the notion of advanced atherosclerotic disease and impaired cardiovascular function in this group, contributing to a poorer prognosis [10].

Glycemic control played a crucial role in outcomes, as evidenced by significantly higher mortality rates in diabetic patients with poor glycemic control (HbA1c ≥ 6.5%) compared to those with good control (p < 0.01). This finding emphasizes the need for stringent glucose management in diabetic stroke patients to improve survival and functional outcomes. Previous studies have similarly demonstrated that better glycemic control reduces complications and enhances recovery in stroke patients [11]. The higher prevalence of smoking among non-diabetic patients with acute ischemic stroke (30.9%) compared to diabetic patients (7.3%) aligns with findings by Pan et al. (2015) and Khaw et al. (2014), suggesting better smoking cessation adherence among diabetics [12,13].

The study emphasizes early control of risk factors in diabetic AIS patients. Targeted therapy and tailored rehabilitation may reduce mortality and improve outcomes.

CONCLUSION

In conclusion, this study highlights that diabetic patients with acute ischemic stroke experience higher stroke severity, poorer functional outcomes, and increased mortality, particularly with poor glycemic control. Effective management of cardiovascular risk factors and stringent glucose control are crucial in improving outcomes for this high-risk group.

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