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Original Research Article

Stroke Pattern In Diabetic Vs Non-Diabetic Patients

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Abstract: *Stroke is a leading cause of morbidity and mortality worldwide, with diabetes mellitus being a major risk factor influencing stroke patterns. Understanding the differences in stroke types and associated risk factors in diabetic and non-diabetic patients can help optimize prevention and management strategies.* ***Objective:*** *This study aimed to compare stroke patterns in diabetic and non-diabetic patients, focusing on the prevalence of ischemic and hemorrhagic strokes and associated vascular risk factors.* ***Methodology:*** *A comparative cross-sectional study was conducted on 60 patients aged 25 years and above who were equally divided into diabetic and non-diabetic groups based on documented medical history and standard diagnostic criteria. Stroke diagnosis was confirmed via neuroimaging with classification into ischemic or hemorrhagic subtypes.* ***Results:*** *The diabetic group had a mean age 55.03±10.09 years while non-diabetics averaged 56.77±11.02 years. BMI was notably higher in diabetics 29.43±2.35 kg/m² vs. 25.82±2.13 kg/m². Hypertension and dyslipidemia were more frequent in diabetics at 46.7% and 36.7% respectively compared to 20.0% and 13.3% in non-diabetics. A history of cardiovascular disease was significantly higher in diabetics, 26.7% vs. 6.7%. Ischemic strokes were more frequent among diabetics, 83.3%, compared to non-diabetics, 56.7%.* ***Conclusion:*** *Diabetes considerably influences stroke patterns with a higher prevalence of ischemic strokes and associated vascular risk factors.*

Keywords: Diabetes mellitus, Ischemic stroke, Hemorrhagic stroke, Hypertension, Dyslipidemia, Risk factors

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Introduction

Diabetes mellitus (DM) is a multifaceted metabolic disorder marked by hyperglycemia, which is defined by persistently raised blood glucose levels. Hyperglycemia arises from irregularities in insulin secretion, insulin action, or both, and presents chronically as well as heterogeneously as dysfunctions in fat, carbohydrate, and protein metabolism. Diabetes exhibits a progressive trajectory with an intricate pathogenesis and diverse manifestations (1, 2). Hyperglycemia impacts various organs and impairs their normal functions. These disruptions develop progressively as well as primarily result from the detrimental impacts of hyperglycemia and its related metabolic abnormalities on normal functioning and structure of micro- along with macrovasculature that is fundamental to organ structure and function through the body (3, 4).

A cerebrovascular accident, commonly referred to as a stroke, is classified into two main categories: ischemic as well as hemorrhagic. In both categories, the outcome is diminished blood flow, nutrients, and oxygen to a specific brain region, leading to neuronal damage and afterwards neurological deficits. Stroke can be attributed to various factors, including prolonged hypertension, arteriosclerosis, as well as emboli resulting from atrial fibrillation or rheumatic fever. In younger patients, potential causes may encompass clotting disorders and different types of vasculitis. In cases of potential stroke presentation, it is essential to conduct a complete physical and medical history, as well as obtain urgent neurological imaging, prior to initiating any treatment (5, 6).

A study revealed a higher incidence of strokes among diabetic patients compared to non-diabetic patients (7). One of the limited studies on stroke patterns in diabetes mellitus carried out in Pakistan found no disparity in age between diabetic patients as well as people without diabetes with stroke. Sub-cortical infarcts occurred more frequently in individuals with diabetes, which was identified as a risk factor for ischemic stroke, but not for hemorrhagic stroke (8).

The study of stroke patterns in diabetic compared to non-diabetic patients is justified by the increasing incidence of diabetes and its established relationship with an elevated stroke risk. This comparison may assist in identifying specific risk factors in diabetic patients, refining prevention strategies, and tailoring treatment protocols, thereby enhancing patient care and decreasing stroke-related mortality and morbidity in this high-risk population.

Methodology

The study employed a comparative cross-sectional design conducted from June 2024 to December 2024 at [Saidu Group of Teaching Hospital, Swat]. Ethical considerations were adhered to with informed consent obtained from all participants prior to enrollment in the study.

Sixty patients aged 25 years and above were recruited and categorized into two groups of 30 each based on their diabetic status. Diabetes was defined using established clinical criteria, including a documented history of diabetes mellitus, a fasting blood glucose level exceeding 126 mg/dL, or a random blood glucose level above 200 mg/dL. Patients who did not meet these criteria and exhibited normal glucose levels at the time of admission were classified as non-diabetic.

A comprehensive clinical assessment was conducted, including demographic details, medical history and the presence of vascular risk factors such as hypertension, dyslipidemia, smoking, and previous cardiovascular events. Blood pressure measurements were obtained using standardized protocols and lipid profiles were assessed to determine dyslipidemia status. Patients with conditions that could confound the

results, such as stress-induced hyperglycemia prior to head trauma, anticoagulant use or metabolic disorders unrelated to diabetes were omitted from the study.

Neurological evaluation was performed upon admission with stroke diagnosis confirmed through neuroimaging techniques including computed tomography (CT) and magnetic resonance imaging (MRI). Stroke classification followed standard criteria distinguishing between ischemic and hemorrhagic types based on radiological findings. For ischemic strokes, further subclassification was conducted, differentiating between cortical and subcortical infarcts, brainstem involvement and cerebellar infarctions.

Data analysis was performed using SPSS 24 to compare risk factors and stroke patterns between the two groups. The significance of differences in stroke and risk factor prevalence between both groups was assessed using the Chi Square test while the value of P was kept notable at < 0.05.

Results

When looking at the ages of these patients, the diabetic group had an average age of 55.03±10.094 years while their non-diabetic counterparts were slightly older on average at 56.77±11.022 years. As for BMI, those with diabetes showed a higher mean value of 29.4307±2.34823 kg/m² as compared to 25.8253±2.13491 kg/m² in the non-diabetic group.

Gender distribution revealed that among the diabetic group 21 (70.0%) were male and 9 (30.0%) were female. In the non-diabetic group 19 (63.3%) were male and 11 (36.7%) were female, showing a slight tilt toward more males in both groups (Figure 1). When it came to hypertension 14 (46.7%) of the diabetic participants had it while only 6 (20.0%) of the non-diabetics had it (P = 0.02). Dyslipidemia followed a similar trend with 11 (36.7%) diabetics affected compared to 4 (13.3%) in the non-diabetic group (P = 0.03). A history of cardiovascular disease was noted in 8 (26.7%) of the diabetics but only 2 (6.7%) of the non-diabetics (P = 0.03). Smoking habits were fairly close between the two with 12 (40.0%) diabetics and 11 (36.7%) non-diabetics reporting they smoked (P = 0.79). As for a previous stroke around 5 (16.7%) in the diabetic group had experienced it as compared to just 1 (3.3%) in the non-diabetic group (P = 0.08) (Table 1).

Regarding the type of stroke, our findings revealed that in the diabetic group, 25 (83.3%) had an ischemic stroke while 5 (16.7%) experienced a hemorrhagic stroke. Meanwhile in the non-diabetic group 17 (56.7%) had an ischemic stroke and 13 (43.3%) had a hemorrhagic one. It seemed that the ischemic strokes were more common overall but especially among the diabetics while hemorrhagic strokes showed up more often in the non-diabetics (P = 0.02) (Table 2).

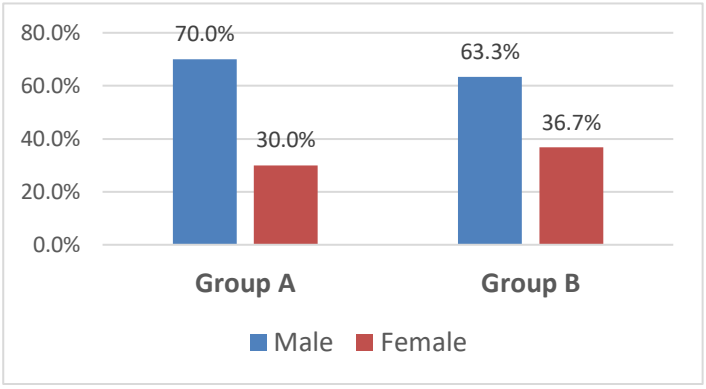

Figure 1 Gender distribution between both groups.

Table 1 Clinical profile of the patients

Clinical profile		Groups				P value
		Diabetic		Non diabetic		
		N	%	N	%	
Hypertension	Yes	14	46.7%	6	20.0%	0.02
	No	16	53.3%	24	80.0%	
Dyslipidemia	Yes	11	36.7%	4	13.3%	0.03
	No	19	63.3%	26	86.7%	
History of CVD	Yes	8	26.7%	2	6.7%	0.03
	No	22	73.3%	28	93.3%	
Smoking	Yes	12	40.0%	11	36.7%	0.79
	No	18	60.0%	19	63.3%	
History of stroke	Yes	5	16.7%	1	3.3%	0.08
	No	25	83.3%	29	96.7%	

Table 2: Type of stroke

		Type of stroke		Total	P value
		Ischemic	Hemorrhagic stroke		
Groups	Diabetic	25	5	30	0.02
		83.3%	16.7%	100.0%	
	Non diabetic	17	13	30	
		56.7%	43.3%	100.0%	
Total		42	18	60	
		70.0%	30.0%	100.0%	

Discussion

Age is a crucial factor in stroke incidence. In our study, the mean age of diabetic stroke patients was slightly lower (55.03±10.094 years) than that of non-diabetic stroke patients, 56.77±11.022 years. This is consistent with some studies, such as the research conducted by Ali R et al., which reported a mean age of 62.48±11.56 years for diabetics and 65.25±14.05 years for non-diabetics (9).

Body mass index (BMI) was significantly higher in diabetics 29.43±2.35 kg/m² than non-diabetics 25.82±2.13 kg/m² in our study. This aligns with Morsy et al., who mentioned that diabetic stroke patients had a higher prevalence of obesity (10). The elevated BMI in diabetics can be attributed to insulin resistance and metabolic syndrome, which exacerbate the risk of ischemic stroke.

Gender distribution in our study showed a male predominance in both groups, with slightly higher proportions in diabetics 70.0% compared to

non-diabetics 63.3%. This is in line with Ali R et al.'s findings, which reported a male-to-female ratio of 1.1:1 in diabetics and 2.1:1 in non-diabetics (9). Similarly, Subhash et al. found that men outnumbered women in both diabetic and non-diabetic groups (11). These results suggest that while stroke is generally more common in men, the difference in gender distribution between diabetic and non-diabetic stroke patients is not highly significant.

Hypertension was markedly more prevalent among diabetics in our study, 46.7% as compared to non-diabetics, 20.0%. This supports several studies, including Morsy et al., who found a significantly higher prevalence of hypertension among diabetics, 77% compared to non-diabetics, 63%(10). Ali R et al. also reported a high incidence of hypertension in diabetic stroke patients (9). Given that hypertension is a major contributor to both ischemic and hemorrhagic strokes, its higher prevalence in diabetics underscores the need for stringent blood pressure management in this population.

Dyslipidemia was also more common in diabetics in our study (36.7% vs. 13.3% in non-diabetics). Morsy et al. similarly reported notably higher dyslipidemia in diabetics 62% compared to non-diabetics 45% (10). This increased prevalence of dyslipidemia in diabetics contributes to accelerated atherosclerosis which further increases their risk of ischemic stroke.

Cardiovascular disease history was notably higher among diabetics, 26.7% compared to non-diabetics, 6.7% in our data. Subhash et al. found similar trends, reporting a higher prevalence of coronary artery disease among diabetics 32.5% than non-diabetics 27.5%(11). The interplay between diabetes and cardiovascular disease further elevates stroke risk in diabetics, reinforcing the need for aggressive cardiovascular risk factor management.

Smoking prevalence was similar between the two groups in our study, with 40.0% of diabetics and 36.7% of non-diabetics being smokers. This is in agreement with Ali R et al., who found no significant difference in smoking prevalence between diabetics and non-diabetics (9). However, smoking remains a potent risk factor for stroke, especially in diabetics, where it compounds the effects of vascular inflammation and endothelial dysfunction.

The history of previous strokes was considerably higher in diabetics 16.7% compared to non-diabetics 3.3% in our study. This aligns with findings from Jain et al., who reported a notably higher recurrence of strokes in diabetics (12). The increased risk of recurrent stroke in diabetics highlights the importance of secondary stroke prevention strategies in this group.

The most striking finding in our study was the distribution of stroke types. Ischemic stroke was significantly more prevalent among diabetics, 83.3%, compared to non-diabetics, 56.7%, while hemorrhagic stroke was more common in non-diabetics, 43.3%, than in diabetics, 16.7%. This pattern is consistent with Ali R et al., who found ischemic stroke in 85% of diabetics and 62.5% of non-diabetics (9). Similarly, Subhash et al. reported that ischemic stroke was more frequent in diabetics 77.5% compared to non-diabetics 72.5% (11). The preference for ischemic stroke in diabetics is thought to result from chronic atherosclerotic changes, while hemorrhagic stroke, more common in non-diabetics, may be linked to hypertensive vascular rupture.

Our findings are in strong agreement with existing literature reinforcing the well-established association between diabetes and ischemic stroke. The significant presence of comorbidities such as hypertension, dyslipidemia, and cardiovascular disease in diabetics further substantiates their heightened risk profile.

Conclusion

We conclude that diabetes remarkably influences stroke patterns, with a higher prevalence of ischemic stroke and increased vascular risk factors compared to non-diabetics. The presence of hypertension, dyslipidemia, and recurrent strokes underscores the need for aggressive preventive strategies in diabetic patients. Effective glycemic control and cardiovascular risk management could help mitigate stroke burden and improve long-term outcomes.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-MMNCS-0331d-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Review of Literature, Data entry, Data analysis, and drafting article.
GR (Post Graduate Resident**)**
Conception of Study, Development of Research Methodology Design,
WA (Resident Nephrologist**)**
Manuscript review
ZUD (Resident Nephrologist**)**
Manuscript review
SH (Post Graduate Resident**)**
Review of Literature.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

1. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes care. 2014; 37(1):81-90.
2. Riddle MC, Bakris G, Blonde L, Boulton AJ, D'alessio D, De Groot M, Cefalu WT. Introduction: standards of medical care in diabetes—2018. Diabetes Care. 2018; 41(1):1-2.
3. American Diabetes Association. 10. Microvascular complications and foot care: standards of medical care in diabetes—2018. Diabetes care. 2018; 41(1):105-18.
4. American Diabetes Association. 9. Cardiovascular disease and risk management: standards of medical care in diabetes—2018. Diabetes care. 2018; 41(1):86-104.
5. Hankey GJ. Stroke. Lancet. 2017; 389(10069):641-654.
6. Murphy SJ, Werring DJ. Stroke: causes and clinical features. Medicine. 2020; 48(9):561-6.
7. Sarkar RN, Banerjee S, Basu A. Comparative evaluation of diabetic and non-diabetic stroke--effect of glycaemia on outcome. J Indian Med Assoc. 2004; 102(10):551-3.
8. Zafar A, Shahid SK, Siddiqui M, Khan FS. Pattern of stroke in type 2 diabetic subjects versus non diabetic subjects. J Ayub Med Coll Abbottabad. 2007; 19(4):64-7.
9. Ali R, Kazmi S, Iqbal MZ. Pattern of stroke in diabetics and non-diabetics. J Ayub Med Coll Abbottabad. 2013; 25(1-2):89-92.
10. Morsy EY, Rohoma KH, Ali SA, Elhalawany SH. Comparison study of clinical presentation and risk factors for cerebrovascular stroke in diabetic versus nondiabetic patients. Egypt J Intern Med. 2022; 34 (1):78.

11. Subhash A, Kumar CR, Singh NK, Krishnamurthy S, Nagabushana MV, Reddy YJV. Stroke in patients with and without diabetes mellitus. J Clin Sci Res. 2018; 7(1):7-11.
12. Jain D, Chawala M, Paul BS, Mittal N, Jain A, Puri S. Profile of cerebrovascular accidents in subjects with or without type 2 diabetes mellitus in intensive care units of a tertiary care centre. J Anaesthesiol Clin Pharmacol. 2020; 36(2):251-4.