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Original Research Article

PATTERN OF STROKE IN PATIENTS WITH DIABETES MELLITUS PRESENTING TO TERTIARY CARE HOSPITAL

KHAN A*, KHAN W, JABBAR A, AHAD A, ZIAULLAH, SHAFIQ M

Department of General Medicine, Saidu Group of Teaching Hospital, Swat, Pakistan
**Corresponding author email address:* aairam99162@gmail.com

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ABSTRACT

Background: *Stroke remains a leading cause of morbidity and mortality globally, with diabetes mellitus being a significant risk factor. Diabetic patients are predisposed to both ischemic and hemorrhagic stroke due to vascular complications. Understanding the stroke pattern in diabetic individuals is crucial for targeted prevention and management strategies.* ***Objective:*** *To assess the pattern of stroke—ischemic or hemorrhagic-in diabetic patients presenting to a tertiary care hospital.* ***Study Design:*** *Descriptive cross-sectional study.* ***Setting:*** Department of Medicine, Saidu Teaching Hospital, Swat. ***Duration of Study:*** *The study spanned a defined period (29-July-2023 to 29-January-2024).* ***Methods:*** *A total of 100 diabetic patients presenting with stroke were enrolled. Demographic data, including age, gender, and history of hypertension, were collected. Stroke type was confirmed using neuroimaging techniques such as CT or MRI. Statistical analysis was performed using SPSS version 24, with chi-square tests applied to assess the association between patient characteristics and stroke type. A p-value ≤ 0.05 was considered statistically significant.* ***Results:*** *The mean age of participants was 51.65 ± 13.56 years. A male predominance was noted (61%). Hypertension was present in 61% of patients. Ischemic stroke was more prevalent (87%) compared to hemorrhagic stroke (13%). A statistically significant association was found between increasing age and the type of stroke (p = 0.02).* ***Conclusion:*** *Ischemic stroke is significantly more common than hemorrhagic stroke among diabetic patients, accounting for 87% of cases. Age appears to be an essential factor influencing stroke type. These findings underscore the need for proactive screening and prevention of ischemic events in diabetic populations.*

Keywords: Diabetes Mellitus, Stroke Pattern, Ischemic Stroke, Hemorrhagic Stroke, Hypertension, Tertiary Care

INTRODUCTION

Diabetes mellitus (DM), often referred to as diabetes, is a severe and chronic condition identified by consistently elevated blood glucose levels (1). This occurs either due to insufficient insulin production or the body's inability to use the insulin produced efficiently. Diabetes impacts people across all ages, genders, and regions, establishing itself as a leading global contributor to mortality and morbidity. Both hereditary and environmental factors play a significant role throughout the etiopathogenesis of type 2 diabetes, causing more than 90% of all cases (1). The predominant forms of diabetes mellitus are type 1 and type 2, each with established diagnostic criteria. The leading cause of type 1 diabetes is the autoimmune destruction of pancreatic beta cells. Type 2 diabetes is greatly affected by genetic factors and is closely associated with obesity as well as a lack of physical activity (1-4).

Stroke is the 3rd leading cause of mortality globally, resulting in 5.8 million deaths each year. This is now recorded as a major contributor to mortality in Sub-Saharan Africa (5). The worldwide prevalence of stroke is estimated at around 15 million new cases annually. Notably, the fatality rate is exceptionally high in sub-Saharan Africa, where 85% of stroke-related deaths are reported (6, 7). The American Heart Association classifies stroke into two subtypes: ischemic and hemorrhagic, with occurrence rates of approximately 87% and 13%, respectively. The fatality rate associated with ischemic strokes was lower than that of hemorrhagic strokes (8). The incidence of stroke has shown a 40% reduction, especially in developed nations; conversely, there has been a significant rise in developing regions (9, 10). Stroke risk factors are categorized into two groups: modifiable and non-modifiable. Non-modifiable risk factors involve age, sex, and race/ethnicity. In contrast, modifiable risk factors encompass hypertension, smoking, poor diet, and a sedentary lifestyle (11, 12). A study observed the pattern of strokes, i.e., Ischemic Stroke (85%), and Hemorrhagic Stroke (15%) in diabetic patients (13).

Information is scarce locally despite the high proportion of work on the topic being done internationally. For this reason, we intend to conduct this study to better understand the stroke rate in our diabetic population. This will aid us in formulating a more effective strategy for the primary stroke prevention program in the diabetic population through antiplatelet agents.

METHODOLOGY

This descriptive study was initiated at the Department of Medicine, Saidu Teaching Hospital, Swat, 29 July 2023—29 January 2024, after obtaining ethical clearance from the institute. We selected a sample of 100 patients based on a 15% prevalence of hemorrhagic strokes among diabetic patients (13), confidence interval 95%, and margin of error 7%.

The study recruited diabetic patients aged 20 to 70 years who were either male or female presenting with confirmed neurological deficits such as hemiplegia, speech dysfunction, hemiparesis, hemianaesthesia, vertigo, or hemianopia. Diabetes was defined as a fasting plasma glucose level greater than 126 mg/dL or a random blood glucose level above 200 mg/dL. Patients with a history of head trauma, intracranial tumors, or pregnancy were screened out. A demographic profile was collected for all patients. All participants underwent a CT scan of the brain to confirm the stroke type, either ischemic or hemorrhagic, based on the radiological findings. Ischemic stroke was defined by the presence of a hypodense area in brain parenchyma, while hemorrhagic stroke was defined by a hyperdense blood collection surrounded by hypodense edema. SPSS 23 was utilized for data analysis. For age, we calculated mean and SD, while for gender, residence, hypertension, and stroke pattern, we used frequencies and percentages. Chi-Square test was used for assessing

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the association of stroke pattern with demographic profile, keeping the P value significant at ≤ 0.05.

RESULTS

The mean age of 100 patients in our cohort was 51.65±13.56 years. The demographic profile exhibited that 61 (61.0%) and 39 (39.0%) were females. Hypertension was seen in 61 (61.0%) participants (Table 1).

The pattern of stroke revealed that ischemic stroke was far more common, it was found in 87 (87.0%) cases, while hemorrhagic stroke was seen in only 13 (13.0%) patients (Table 2). Subgroup analysis further revealed that ischemic stroke was most prevalent in the 51–70-year age group, making up 51 (58.6%) cases, which was followed by the 36–50-year group with 24 (27.6%) cases. Hemorrhagic stroke, on the other hand, was less frequent but was notably higher in the 51–70-year group with 8 (61.5%) cases (P = 0.02). Gender, we observed that males had a slightly higher frequency of ischemic stroke, 51 (58.6%), and hemorrhagic stroke, 10 (76.9%), but the difference could not reach a point of association (P > 0.05). Hypertension was linked with ischemic stroke in 54 (62.1%) cases and hemorrhagic stroke in 7 (53.8%), but showed no notable association (P = < 0.05) (Table 3).

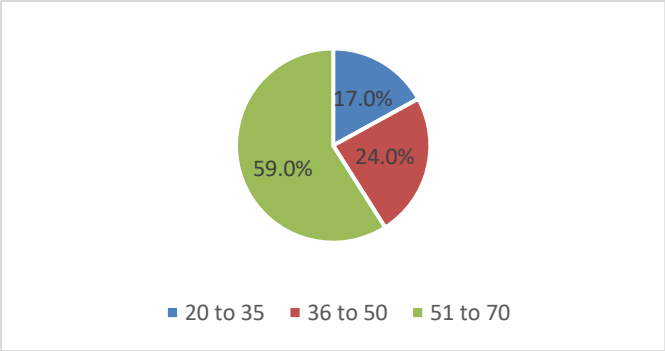

Figure 1: Age distribution (Years)

Table 1: Demographic profile

Demographic profile		Frequency	%
Gender	Male	61	61.0%
	Female	39	39.0%
Residence	Urban	56	56.0%
	Rural	44	44.0%
Hypertension	Yes	61	61.0%
	No	39	39.0%

Table 2: Pattern of stroke

Pattern of stroke	Frequency	Percentage
Ischemic stroke	87	87.0%
Hemorrhagic stroke	13	13.0%

Table 3: Association of the pattern of stroke with demographics

Demographics		Pattern of stroke				P value
		Ischemic stroke		Hemorrhagic stroke		
		Frequency	Percentage	Frequency	Percentage	
Age distribution (Years)	20 to 35	12	13.8%	5	38.5%	0.02
	36 to 50	24	27.6%	0	0.0%	
	51 to 70	51	58.6%	8	61.5%	
Gender	Male	51	58.6%	10	76.9%	0.20
	Female	36	41.4%	3	23.1%	
Hypertension	Yes	54	62.1%	7	53.8%	0.57
	No	33	37.9%	6	46.2%	
Residence	Urban	49	56.3%	7	53.8%	0.86
	Rural	38	43.7%	6	46.2%	

DISCUSSION

The demographic profile of the patients in our study showed that the mean age was 51.65 years, with a male predominance (61%), which aligns closely with Karapanayiotides et al. They reported that diabetic patients tended to be older than non-diabetic patients. Our findings were consistent in terms of the distribution of gender, with a slightly higher male representation in stroke cases (14). Interestingly, although our study showed a mean age of 51.65 years, some studies, like Zafar et al., found a slightly higher mean age of 59.5 years for diabetic stroke patients (15).

One of the notable patterns observed in our findings was higher ischemic strokes, with 87% of patients, while only 13% of patients had hemorrhagic strokes. This finding resonates with other studies where diabetic patients showed a greater susceptibility to ischemic strokes rather than hemorrhagic strokes.

Ali et al. reported that ischemic stroke was observed in 85% of diabetic patients, which is comparable to our study (13). Karapanayiotides et al. exhibited a higher prevalence of ischemic stroke, with 93.6%, and only 6.4% with hemorrhagic stroke (14). Zafar et al. showed that 88% of patients in their diabetic group had ischemic stroke while 12% had hemorrhagic stroke (15). Siddiqui et al. also showed that our findings are affirmed, as they reported higher ischemic stroke prevalence in diabetic cohorts (16). Furthermore, the lower incidence of hemorrhagic strokes in diabetics is a recurrent theme in stroke research as diabetes is quite often associated with a higher likelihood of small vessel disease (SVD), which tends to result in ischemic events rather than hemorrhages.

When we analyzed the age distribution, we found that the 51–70-year-old age group was most affected by ischemic stroke. Siddiqui et al. also showed that both ischemic and hemorrhagic strokes were more common in patients aged > 60, which confirms the findings of our study (16). The association between ischemic stroke and increasing age in diabetic populations is likely due to the cumulative effects of chronic hyperglycemia, hypertension, and other vascular risk factors that typically manifest in older age.

Although our study did not further classify the ischemic stroke, lacunar strokes, which are often due to small vessel disease (SVD), are mostly common in diabetic patients due to the microvascular complications associated with long-standing hyperglycemia. Ali et al. reported a higher incidence of lacunar infarcts in diabetic patients (13). This trend reflects the pathophysiological effects of diabetes on small arteries, leading to lacunar infarctions, which are often less severe in the short term but are associated with notable long-term risk.

We observed that hypertension was pretty high in ischemic and hemorrhagic stroke patients. Still, we could not reach the point of

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significance, the reason behind this is most probably due to the lack of a control group in our study, which we also consider a weakness. Karapanayiotides et al. found that hypertension was a notable factor for subcortical infarcts.

The key findings that we observed in our study were that ischemic stroke is more common in middle-aged patients, male gender is more affected, and hypertension is a significant factor for strokes regardless of their type.

CONCLUSION

In conclusion, our study found a higher incidence of ischemic stroke in diabetic patients (87%) than hemorrhagic stroke (13%). Patients in their middle age need to be more careful about their glycemic control routine. Hypertensive patients with diabetes are at more risk of developing stroke; they need to monitor their blood pressure levels routinely.

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. (20-ERB/023)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

ADNAN KHAN (Postgraduate Resident)
Conception of Study, Development of Research Methodology Design, Data Collection, Study Design, Manuscript Writing, Review of manuscript.

WASIL KHAN (Professor)
Study Design, Critical Input, Review of manuscript, final approval of manuscript

ABDUL JABBAR (Associate Professor)
Critical input

ABDUL AHAD (Professor)
Conception of Study, Literature Review

ZIAULLAH (Associate Professor)
Literature Review, Critical input

MOHAMMAD SHAFIQ (Senior Registrar)
Literature Review

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