ORIGINAL ARTICLE

# PATTERN OF STROKE IN DIABETICS AND NON-DIABETICS

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**Background:** Diabetes mellitus has been established as a risk factor for stroke. Diabetes increases the risk of stroke in younger patients and diabetics are more likely to have an ischemic stroke. There are numerous studies on microvascular complications but there are only a few studies on strokes in diabetics. Therefore, this study was conducted to assess the impact of diabetes on the pattern of stroke in our population. **Methods:** This descriptive study was carried out in Department of Medicine, Ayub Teaching Hospital, Abbottabad from September 2011 to February 2012. Forty diabetics and 40 non-diabetics stroke patients were included in the study. Risk factors were noted and their distribution in both groups was analysed. **Results:** The difference in age and gender distribution in both groups was not significant. Thirty-four (85%) of diabetics, and 25 (62.5%) non-diabetics suffered from ischemic stroke. Six (15%) of diabetics and 15 (37.5%) of non-diabetics suffered from haemorrhagic stroke. The differences between the distribution of ischemic stroke were significant ($p<0.02$). In the diabetic group 32.5% of the individuals suffered from lacunar infarcts and in the non-diabetic group 10% suffered from lacunar infarctions ($p<0.02$). There was no significant difference in distribution of risk factors. **Conclusion:** Diabetics are more likely to have an ischemic stroke and lacunar infarctions.

**Keywords:** Diabetes mellitus, Stroke, Lacunar infarcts

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## INTRODUCTION

Diabetes mellitus affects more than 200 million people worldwide.[1] It is causing a major burden on all health care systems around the world. The cost of managing diabetes in the U.S. was an estimated $174 billion in the year 2007.[2] This is expected to increase many folds as there seems to be no end to the pandemic of diabetes.

Asia is bearing the major brunt of this spreading disease and Pakistan seems to be at the forefront. More than 5.2 million people in Pakistan are suffering from diabetes mellitus. This is expected to rise to 13.9 million in the year 2030.[1]

Diabetes mellitus has been established as a risk factor for stroke.[3] Stroke in diabetics is 1.5–3 times more likely as compared to non-diabetics.[4] It causes a major proportion (20%) of deaths in diabetic patients.[5] The pattern of stroke in diabetics is different than non-diabetics. Diabetes substantially increases the risk of stroke in younger patients as well as women.[6] A large landmark multicentre European study showed that the diabetic patients were more likely to have an ischemic stroke (77.5% versus 71.9%) and less likely to have a hemorrhagic stroke than non-diabetic patients (8.5% versus 11.5%).[7] Another study augments this fact by stating that intracerebral haemorrhage is 6 times less frequent in diabetics.[8] Further, diabetic patients are more likely to have lacunar strokes.[9] Infratentorial infarcts are more frequent in diabetics and associated with a worse prognosis, with a 2 fold increase in the likelihood of subsequent strokes.[10] In one study, sub-cortical infarcts (SCI) were more frequent in diabetics, whereas complete Middle Cerebral Artery (MCA) territory infarcts were less frequent.[11] The association of diabetes with lacunar or sub-cortical infarcts suggests small vessel disease as the underlying pathology.

In a study conducted in India, there was a higher incidence of TIA, recurrent strokes, ischemic strokes, and lacunar strokes in diabetic patients than the non-diabetic patients.[12] In one of the very few studies conducted in Pakistan on stroke pattern in diabetes mellitus there was no age difference between diabetic and non-diabetic subjects with stroke. Sub-cortical infarcts (SCI) were more frequent in diabetics and diabetes was found as a risk factor for ischemic stroke (88% in diabetics versus 58% in non-diabetics) and not for hemorrhagic stroke.[13]

Although considerable work has been done on this topic internationally, there is great paucity of data locally. Therefore this study is planned to identify the pattern of stroke in diabetics in our population, and how it differs from the non-diabetics. This will hopefully help us in building a better strategy towards primary prevention of stroke in the diabetic population by administration of antiplatelet agents.

## MATERIALS AND METHODS

Patients were recruited from admitted patients in Medical Unit 'B' of Ayub Teaching Hospital, Abbottabad. Informed consent was taken. Patients >25 years of age, either gender, presenting with features of stroke such as hemiparesis, hemiplegia, hemianaesthesia, speech dysfunction, vertigo, and hemianopia, confirmed by neuro-maging (CT Scan of brain showing hyper-dense or hypo-dense areas) were included in the study.

Patients were divided into two groups, diabetics and non-diabetics. Forty diabetic stroke patients and 40 non-diabetic stroke patients were included. The diabetic group had a previous history of diabetes, fasting blood glucose level >126 mg/dl, or random blood glucose level >200 mg/dl treated or untreated. Patients newly diagnosed as diabetic on presentation were not included in the study. Those patients who had no prior history of diabetes and were normoglycaemic on presentation and during stay in hospital were included in the non-diabetic group. Patients with previous history of head trauma, anticoagulant use, intracranial tumours or neurosurgery were not included in this study. Hypertension, smoking, hyperlipidemia, atrial fibrillation, and ischemic heart disease were also noted in both groups.

Stroke was classified into haemorrhagic and ischemic stroke. Ischemic stroke, on the basis of CT scan, was further divided into:

a. Cortical Infarcts: Infarcts in the territory of Middle Cerebral Artery (MCA), Anterior Cerebral Artery (ACA) or Posterior Cerebral Artery (PCA).
b. Sub-cortical or Lacunar Infarcts: Infarcts less than 1.5 Cm.
c. Cerebellar Infarcts (right lobe, left lobe, and vermis).
d. Brainstem Infarcts (midbrain, pons, and medulla).

Data were analysed using SPSS-19. Chi-square test was used to determine the differences of frequency of different types of stroke in both groups and $p<0.05$ was considered significant.

## RESULTS

The mean age of the diabetic patients was 62.48 ±11.56 years, and it was 65.25±14.05 years for the non-diabetic patients. The male to female ratio for the diabetic group was 1.1:1 and for the non-diabetic group it was 2.1:1. The difference in age and gender was not significant.

The diabetic patients that sustained an ischemic stroke were 34 (85%) and those that had a hemorrhagic stroke were 6 (15%). In the non-diabetic group 25 (62.5%) had an ischemic stroke, and 15 (37.5%) had a haemorrhagic stroke (Table-1). The differences between the distribution of ischemic stroke were found to be significant ($p<0.02$).

In the diabetic group 50% of the individuals suffered from cortical infarcts, whereas of the non-diabetic group 52.5% of the individuals had a cortical infarct. In the diabetic group 32.5% of the individuals suffered from lacunar infarcts and in the non-diabetic group 10% suffered from lacunar infarctions (Table-2). This difference was found to be significant ($p<0.02$). There were no significant differences in the distribution of risk factors.

**Table-1: Stroke types among the groups [n (%)]**

| Group | Ischemic Stroke | Hemorrhagic Stroke |
|---|---|---|
| Diabetics | 34 (85) | 6 (15) |
| Non-diabetics | 25 (62.5) | 15 (37.5) |

**Table-2: Ischemic stroke subtypes in diabetics and non-diabetics [n (%)]**

| | Diabetics (n=40) | Non-diabetics (n=40) |
|---|---|---|
| Cortical infarcts | 20 (50) | 21(52.5) |
| Lacunar infarcts | 13 (32.5) | 4 (10) |
| Cerebeller infarcts | 1 (2.5) | 0 (0) |
| Brain stem infarcts | 0 (0) | 0 (0) |
| Total | **34** | **25** |

## DISCUSSION

In our study the mean age difference points to a lower mean age for the diabetic group but it was found to be non significant. Other studies point to increased risk of stroke in younger patients and lower mean age for the diabetic stroke patients.[4,14] In a study from India, the mean age for the diabetic stroke patients was significantly lower than those without diabetes.[12] While our findings contrast with the findings of these studies, it is comparable with the study by Zafar A *et al*[13], in which the mean age of diabetic stroke patients was 59.5 years and for non-diabetic stroke patients it was 60.4 years.[13] This difference in international and local data might be explained by the fact that our study as well as the study conducted by Zafar A *et al,* had a small sample size, 80 and 100 respectively, whereas the studies conducted abroad had a large patient population.[13]

In our study the male to female ratio shows a female preponderance as pointed out by other international[6,12,14] and national studies[13,15]. This difference was not found to be significant in our study.

There was a higher incidence of ischemic stroke in the diabetics than the non-diabetics in our study. Out of the 40 diabetic individuals, 85% suffered an ischemic stroke and 15% had haemorrhagic stroke. This contrasted with the non-diabetic group in which 62.5% patients had an ischemic stroke and 37.5% patients had a haemorrhagic stroke. This difference was significant ($p<0.02$). Similarly, 15% versus 37.5% had haemorrhagic stroke in the diabetic and non-diabetic group respectively. Our findings were consistent with many other studies,[8,12,13,16] which suggest that diabetics are more prone to have an ischemic stroke and less likely to have haemorrhagic stroke. The European BIOMED Stroke Project, a large multicentre study, showed that the diabetic patients were more likely to have an ischemic stroke and less likely to have a haemorrhagic stroke than non-diabetic patients.[7] In the study by Zafar A *et al*[13], sub-cortical infarcts (SCI) were more frequent in

diabetics and diabetes was found as a risk factor for ischemic stroke and not for haemorrhagic stroke.[13] Our results were consistent with their study.

Literature also points to a higher prevalence of lacunar stroke in diabetics than the non-diabetic population.[9,11,12,17] Arboix A *et al,* showed that people with diabetes compared to people without diabetes present more frequently with lacunar infarction.[18] The European BIOMED Stroke Project also showed that diabetic patients were more likely to have lacunar cerebral infarction.[7] We also found that diabetic patients were more likely to suffer from lacunar stroke than non-diabetics ($p<0.02$). This finding was consistent with these studies.

Apart from the rising incidence of diabetes, there is another unfortunate trend seen throughout the world. There has been an estimated 42% increase in diabetes in the developed countries whereas an enormous 170% increase in the developing countries.[19,20]

Given that more and more people are diagnosed with diabetes yearly, the impact of diabetes on the incidence of stroke is of increasing importance. An alarming aspect of the cerebrovascular complications of diabetes is that many studies report a significantly reduced rate of transient ischemic attacks (TIAs) in diabetic patients compared to non-diabetic patients.[21] TIAs can serve as a warning sign, providing a window of opportunity for medical intervention to prevent a completed stroke. The relative lack of warning in diabetic patients requires that physicians, nurses, and educators be aggressive about risk factor intervention, as comprehensive programs to reduce risk can be highly successful.

Lacunar infarcts, which are more prevalent in the diabetic patients, show a paradoxical clinical course with a favourable prognosis in the short term, characterised by a low early mortality and reduced functional disability on hospital discharge, but with an increased risk of death, stroke recurrence and dementia in the mid- and long term. For this reason, lacunar infarction should be regarded as a potentially severe condition rather than a relatively benign disorder and, therefore, lacunar stroke patients require adequate and rigorous management and follow-up.

It has been proven that stroke in diabetics carries a poorer prognosis.[22] Therefore, aggressive treatment of diabetes and its risk factors are important to minimise its complications. Anti-platelet drugs, careful blood pressure control, use of statins and modification of lifestyle risk factors are key elements in secondary prevention after lacunar stroke.[23] Blood pressure control with angiotensin-converting enzyme inhibitor in Heart Outcomes Prevention Evaluation (HOPE) study also showed significant reductions in the risk of vascular complications in high risk patients including diabetes.[21] Statin therapy has been shown to be effective in the primary prevention of cardiovascular disorders.[24] The UKPDS trial has shown that intensive glycaemic[25] and blood pressure[26] control reduce the risk of vascular events.

## CONCLUSION

Diabetics are more likely to have an ischemic stroke, and they are more likely to suffer from lacunar infarctions. We recommend greater use of antiplatelet agents, strict control of blood pressure, modification of lifestyle risk factors, ACE inhibitors, and statins to lower the risk of ischemic and lacunar stroke in diabetic patients.

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