CLINICODEMOGRAPHIC PROFILE AND RISK FACTORS OF STROKE IN DIABETIC AND NONDIABETIC PATIENTS IN VINDHYA REGION

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ABSTRACT

BACKGROUND
Stroke is defined as abrupt onset of neurologic deficit that is attributable to a focal vascular cause. It represents the second most common cause of mortality and the third most common cause of disability in developed countries. Diabetes is an important risk factor for ischemic stroke and the risk of ischemic stroke in patients with diabetes is twice as in those without diabetes. Hence the need of a study to assess the pattern of stroke, clinical profile and risk factors in diabetes mellitus and nondiabetic patients.

MATERIALS AND METHODS
This was a cross sectional study conducted on 500 patients of stroke for a duration of one year. Written informed consent was taken from all patients. History, clinical examination and radiological investigations (CT Scan/ MRI) was done for confirmation of stroke. Haematological and biochemical examination (HbA1c and Lipid profile) were done. ECG was done to rule out CAD.

RESULTS
Out of 500 patients, 72.8% had ischemic stroke and 27.2% had haemorrhagic stroke. Diabetic patients had greater probability of ischemic stroke (81.73%). Stroke was more common in males with a male to female ratio of 1.52:1 (60.4% vs 39.6%). Young stroke (≤45 year) comprised of 12.8% patients. 52.4% patients were hypertensive. In diabetic group, hypertension was present in 60.0% and in nondiabetics 46.91%, and this was significant (p value 0.00046). Diabetic hypertensives have significant association with ischemic stroke. 86.5% of the diabetic patients had HbA1c >6.5 % reflecting poor glyemic control. 99.3% patients in nondiabetic group had HbA1c ≤6.5 %. HbA1c is positively associated with ischemic stroke (p – value was <0.05).

CONCLUSION
This study shows that diabetes mellitus increases the risk of ischemic stroke. Diabetic stroke patients were younger as compared to nondiabetic stroke patients. Hypertension, poor glycemic control, dyslipidemia, obesity, smoking and tobacco chewing increases the risk of ischemic stroke. Thus, we can use glyemic control, HbA1c and duration of diabetes as a predictor of stroke.

KEY WORDS
Stroke, Diabetic, Nondiabetic, HbA1c.


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A Stroke is defined as an abrupt onset of neurologic deficit that is attributable to a focal vascular cause.[1] Stroke can be divided into two broad categories ischemic stroke and haemorrhagic stroke. There are several modifiable risk factors for stroke including hypertension, diabetes mellitus, smoking and dyslipidaemia. Diabetes mellitus is one of the well known risk factor for stroke[2] and the risk of ischemic stroke in patients with diabetes is twice than those without diabetes. Worldwide stroke is the second most common cause of mortality and the third most common cause of disability.[3] In India Stroke prevalence rate is 471.58/10000.[4] It is well known that diabetes mellitus may cause systemic and intracranial atherosclerotic disease and this increased risk has been linked to the pathophysiological changes seen in the cerebral vessels of patients with diabetes. The combined role of HbA1c, microvascular complications, low HDL cholesterol, and treatment with insulin plus oral agents highlights the importance of diabetes mellitus history and clinical background in the development of stroke.

Men have a higher incidence of stroke than women at younger but not older ages, with the incidence reversed and higher for women by age 75 years and older.[5]

Our study is aimed at analysing the epidemiological, radiological profile of diabetic and Nondiabetic stroke patients of Vindhya region admitted in Sanjay Gandhi hospital Rewa (MP). As few studies have been conducted in Asian countries portraying role of HbA1c and duration of diabetes with risk of stroke, our study may help in analysing correlation of HbA1c levels and duration of diabetes with type of stroke.

MATERIALS AND METHODS
The present study was conducted in Department of Medicine, Sanjay Gandhi Memorial Hospital, associated with Shyam Shah Medical College, Rewa between April 2017 to March 2018 (12 Months).
Study Design
Cross sectional study.

Duration of Study
01 year from April 2017 to March 2018.

Sample Size
500 patients of stroke.

Inclusion Criteria
All patients older than 18 years presenting clinically and radiologically with feature of stroke.

Exclusion Criteria
1. Age less than 18 years.
2. Stroke due to other causes.
   • History of head injury.
   • Drugs.
   • Hypo coagulable stroke.
   • Eclampsia.
   • Infection.
   • Sub Arachnoid Haemorrhage.

Data Collection
This was a cross sectional study conducted on 500 patients of stroke who fulfilled inclusion criteria was taken for this study for a duration of one year. Written informed consent was taken from all patients. History, clinical examination and radiological investigation (CT-Scan/MRI Head) was done. Diabetic and non-diabetics were defined as per American Diabetes association 2003 criteria of HbA1c (<5.7% normal, 5.7% to 6.4% impaired glucose tolerance ≥6.5% diabetes). Hypertension was defined as systolic blood pressure > 140 mm Hg and diastolic pressure > 90 mmHg. Dyslipidaemia was diagnosed when LDL cholesterol was >100 mg/dL, HDL cholesterol was <40 mg/dL and Triglyceride was >150 mg/dL. HbA1c was measured by high performance liquid chromatography method. Diabetic and non-diabetic patients were further grouped according to type of stroke. Co-relation between Ischemic Stroke and level of HbA1c was find out.

Statistical Analysis
Statistical analyses were carried out using a computer based statistical analysis programme, SPSS (Statistical Program for Social Sciences) version 22.0. The Chi Square was used wherever comparisons were needed between the two groups or between two categories in the same group. A p value < 0.05 was considered significant. The analysed data was graphically represented by, bar graphs etc.

RESULTS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Diabetic (n=208)</th>
<th>Non-Diabetic (n=292)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>132</td>
<td>76</td>
</tr>
<tr>
<td>Age Group</td>
<td>18-30</td>
<td>2 (0.96%)</td>
<td>3 (1.02%)</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>5 (2.4%)</td>
<td>16 (5.47%)</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>29 (13.9%)</td>
<td>52 (17.8%)</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>68 (32.7%)</td>
<td>42 (14.3%)</td>
</tr>
<tr>
<td></td>
<td>61-70</td>
<td>62 (29.8%)</td>
<td>61 (20.8%)</td>
</tr>
<tr>
<td></td>
<td>&gt;70</td>
<td>42 (20.1%)</td>
<td>118 (40.4%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of stroke</th>
<th>Ischemic stroke</th>
<th>170</th>
<th>194</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemorrhagic stroke</td>
<td>38</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Clinical Profile of Diabetic and Non-Diabetic Stroke Patients

In our study out of 500 stroke patients, 208(41.6%) were diabetic stroke and 292(58.4%) were non diabetic stroke. Out of 500 patients 302 were male & 198 were female. Stroke was more common in male with male: female ratio is 1.52:1. In diabetic group male:female ratio was 1.73:1 compared to 1.39:1 in non-diabetics.

The age range was 18 to 100 year, mean age ± SD in total study population was 60.86 ± 12.51 years. In diabetics Mean age ± SD was 59.25±11.13 years and in non-diabetics Mean age ± SD was 62.03±12.30. Young stroke (≤ 45 year) patients was 12.8%. In Non-diabetic group maximum number of patients (40.4%) were of >70-year age group compared to diabetic patients where maximum number of patients (32.69%) belonged to 51-60 years age group.

In total study population the percentage of Haemorrhagic stroke was 27.2% and the percentage of ischemic stroke was 72.8%. In diabetic group ischemic stroke patients were 81.73% and haemorrhagic stroke patients were 18.26%. In Non-diabetic group ischemic stroke patients were 66.43% and haemorrhagic stroke patients were 33.53%. Diabetic patients have greater probability of having ischemic stroke (p-value =0.0002)

In our study prevalence of stroke was slightly higher in the rural population (54.4%) as compared to urban population (45.6%).
TG >150 mg/dl was found in 32.6% of total cases. It was 51.44% in diabetics compared to 19.17% in non-diabetics and this finding was significant p value was <0.05. DM patients have significant association with high triglyceride.

LDL level >100 was found in 31% of total cases. It was 49.5% in diabetics compared to 17.80% in non-diabetics and this finding was significant (p value <0.05) suggesting DM patients have significant association with high LDL.

### Table 2. Risk Factors of Diabetic and Non-Diabetic Stroke Patients

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Category</th>
<th>Diabetic (n=208)</th>
<th>Non-Diabetic (n=292)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>Present</td>
<td>68 (32.7%)</td>
<td>61 (20.9%)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>140 (67.32%)</td>
<td>231 (79.1%)</td>
</tr>
<tr>
<td>Tobacco</td>
<td>Present</td>
<td>93 (44.7%)</td>
<td>116 (39.7%)</td>
</tr>
<tr>
<td>Chewing</td>
<td>Absent</td>
<td>115 (55.28%)</td>
<td>176 (60.27%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Present</td>
<td>125 (60.09%)</td>
<td>137 (46.91%)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>83 (39.9%)</td>
<td>155 (53.08%)</td>
</tr>
<tr>
<td>CAD/ECG</td>
<td>Present</td>
<td>76 (36.5%)</td>
<td>16 (5.47%)</td>
</tr>
<tr>
<td>Changes</td>
<td>Absent</td>
<td>132 (63.46%)</td>
<td>276 (94.53%)</td>
</tr>
<tr>
<td>Recurrent</td>
<td>Present</td>
<td>101 (48.5%)</td>
<td>86 (29.3%)</td>
</tr>
<tr>
<td>Stroke</td>
<td>Absent</td>
<td>109 (52.50%)</td>
<td>206 (70.54%)</td>
</tr>
<tr>
<td>HbA1c</td>
<td>4.5-5.7</td>
<td>4 (1.92%)</td>
<td>268 (92.4%)</td>
</tr>
<tr>
<td></td>
<td>5.8-6.5</td>
<td>24 (11.5%)</td>
<td>22 (7.6%)</td>
</tr>
<tr>
<td></td>
<td>6.6-7.5</td>
<td>62 (29.8%)</td>
<td>2 (0.68%)</td>
</tr>
<tr>
<td></td>
<td>&gt;8.5</td>
<td>50 (28.88%)</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table 3. Distribution of Patients of Stroke according to HbA1c Levels and Type of Stroke

<table>
<thead>
<tr>
<th>Type of Stroke</th>
<th>HbA1c≥ 6.5</th>
<th>HbA1c&lt;6.5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic</td>
<td>175</td>
<td>199</td>
<td>374</td>
</tr>
<tr>
<td>Haemorrhagic</td>
<td>09</td>
<td>127</td>
<td>136</td>
</tr>
</tbody>
</table>

This finding is significant (p-value was <0.05). HbA1c is positively associated with ischemic stroke.

### Table 4. Distribution of Diabetic Patients of Stroke according to Duration of Diabetes and Type of Stroke

<table>
<thead>
<tr>
<th>Duration of Diabetes</th>
<th>&gt; 5 Year</th>
<th>1-5 Year</th>
<th>&lt; 1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic</td>
<td>88 (94.7%)</td>
<td>62 (87.5%)</td>
<td>20 (92.8%)</td>
</tr>
<tr>
<td>Haemorrhagic</td>
<td>9 (5.3%)</td>
<td>15 (12.5%)</td>
<td>14 (7.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>76</td>
<td>35</td>
</tr>
</tbody>
</table>

The duration of diabetes increases chances of ischemic stroke (p-value was <0.05).

### DISCUSSION

Out of 500 stroke patients 364 (72.8%) having ischemic stroke and 136 (27.25%) having haemorrhagic stroke compared to studies like that done by Krishnamurthi RV et al[6] and Aiyar I et al[7] in which infarction was present in 70%.

In our study 87.13% of diabetic patients had ischemic stroke, these findings are similar to studies like European multicentre study done by Megherbi SE et al[9] where it was concluded that ischemic stroke was more prevalent in diabetics. 18.27% patients had haemorrhagic stroke all of which were hypertensive suggesting uncontrolled blood pressure could have possibly leads to intracerebral haemorrhage.

In our study 272 (54.45%) patients were rural and 228 (45.6%) patients were urban. The prevalence of stroke was slightly higher in rural population which correlates with the study done by Basri Ret al[9].

In our study male to female ratio was 1.52:1. Which correlates with the study of Vaidya C et al [10](1:4:1). So it can be concluded that incidence of stroke is more common in male.

### Age Wise Distribution of Stroke Patients

The mean age ± SD in present study was 60.86 ± 12.51 years compared to study done by Vaidya C et al [10] and Maskey A et al[11] where it was 61 and 63 year respectively. The major age group was >70 year followed by 61-70 years compared to study done by Vaidya C et al [10] and similar study by Ukoha OB et al[12] Mean age ± SD in diabetic group was 59.25 ± 11.13 years compared to 55.6 years in study done by Nomani AZ et al[13] Mean age ± SD was 62.03 ± 13.30 years in non-diabetic group compared to study done by Nomani AZ et al[13] The major age group in diabetic group was 51-60 compared to >70 years in non-diabetic group. In this study age was found to be an important factor for ischemic stroke similar to what was concluded from Helsinki Young Stroke Registry which finds the frequency of ischemic stroke rises sharply beginning at the age of 40.

Young stroke (age ≥45 years) comprised 12.0% of all patients which closely correlates with study done by Sallam AR et al[14](13.6%).

### Percentage of Diabetic Stroke Patients in Study Group

The percentage of diabetic patients in our study was 4.16% compared to study done in France, based on national database called Hospital Discharge Diagnosis Records where it was 15%. In the study by Vaidya C et al [10], diabetes patients were 9.3%, by Maskey A et al[11](9.3%).

### BMI, Waist Circumference and Waist Hip Ratio of Patients

The mean BMI was 21.9±4.4, among diabetic it was 25.98 ± 4.50 and among Non-diabetic it was 21 ± 4.2 correlate with study done by Ali A et al[15] 4.3[20.67%] had BMI of equal to or more than 30 kg/m² (Obese). In diabetic group maximum number of patients (44.7%) were belong to 25-29.9 kg/m² in non-diabetic group maximum number of patients were belong to 18.5-24.9 kg/m². In our study the prevalence of Obesity (BMI >30 kg/m²) in diabetic stroke patients was 20.67% as compared to nondiabetic where it was 11.62% and
it was significant (p-value 0.0058) which correlates with study done by Suleh WM et al., where it was 20.2% and 13.75% respectively.

Mean Waist circumference ± SD was 93±5.35 among diabetic male it was 95±4.23 and in nondiabetic it was 92 ± 5.21 which correlate with study done by Suleh WM et al. Mean waist hip ratio ± SD for male was 92 ± 0.04 for diabetic male was 93 ± 0.05 and for nondiabetic male it was 0.90±0.06. Mean waist hip ratio ± SD for diabetic female was 0.90 ±0.08, and for nondiabetic it was 0.82 ± 0.06 which correlate with study done by Ali Aet al. and Suleh WM et al.

Hypertension in Stroke Patients
Hypertension was the most common risk factor in our study. It was present in 50.6% of patients. In diabetic group it was present in 60.09% which was comparable to the study done by Pell S et al. where prevalence of hypertension was 54% higher in the diabetic patients. Moreover, hypertension increased the probability of suffering ischemic stroke in diabetic patients (p-value 0.01). In nondiabetic group hypertension was present in 47.26% which was comparable to study done by study done by Eapen et al (40%), Sallam AR et al (67%) and Vaidya C et al (34.1%).

Lipid Profile and Dyslipidaemia
Dyslipidaemia was found in 32.6% of all patients compared to other studies like Eapen et al (17%) and Sallam AR et al (13.9%). Presence of diabetes in patient group having HDL <40 mg/dl, LDL>100 mg/dl, Triglyceride >150 mg/dl was associated with increased probability of ischemic stroke (p-value 0.0001, 0.00025, 0.0066 respectively).

Smoking and Tobacco Chewing
In our study, percentage of addiction specially tobacco chewing was more as compared to other studies. Smoking was present in 25.8% of patients in diabetic group it was 32.69% and in nondiabetic group it was 20.89%, as compared to study done by Vaidya C et al where it was 14.2%.

Smoking was present in 41.8% of patients in diabetic stroke it was 44.7% and in nondiabetic stroke it was 39.7%, were more as compared to study done by Vaidya C et al.

History of CAD and ECG Changes
History and ECG suggestive of CAD was present in 10.4% of total patients. In diabetic group it was 22.6%. This was comparable to Kaur et al and Eapen et al (9%). Presence of ECG changes suggestive of CAD had increased the likelihood of ischemic stroke.

HbA1c and Duration of Diabetes
In our study HbA1c was found to be significantly associated with ischemic stroke. Mean HbA1c ± SD in study group was 6.15 ± 1.51 in diabetics it was 7.69 ± 1.095 and in nondiabetics it was 5.06±0.439. 86.5% of the diabetic patients had HbA1c >6.5 reflecting the poor glycaemic control. This was similar to earlier studies like Hiyama study where in ischemic stroke risk was 3.57 (HbA1c-5.5-6.4) and 9.65% (HbA1c >6.5%), Norfolk prospective population shown that relative risk for stroke for participants with HbA1c concentrations 5-5.4, 5.5-6.9, >7 were 0.78 (0.50 to 1.22), 0.83 (0.54 to 1.27), and 2.83 (1.40 to 5.74), respectively, compared with those with HbA1c <5% (10489 subjects).

The Atherosclerosis Risk in Communities (ARIC) Study found that in diabetic group patients the adjusted risk of stroke was 2.33 (95% CI 1.29-4.21) in highest percentile of HbA1c (>6.8%) as compared with the lowest one (<4.7%), Nomani AZ et al. mean HbA1c values were significantly higher in the diabetes group (7.6 ± 2.1 vs 6.1 ± 2.3) (p<0.05).

CONCLUSION
This study shows that diabetes mellitus increases the risk of ischemic stroke. Diabetic stroke patients were younger as compared to non-diabetic stroke patients. Hypertension, poor glycemic control, dyslipidemia, obesity, smoking and tobacco chewing increases the risk of ischemic stroke. Thus, we can use glycemic control, HbA1c and duration of diabetes as a predictor of stroke. Screening of diabetic patients, better glycaemic control are believed to reduce the risk of stroke.

REFERENCES


