



Original Research Article

A study of acute stroke syndromes in patients of type 2 diabetes mellitus in a tertiary care hospital in south Rajasthan - A cross sectional observational study

Authors

Dr Sourav Chattopadhyay¹, Dr Parv Rasiklal Raiyani^{2*}

¹PDT, Deptt. of Neurology, Geetanjali Medical College and Hospital, Hiranmagri Extension, Manwakhera NH- 8 Bypass, Near Eklingpura Chouraha, Udaipur 313002, Rajasthan, India

²M.B.B.S., 3rd Year General Medicine Resident Doctor, Geetanjali Medical College and Hospital, Udaipur, India

Corresponding Author*

Dr Parv Rasiklal Raiyani

Introduction

Stroke is one of the leading causes of death and long term disability in India. Stroke is an important cause of premature death and disability in low- income and middle-income countries like India, largely driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors.

Among all the neurological diseases of adult life, cerebrovascular accidents clearly ranks first in frequency of importance. Almost fifty percent of neurological diseases in general hospital are due to stroke.

Cerebrovascular accident includes ischemic stroke, hemorrhagic stroke, and cerebrovascular anomalies such as intracranial aneurysm, AV malformation and cortical venous thrombosis. Stroke after heart disease, is the second most common cause of death among non-communicable diseases.^[1] With the introduction of effective treatment for hypertension, there has

been a marked reduction in the frequency of stroke.

Diabetes mellitus by virtue of its association with micro vascular and macrovascular disease is an important risk factor in the genesis of stroke.^[2]

Most of the diabetic patients with stroke have raised glycosylated hemoglobin indicating that most of them have uncontrolled diabetes.

Diabetics have severe strokes resulting in poor outcome. Stroke is Twice more common in diabetics than in non diabetics.^[3]

Hypertension is common in diabetes and accelerates atherosclerosis which promotes intracranial small vessel disease and heart disease leading to lacunar and embolic infarction respectively. There are several risk factors that determine the outcome of stroke.

Aim of the Study

To determine the pattern of stroke in the patients of type 2 diabetes mellitus.

Materials and Methods

Total of 93 patients of acute stroke syndrome admitted in the Department of Internal medicine, Geetanjali Medical College and Hospital, between June 2023 to June 2024 were studied. The patients were selected on the following basis

Inclusion Criteria

All patients with acute stroke syndrome with type 2 diabetes mellitus in thanjavur medical college hospital.

Exclusion Criteria

1. Non diabetic stroke patients.
2. Stroke patients with other comorbidities like Hypertension.
3. Patients with acute CNS infections, trauma and encephalopathy.

Complete history was taken, clinical examination was done and clinical diagnosis for each patient has been arrived.

Blood pressure measurement, Blood sugar, urea, creatinine, Serum electrolytes, Hemoglobin, Total count, Differential count, Urine sugar, albumin, & deposits, ECG and Chest X ray done for all patients

The severity of acute stroke syndrome for each patient is calculated based on NIH stroke scale, NIHSS which takes the following clinical findings in to account & specific points for each criteria.

1a Level of consciousness:

| | | |
|-----------|---|---|
| Alert | - | 0 |
| Drowsy | - | 1 |
| Stuporous | - | 2 |
| Comatose | - | 3 |

1b LOC questions:

| | | |
|------------------------|---|---|
| Answers both correctly | - | 0 |
| Answers one correctly | - | 1 |
| Incorrect | - | 2 |

1c LOC commands

| | | |
|----------------------|---|---|
| Obeys both correctly | - | 0 |
| Obeys one correctly | - | 1 |
| Incorrect | - | 2 |

2. Best gaze :

| | | |
|--------------------|---|---|
| Normal | - | 0 |
| Partial gaze palsy | - | 1 |
| Forced deviation | - | 2 |

3. Visual :

| | | |
|----------------------|---|---|
| No visual loss | - | 0 |
| Partial hemianopia | - | 1 |
| Complete hemianopia | - | 2 |
| Bilateral hemianopia | - | 3 |

4. Facial palsy :

| | | |
|--------------------|---|---|
| Normal symmetric | - | 0 |
| Minor paralysis | - | 1 |
| Partial paralysis | - | 2 |
| Complete paralysis | - | 3 |

5. Best motor arm (right and left)

| | | |
|-------------------------|---|---|
| No drift | - | 0 |
| Drift | - | 1 |
| Some antigravity effort | - | 2 |
| No antigravity effort | - | 3 |
| No movement | - | 4 |

6. Best motor leg (right and left)

| | | |
|-------------------------|---|---|
| No drift | - | 0 |
| Drift | - | 1 |
| Some antigravity effort | - | 2 |
| No antigravity effort | - | 3 |
| No movement | - | 4 |

7. Limb ataxia

| | | |
|-----------------------|---|---|
| Absent | - | 0 |
| Present in one limb | - | 1 |
| Present in both limbs | - | 2 |

8. Sensory

| | | |
|----------------------------|---|---|
| No sensory loss | - | 0 |
| Mild-moderate sensory loss | - | 1 |
| Total sensory loss | - | 2 |

9. Best language

| | | |
|--------------------------|---|---|
| Normal, no aphasia | - | 0 |
| Mild to moderate aphasia | - | 1 |
| Severe aphasia | - | 2 |
| Mute, global aphasia | - | 3 |

10. Dysarthria

| | | |
|------------------|---|---|
| Normal | - | 0 |
| Mild to moderate | - | 1 |
| Severe | - | 2 |

11. Extinction/ inattention

| | | |
|--|---|---|
| No abnormality | - | 0 |
| Visual/ tactile/ spatial/ personal inattention | - | 1 |
| Profound hemi inattention | - | 2 |

The total score was calculated, out of forty two points.

NIHSS classification

Table 1. NIHSS classification

| Score | Stroke severity |
|-------|---------------------------|
| 0 | No stroke symptoms |
| 1-4 | Minor stroke |
| 5-15 | Moderate stroke |
| 16-20 | Moderate to severe stroke |
| 21-42 | Severe stroke |

Once clinical diagnosis of acute stroke is made venous blood sample is taken and sent to laboratory for glucose (random, fasting & postprandial) and HbA1c estimation. HbA1c is structurally homologous to HbA except for the addition of glucose to the terminal amino acid of the beta chain of hemoglobin Molecule [glycosylation]. Therefore HbA1c is a function of exposure of the RBC's to glucose. Since the glucose linkage to hemoglobin is relatively stable, Hemoglobin A1c accumulates throughout the life span of erythrocytes and its concentration reflects the integrated blood glucose concentration over a period approximating to the half-life of erythrocytes i.e. six to eight weeks. Therefore measurement of HbA1c helps to monitor the overall degree of diabetic control achieved).

- Normal glucose tolerance - <5.6%
- Pre diabetes - 5.7 to 6.4%
- Diabetes. - > 6.5%

CT & MRI of the brain was performed in all these patients to : Confirm the diagnosis

- Identify the type of stroke.
- Measure the size of lesion (Small < 5mm; Medium 5 – 10 mm; Large > 10 mm or involving more than one vascular territory)
- Locate the site of lesion.
- Detect the presence of cerebral edema or midline shift.

Observation and Results

Statistical analysis

The data were entered in MS office excel sheet and analyzed using SPSS version 26.0 Continuous data with normal distribution was expressed as mean with standard deviation. Categorical data were expressed as frequency with %. One way ANOVA was used to compare the variance between the three groups. Fisher's exact test was used to compare the frequency between the groups. Pearson's correlation test was used to determine the direction and degree of association between NIHSS value and other parameters. P<0.05 was considered statistically significant.

Table 2. Description of age category in diabetic patients with stroke observed in the study

| S.No | Age category | n | % |
|------|---------------|----|------|
| 1. | 41 - 50 years | 19 | 20.4 |
| 2. | 51 - 60 years | 31 | 33.3 |
| 3. | 61 - 70 years | 29 | 31.2 |
| 4. | 71 - 80 years | 14 | 15.1 |

Data are expressed as n with %. Total N = 93. The mean age is 60.7 years with standard deviation of 10.3 years. The minimum age is 42 years and the maximum age is 80 years.

Figure 1

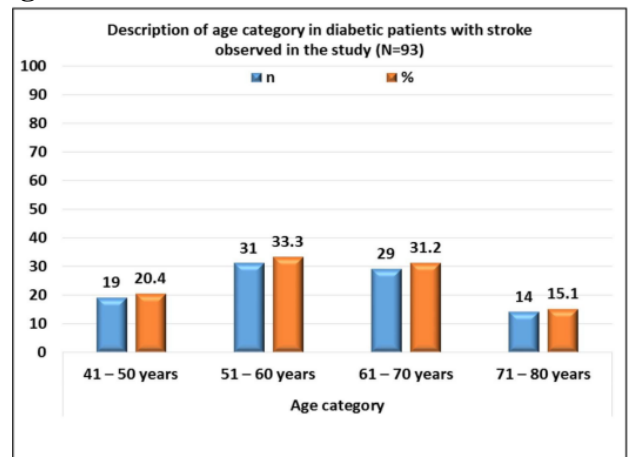


Table 3. Description of gender category in diabetic patients with stroke observed in the study.

| S.No | Gender category | n | % |
|------|-----------------|----|------|
| 1 | Female | 22 | 23.7 |
| 2 | Male | 71 | 76.3 |

Data are expressed as n with %. Total N = 93.

Figure 2

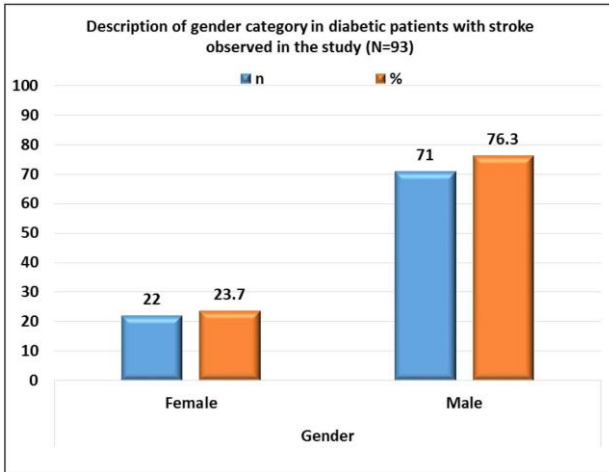


Table 4. Description of duration of diabetes category in diabetic patients with stroke observed in the study.

| S.No | Duration of diabetes category | n | % |
|------|-------------------------------|----|------|
| 1 | 2 - 5 years | 21 | 22.6 |
| 2 | > 5 – 10 years | 29 | 31.2 |
| 3 | >10– 15 years | 10 | 10.8 |
| 4 | >15 – 20 years | 13 | 14 |
| 5 | > 20– 25 years | 12 | 12.9 |
| 6 | > 25 – 30 years | 8 | 8.6 |

Data are expressed as n with %. Total N = 93. The mean duration is 13.5 years with standard deviation of 8.5 years. The median duration is 10 years. The minimum duration is 2 years and the maximum duration observed is 30 years.

Figure 3.

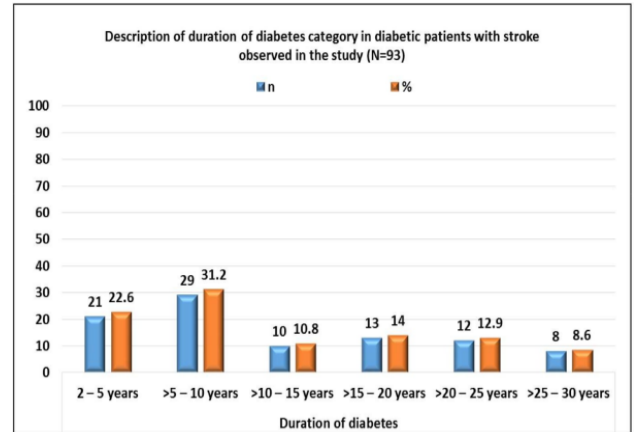


Table 5. Description of adherence to treatment in diabetic patients with stroke observed in the study.

| S.No | Adherence to treatment | n | % |
|------|------------------------|----|------|
| 1 | Irregular | 48 | 51.6 |
| 2 | Regular | 45 | 48.4 |

Data are expressed as n with %. Total N = 93.

Figure 4

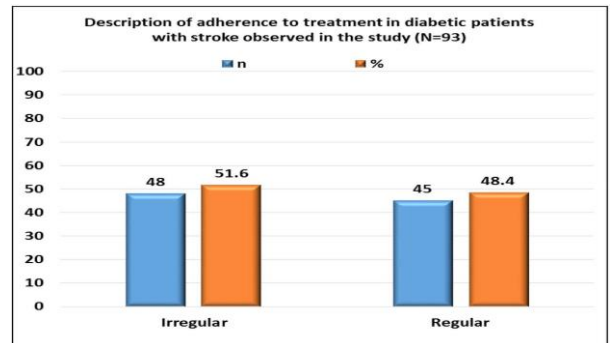


Table 6. Description of presence of various risk factor in diabetic patients with stroke observed in the study.

| S.No | Risk factors | n | % |
|------|--------------|----|------|
| 1 | CAD | 46 | 49.5 |
| 2 | Smoking | 40 | 43 |
| 3 | Alcoholism | 55 | 59.1 |
| 4 | Dyslipidemia | 51 | 54.8 |

Data are expressed as n with %. Total N = 93

Figure 5

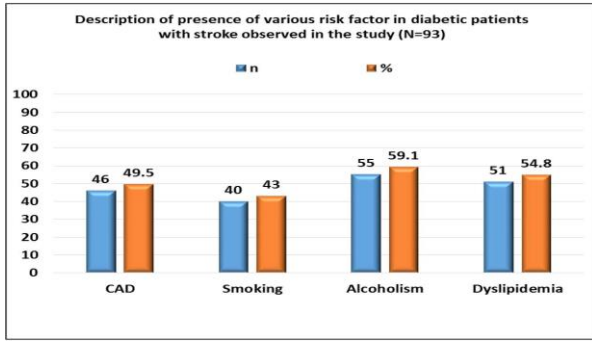


Table 7. Description of FBS category levels in diabetic patients with stroke observed in the study. Data are expressed as n with %. Total N = 93.

| S.No | FBS category level | n | % |
|------|--------------------|----|------|
| 1 | <100 mg/dL | 20 | 21.5 |
| 2 | 101 – 126 mg/dL | 11 | 11.8 |
| 3 | 127 – 150mg/dL | 18 | 19.4 |
| 4 | 151 – 200mg/dL | 30 | 32.3 |
| 5 | 201 – 250mg/dL | 11 | 11.8 |
| 6 | 251 – 300mg/dL | 3 | 3.2 |

Figure 6

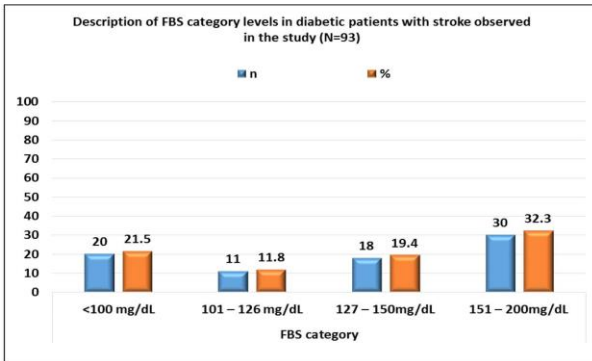


Table 8. Description of PPBS category levels in diabetic patients with stroke observed in the study. Data are expressed as n with %. Total N = 93.

| S.No | PPBS category level | n | % |
|------|---------------------|----|------|
| 1 | <200 mg/dL | 13 | 14 |
| 2 | 201 – 250 mg/dL | 21 | 22.6 |
| 3 | 251 – 300mg/dL | 16 | 17.2 |
| 4 | 301 – 350mg/dL | 20 | 21.5 |
| 5 | 351 – 400mg/dL | 18 | 19.4 |
| 6 | 401 – 450mg/dL | 5 | 5.4 |

Data are expressed as n with %. Total N = 93.

Figure 7

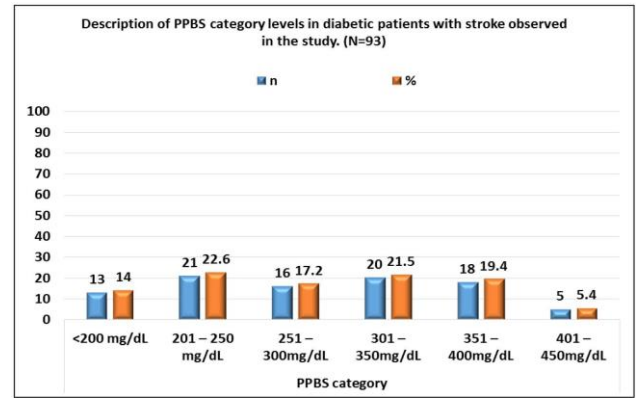


Table 9. Description of HbA1c category levels in diabetic patients with stroke observed in the study. Data are expressed as n with %. Total N = 93.

| S.No | HbA1C category level | n | % |
|------|----------------------|----|------|
| 1 | 8 – 10 % | 29 | 31.2 |
| 2 | >10 – 12 % | 43 | 46.2 |
| 3 | >12% | 21 | 22.6 |

Figure 8

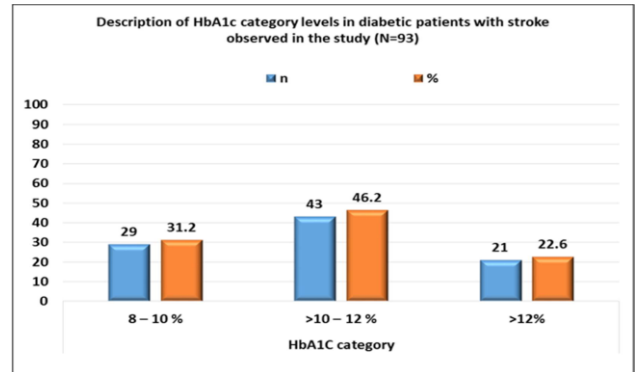


Table 10. Description of CT brain finding in diabetic patients with stroke observed in the study. Data are expressed as n with %. Total N = 93.

| S.No | CT brain finding | n | % |
|------|---------------------------------|----|------|
| 1 | Lt capsuloganglionic infarct | 4 | 4.3 |
| 2 | Lt FP infarct | 1 | 1.1 |
| 3 | Lt cerebellar infarct | 2 | 2.2 |
| 4 | Lt capsuloganglionic hemorrhage | 2 | 2.2 |
| 5 | Lt lacunar infarct | 11 | 11.8 |
| 6 | Lt medullary infarct | 5 | 5.4 |
| 7 | Lt midbrain infarct | 4 | 4.3 |
| 8 | Lt pontine infarct | 2 | 2.2 |
| 9 | Lt PT infarct | 2 | 2.2 |
| 10 | Lt thalamic infarct | 2 | 2.2 |
| 11 | No lesion | 9 | 9.7 |
| 12 | Rt cerebellar infarct | 5 | 5.4 |
| 13 | Rt capsuloganglionic hemorrhage | 2 | 2.2 |
| 14 | Rt capsuloganglionic infarct | 9 | 9.7 |
| 15 | Rt lacunar infarct | 14 | 15.1 |
| 16 | Rt medullary infarct | 3 | 3.2 |
| 17 | Rt occipital infarct | 2 | 2.2 |
| 18 | Rt parietal hemorrhage | 2 | 2.2 |
| 19 | Rt parietal infarct | 2 | 2.2 |
| 20 | Rt Pontine infarct | 5 | 5.4 |
| 21 | Rt PT infarct | 1 | 1.1 |
| 22 | Rt Thalamic infarct | 4 | 4.3 |

Data are expressed as n with %. Total N = 93.

Table 11. Description of MRI brain finding in diabetic patients with stroke observed in the study.

| S.No | MRI brain finding | n | % |
|------|---------------------------------|----|------|
| 1 | Lt capsuloganglionic infarct | 5 | 5.4 |
| 2 | Lt FP infarct | 1 | 1.1 |
| 3 | Lt cerebellar infarct | 2 | 2.2 |
| 4 | Lt capsuloganglionic hemorrhage | 2 | 2.2 |
| 5 | Lt lacunar infarct | 11 | 11.8 |
| 6 | Lt medullary infarct | 5 | 5.4 |
| 7 | Lt midbrain infarct | 6 | 6.5 |
| 8 | Lt pontine infarct | 2 | 2.2 |
| 9 | Lt PT infarct | 2 | 2.2 |
| 10 | Lt putamen infarct | 1 | 1.1 |
| 11 | Lt thalamic infarct | 2 | 2.2 |
| 12 | Rt caudate infarct | 1 | 1.1 |
| 13 | Rt cerebellar infarct | 5 | 5.4 |
| 14 | Rt capsuloganglionic hemorrhage | 2 | 2.2 |
| 15 | Rt capsuloganglionic infarct | 9 | 9.7 |
| 16 | Rt lacunar infarct | 15 | 16.1 |
| 17 | Rt medullary infarct | 3 | 3.2 |
| 18 | Rt occipital infarct | 2 | 2.2 |
| 19 | Rt parietal hemorrhage | 2 | 2.2 |
| 20 | Rt parietal infarct | 2 | 2.2 |
| 21 | Rt pontine infarct | 5 | 5.4 |
| 22 | Rt PT infarct | 1 | 1.1 |
| 23 | Rt subthalamic infarct | 1 | 1.1 |
| 24 | Rt thalamic infarct | 6 | 6.5 |

Data are expressed as n with %. Total N = 93.

Table 12. Description of NIHSS category levels in diabetic patients with stroke observed in the study.

| S.No | NIHSS category | n | % |
|------|--------------------|----|------|
| 1 | Moderate | 47 | 50.5 |
| 2 | Moderate to severe | 18 | 19.4 |
| 3 | Severe | 28 | 30.1 |

Data are expressed as n with %. Total N = 93.

Figure 9

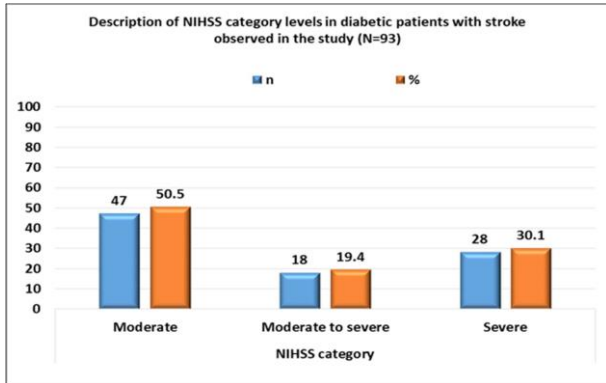


Table 13. Comparison of age category of diabetic stroke patients with respect to NIHSS category in the study.

| S. No | Age Category | NIHSS category | | | | | | Chi square value | df | P value |
|-------|---------------|-----------------|------|---------------------------|------|---------------------------|------|------------------|----|------------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Moderate to severe (N=18) | | | | |
| | | n | % | n | % | n | % | | | |
| 1 | 41 – 50 years | 8 | 17 | 3 | 16.7 | 8 | 28.6 | 5.38 | 6 | 0.501 (NS) |
| 2 | 51 – 60 years | 13 | 27.7 | 8 | 44.4 | 10 | 35.7 | | | |
| 3 | 61 – 70 years | 17 | 36.2 | 6 | 33.3 | 6 | 21.4 | | | |
| 4 | 71 – 80 years | 9 | 19.1 | 1 | 5.6 | 4 | 14.3 | | | |

Data are expressed as n with %. Fisher’s exact test was used to compare the frequency between the groups. NS = Not significant.

Table 14. Comparison of gender category of diabetic stroke patients with respect to NIHSS category in the study.

| S. No | Gender | NIHSS category | | | | | | Chi square value | df | P value |
|-------|--------|-----------------|------|---------------------------|------|---------------|------|------------------|----|------------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Severe (N=28) | | | | |
| | | n | % | n | % | n | % | | | |
| 1 | Female | 12 | 25.5 | 5 | 27.8 | 5 | 17.9 | 0.782 | 2 | 0.676 (NS) |
| 2 | Male | 35 | 74.5 | 13 | 72.2 | 23 | 82.1 | | | |

Data are expressed as n with %. Fisher’s exact test was used to compare the frequency between the groups. NS = Not significant.

Table 15. Comparison of duration of diabetes category of diabetic stroke patients with respect to NIHSS category in the study

| S.No | Duration of diabetes | NIHSS category | | | | | | Chi square value | df | P value |
|------|----------------------|-----------------|------|---------------------------|------|---------------|------|------------------|----|------------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Severe (N=28) | | | | |
| | | n | % | n | % | n | % | | | |
| 1 | 2 – 5 years | 7 | 14.9 | 3 | 16.7 | 11 | 39.3 | 11.9 | 10 | 0.286 (NS) |
| 2 | >5 – 10 years | 16 | 34 | 7 | 38.9 | 6 | 21.4 | | | |
| 3 | >10–15 years | 4 | 8.5 | 1 | 5.6 | 5 | 17.9 | | | |
| 4 | >15-20 years | 7 | 14.9 | 4 | 22.2 | 2 | 7.1 | | | |
| 5 | >20 – 25 years | 8 | 17 | 2 | 11.1 | 2 | 7.1 | | | |
| 6 | >25 – 30 years | 5 | 10.6 | 1 | 5.6 | 2 | 7.1 | | | |

Data are expressed as n with %. Fisher’s exact test was used to compare the frequency between the groups. NS = Not significant.

Table 16. Comparison of treatment adherence of diabetic stroke patients with respect to NIHSS category in the study

| S. No | Treatment adherence | NIHSS category | | | | | | Chi square value | df | P value |
|-------|---------------------|-----------------|----|---------------------------|------|---------------|----|------------------|----|---------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Severe (N=28) | | | | |
| | | n | % | n | % | n | % | | | |
| 1 | Irregular | 16 | 34 | 11 | 61.1 | 21 | 75 | 12.6 | 2 | 0.002* |
| 2 | Regular | 31 | 66 | 7 | 38.9 | 7 | 25 | | | |

Data are expressed as n with %. Fisher’s exact test was used to compare the frequency between the groups. *indicates p<0.05 and considered statistically significant.

Figure 10

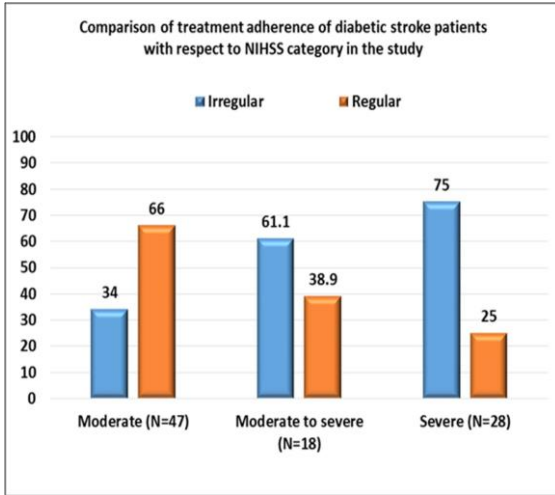


Table 17. Comparison of various risk factors of diabetic stroke patients with respect to NIHSS category in the study

| S. No | Risk factors (presence of) | NIHSS category | | | | | | Chi square value | df | P value |
|-------|----------------------------|-----------------|------|---------------------------|------|---------------|------|------------------|----|------------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Severe (N=28) | | | | |
| | | n | % | n | % | n | % | | | |
| 1 | Alcoholism | 24 | 51.1 | 12 | 66.7 | 19 | 67.9 | 2.57 | 2 | 0.276 (NS) |
| 2 | CAD | 27 | 57.4 | 8 | 44.4 | 11 | 39.3 | 2.54 | 2 | 0.281 (NS) |
| 3 | Smoking | 19 | 40.4 | 7 | 38.9 | 14 | 50 | 0.811 | 2 | 0.667 (NS) |
| 4 | Dyslipidemia | 29 | 61.7 | 10 | 55.6 | 12 | 42.9 | 2.52 | 2 | 0.284 (NS) |

Data are expressed as n with %. Fisher’s exact test was used to compare the frequency between the groups. NS = Not significant.

Table 18. Comparison of FBS category of diabetic stroke patients with respect to NIHSS category in the study

| S. No | FBS category | NIHSS category | | | | | | Chi square value | df | P value |
|-------|----------------|-----------------|------|---------------------------|------|---------------|------|------------------|----|---------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Severe (N=28) | | | | |
| | | n | % | n | % | n | % | | | |
| 1 | <100 mg/dL | 17 | 36.2 | 0 | 0 | 3 | 10.7 | 23.3 | 10 | 0.011* |
| 2 | 101 –126 mg/dL | 7 | 14.9 | 3 | 16.7 | 1 | 3.6 | | | |
| 3 | 127 – 150mg/dL | 8 | 17 | 5 | 27.8 | 5 | 17.9 | | | |
| 4 | 151 – 200mg/dL | 12 | 25.5 | 8 | 44.4 | 10 | 35.7 | | | |
| 5 | 201 – 250mg/dL | 2 | 4.3 | 2 | 4.3 | 7 | 25 | | | |
| 6 | 251 – 300mg/dL | 1 | 2.1 | 0 | 0 | 2 | 7.1 | | | |

Data are expressed as n with %. Fisher’s exact test was used to compare the frequency between the groups. *indicates p<0.05 and considered statistically significant.

Figure 11

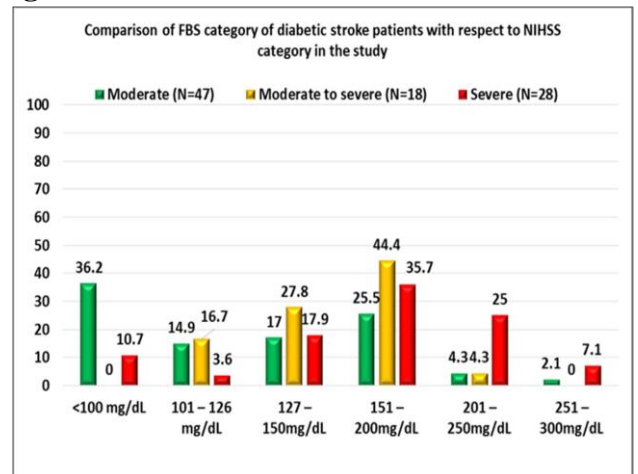


Table 19. Comparison of PPBS category of diabetic stroke patients with respect to NIHSS category in the study

| S. No | PPBS category | NIHSS category | | | | | | Chi square value | df | P value |
|-------|-----------------|-----------------|------|---------------------------|------|---------------|------|------------------|----|---------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Severe (N=28) | | | | |
| | | n | % | n | % | n | % | | | |
| 1 | <200 mg/dL | 11 | 23.4 | 0 | 0 | 2 | 7.1 | 32.2 | 10 | <0.001* |
| 2 | 201 – 250 mg/dL | 16 | 34 | 4 | 22.2 | 1 | 3.6 | | | |
| 3 | 251 – 300mg/dL | 8 | 17 | 4 | 22.2 | 4 | 14.3 | | | |
| 4 | 301 – 350mg/dL | 6 | 12.8 | 7 | 38.9 | 7 | 25 | | | |
| 5 | 351 – 400mg/dL | 5 | 10.6 | 1 | 5.6 | 12 | 42.9 | | | |
| 6 | 401– 450mg/dL | 1 | 2.1 | 2 | 11.1 | 2 | 7.1 | | | |

Data are expressed as n with %. Fisher’s exact test was used to compare the frequency between the groups. *indicates p<0.05 and considered statistically significant.

Figure 12

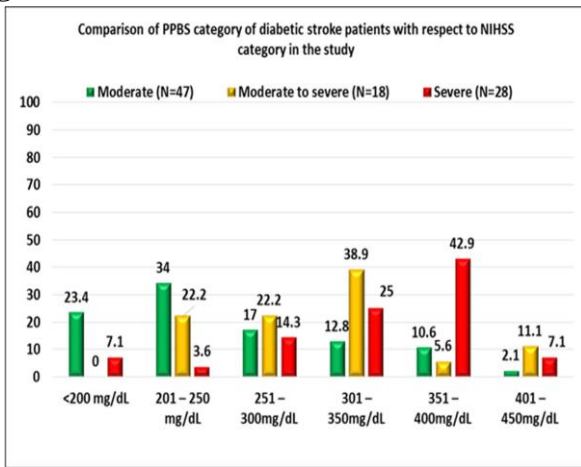


Table 20. Comparison of HbA1C category of diabetic stroke patients with respect to NIHSS category in the study

| S. No | HbA1C Category | NIHSS category | | | | | | Chi square value | df | P value |
|-------|----------------|-----------------|------|---------------------------|------|---------------|------|------------------|----|---------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Severe (N=28) | | | | |
| | | n | % | n | % | n | % | | | |
| 1 | 8 – 10 % | 26 | 55.3 | 2 | 11.1 | 1 | 3.6 | 38.8 | 4 | <0.001* |
| 2 | >10 – 12 % | 19 | 40.4 | 12 | 66.7 | 12 | 42.9 | | | |
| 3 | >12% | 2 | 4.3 | 4 | 22.2 | 15 | 53.6 | | | |

Data are expressed as n with %. Fisher’s exact test was used to compare the frequency between the groups. *indicates p<0.05 and considered statistically significant.

Figure 13

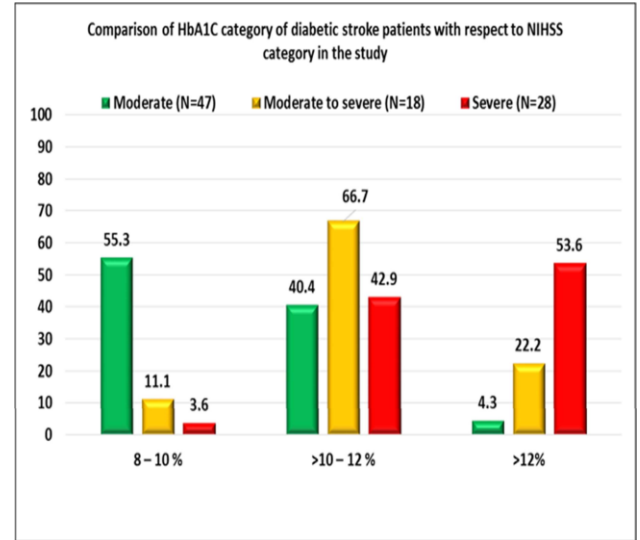


Table 21 Comparison of mean values of various parameters with respect to NIHSS category in diabetic stroke patients

| S. No | Parameter | NIHSS category | | | | | | F value | P value |
|-------|--------------|-----------------|-----|---------------------------|-----|---------------|-----|---------|---------|
| | | Moderate (N=47) | | Moderate to severe (N=18) | | Severe (N=28) | | | |
| | | Mean | SD | Mean | SD | Mean | SD | | |
| 1 | FBS (mg/dL) | 128 | 46 | 159 | 36 | 174 | 50 | 9.3 | <0.001* |
| 2 | PPBS (mg/dL) | 254 | 71 | 305 | 58 | 331 | 62 | 12.6 | <0.001* |
| 3 | HbA1c % | 10 | 1.1 | 11.4 | 0.8 | 11.9 | 0.9 | 38.6 | <0.001* |

Data are expressed as mean with SD. One way ANOVA was used to compare the variance between the groups. *indicates p<0.05 and considered statistically significant.

Table 22. Correlation of various parameters with NIHSS score observed in diabetic stroke patients in the study.

| S. No | Correlation of NIHSS with | Pearson's r | P value | Inference |
|-------|---------------------------|-------------|----------|---|
| 1 | Age in years | --0.245 | 0.018* | Significant negative correlation of weak strength |
| 2 | Duration of diabetes | --0.241 | 0.02* | Significant negative correlation of weak strength |
| 3 | HbA1C (%) | 0.697 | <0.0001* | Significant positive correlation of strong strength |
| 4 | FBS (mg/dL) | 0.475 | <0.0001* | Significant positive correlation of moderate strength |
| 5 | PPBS (mg//dL) | 0.504 | <0.0001* | Significant positive correlation of moderate strength |

Total N = 93. Correlation was performed using Pearson's correlation test. Degree and direction of association was represented using 'r' value.

*indicates $p < 0.05$ and considered statistically significant. NS = Not significant.

Discussion

Age & sex distribution

Out of 93 stroke patients enrolled in our study, majority were in the age group of 51 to 60. Among the patients, more than two third of them are males. Increased incidence among the old age group and males is observed in our study which is commonly seen in other studies . So increasing age and male sex are the important non modifiable risk factors as we mentioned before.

Other risk factors

Along with diabetes, 46 patients are having coexisting coronary artery disease and 51 of them were dyslipidemic which predispose to macrovascular complications like Stroke ,MI. Out of 93 patients, 55 were chronic alcoholic and 40 were smoker both of them lead to these atherosclerotic events in addition to the diabetes.

Duration of diabetes

Among the 93, 50 patients had a stroke within 10 years from the diagnosis of diabetes. Incidence of stroke decreases as per the duration progresses which is mainly due to the adaptive changes in the cerebral circulation and reduced life expectancy due to some other complications of diabetes.

Adherence to treatment

In our study, out of 93 patients, 48 were on irregular treatment and 45 were on regular treatment. There is no significant difference in the incidence but severity of the stroke correlates statistically significant with treatment adherence.

Glycemic status

Here we assess the glycemic status of stroke patients by measuring FBS, PPBS and HbA1C levels. Severity of the stroke has significant positive correlation of moderate strength with FBS and PPBS level & of strong strength with HbA1C level.

Site of lesion

In our study, 87 patients had ischemic stroke and 6 patients had hemorrhagic stroke. Out of 87 patients with ischemic stroke, lacunar infarct is the commonly observed site of lesion (n = 26). Next to the lacunar infarct, capsuloganglionic infarcts are commonly seen (n = 14).

Severity of stroke

NIHSS used to assess the severity of stroke. All the diabetic patients enrolled in our study are coming under the category of moderate severity and above. Severity of the stroke is compared with respect of many variables in our study.

Age of the patient & Duration of the diabetes are having significant negative correlation of weak strength with severity of the disease.

Sex of the patient and an associated risk factors like CAD, smoking, alcoholism correlation with severity is not statistically significant.

Adherence to the treatment has significant positive

correlation with severity. Glycemic status of the patients indicated by FBS, PPBS & HbA1C levels which is also influenced by the treatment adherence also having a statistically significant positive correlation with NIHSS category. HbA1C level correlates better than FBS and PPBS levels ($p < 0.001$).

Conclusion

In this observational study, we can clearly conclude that incidence of stroke in diabetic patients is increased with advancing age and in males. Lacunar infarcts are commonly observed vascular insults in diabetic patients. And the severity of the symptoms is mainly depends upon the glycemic status of the patients and whether the patient is on regular treatment or not. Patients who were on regular treatment had better glycemic control than those who were not. NIHSS scores were high among the patients with high HbA1C, FBS & PPBS level which indicates the poorly controlled diabetes. Hence we came to know that the importance of taking regular medications in prevention of macrovascular complications of diabetes like stroke and reduced severity, even if stroke occurs. So early detection, treatment and regular follow up of diabetes have a significant role in decreasing the incidence of acute stroke syndrome and its morbidity and mortality.

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