Study to Determine the Incidence of High HbA1c in Patients with Ischemic Stroke at Bilawal Medical College, Kotri, Sindh, Pakistan

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Authors’ contributions

This work was carried out in collaboration among all authors. Authors AA and KP designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MAK and NAK managed the analyses of the study. Authors AGD managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Diabetes mellitus is a known risk factor for stroke. Unlike postprandial and fasting blood glucose levels, HbA1C is not affected by temporary lifestyle modifications. Thus, HbA1C may offer a much precise blood glucose level.

Aim: To study the incidence of HbA1c elevation in patients with ischemic stroke whose blood glucose levels were normal within the last six months.

Study Design: A cross-sectional study.

Place and Duration: This cross-sectional study of the 96 patients with cerebral ischemic disease selected from the internal medicine department of Bilawal medical college Hospital Kotri, Sindh, Pakistan for one-year duration from August 2019 to August 2020.

Methods: Crosssectional study was conducted in the internal medicinal department of Bilawal Medical college Hospital, Kotri Sindh, Pakistan for the period of one year from August 2019 to August 2020. Total 96 study subjects were selected with cerebral ischemic disease, 62 were males

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and 34 were females. Many factors such as age more than 20 years, ischemic stroke and RBG (Random Blood Glucose) were also evaluated from each participant. SPSS 23.00 version was used for statistical analysis of research data.

**Results:** 57.01 ± 13.4 years was the mean age of the patients. 62 (64.6%) patients were male and 34 (35.4%) were female. The male to female ratio was 2:1. HbA1c was elevated in 35 (36.5%) of 96 patients, while 61 (63.5%) had normal HbA1c. The distribution of HbA1c elevation by gender showed that 20 (57.1%) patients with elevated HbA1c were men and 15 (42.9%) were women. Forty-three (70.5%) of 61 patients with normal HbA1c were male and 18 (29.5%) were female.

**Conclusion:** it was concluded that glycated haemoglobin plays an important role for reducing the macro complication of Diabetes and the major macro complication observed was cerebral ischemic stroke among the people with elevated HbA1c.

**Keywords:** Ischemic disease; diabetes mellitus; random blood glucose; laboratory; HbA1c; life style modification.

### 1. INTRODUCTION

Rapidly emerging clinical signs of diffuse or focal neurological deficit (loss of sensation, limb weakness, dysphagia and speech disturbance) persisting for more than twenty-four hours with no identifiable reason other than vascular cause as determined by computed tomography is defined as stroke [1-2]. The cerebral ischemia symptoms may be temporary, lasts from seconds to minutes, or last longer. This might be because of ischemia instigated by a blockage or bleeding [3-4]. The brain affected area cannot function properly, making it impossible to form or understand speech, to move one or more limbs on one side of the body, or to visualize one side of the visual field. For stroke; the utmost significant modifiable risk factors are atrial fibrillation and high blood pressure [5-6]. Other modifiable risk factors comprise diabetes, high blood cholesterol, alcohol abuse, drug use, smoking (active and passive), physical inactivity, processed red meat feeding, obesity and an unnatural diet. The stroke associated drugs are amphetamines, cocaine that cause hemorrhagic stroke, and nonprescription cold and cough medications acting as sympatho-mimetics.

Stroke is one of the four leading causes of death in most countries and the leading cause of disability among adults. Men are 25% more likely to have a stroke than women [7-8]. About 75% of stroke fighters suffer from disability, reducing their employability. The stroke can distress individuals mentally, physically, psychologically, or an amalgamation of these three. Post-stroke outcomes fluctuate greatly dependent on the location and size of the ischemia [9]. Between 35% and 52% of the survivors from stroke suffer from post-stroke depression, categorized by irritability, lethargy, low self-esteem, sleep disturbance and withdrawal. People with diabetes have more than twice the ischemic stroke risk equated with people deprived of DM after adjusting for other risk factors [10-11]. HbA1c levels are proportional to the average blood glucose in the last four rows from one week to three months. HbA1c control may improve outcomes in people with diabetes. A significant proportion of people are unaware of high HbA1c levels prior to laboratory blood testing. HbA1c ≥ 6.5% is considered abnormal [12]. There is a durable association between ischemic stroke and high HbA1c levels, as shown in earlier studies. Geberhiwot et al study showed that 24% of diabetics with normal BSR levels had raised levels of HbA1c [13]. There is a strong link between HbA1c and stroke; we can prevent this catastrophic disease that can result in significant deaths and permanent disability. The aim of the research is to evaluate the incidence of HbA1c elevation in patients with ischemic stroke with normal blood glucose levels since last six months at Bilawal Medical college Hospital Kotri, Sindh, Pakistan.

### 2. PATIENTS AND METHODS

Crossectional study was conducted in the internal medicinal department of Bilawal Medical college Hospital, Kotri Sindh, Pakistan for the period of one year from August 2019 to August 2020. Total 96 study subjects were selected with cerebral ischemic disease, 62 were males and 34 were females. Many factors such as age more than 20 years, ischemic stroke and RBG (Random Blood Glucose) were also evaluated from each participant. Patients with any other disorder were excluded from the study. Glycated Haemoglobin (HbA1c) was also evaluated from each patients from the well reputed laboratory. SPSS 23.00 version was used for statistical analysis of research data.
3. RESULTS

Total 96 patients were divided into three different groups on the basis of their age group as mentioned in the Table 1. 12 patients were included in the age group of 20-40 years, 37 patients were included in age groups of 41-60 years whereas 47 patients were included in the age group of 61-80 years.

Table 1. Distribution of subjects according to age (n=96)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 40</td>
<td>12</td>
<td>12.5%</td>
</tr>
<tr>
<td>41 - 60</td>
<td>37</td>
<td>38.5%</td>
</tr>
<tr>
<td>61 - 80</td>
<td>47</td>
<td>48.95%</td>
</tr>
</tbody>
</table>

From 96 study subjects 62 were male whereas 34 were females as mentioned in the Table 2.

Table 2. Distribution of subjects according to sex (n=96)

<table>
<thead>
<tr>
<th>GENDER</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>62</td>
<td>64.58%</td>
</tr>
<tr>
<td>Female</td>
<td>34</td>
<td>35.41%</td>
</tr>
</tbody>
</table>

Glycated Haemoglobin is also best tool to diagnose the elevated blood glucose in the patients that gave the results of 03 months results of glucose in the body and as per diagnosis, HbA1c was evaluated that was elevated in 35 (36.5%), while 61 (63.5%) had normal HbA1c as mentioned in (Table 3).

Table 3. Distribution of subjects according to HbA1c (n=96)

<table>
<thead>
<tr>
<th>HbA1c</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raised</td>
<td>35</td>
<td>36.45%</td>
</tr>
<tr>
<td>Normal</td>
<td>61</td>
<td>63.54%</td>
</tr>
</tbody>
</table>

The distribution of HbA1c elevation by gender showed that 20 (57.1%) patients with elevated HbA1c were men and 15 (42.9%) were women (Table 4).

Table 4. Gender distribution according to raised HbA1c (n=35)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency of 35 Patients</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>20</td>
<td>57.1%</td>
</tr>
<tr>
<td>Females</td>
<td>15</td>
<td>42.85%</td>
</tr>
</tbody>
</table>

43 male participants had normal HbA1c whereas 18 females had normal HbA1c. as mentioned in Table 5.

Table 5. Gender distribution according to normal HbA1c (n=61)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>43</td>
<td>70.5%</td>
</tr>
<tr>
<td>Females</td>
<td>18</td>
<td>29.5%</td>
</tr>
</tbody>
</table>

4. DISCUSSION

Ischemic stroke among the patients with diabetes is diagnosed more than the people without diabetes mellitus, so it can be considered as major risk factor for the occurrence of ischemic stroke [14-15]. Numerous studies had conducted on the association of ischemic stroke with Diabetes and other severe risk factors [16]. Similar type of relation was also evaluated in the current study that gave effective results to understand the relationship between them. Due to physiological change from person to person the glucose level also altered among them and hyperglycemia can cause quick response to initiate macro complication. HbA1c is an accurate and precise measuring tool to diagnose chronic blood glucose levels and is more closely related to the complications risk than episodic or single glucose measurements [17]. Socioeconomic levels also considered as risk factor among the diabetes patients. Current research was carried out to evaluate ischemic stroke among the patients with enhanced HbA1c level and data was compared with published [18]. Geberhiwot et al., study in 2015 showed that 24% of individuals with normal BSR levels had raised HbA1c levels, which in our study accounted for 35%. A study by Oh HG et al., In Korean non-diabetic patients found that raised HbA1c was related with a single ischemic stroke rate of 9.5925. In a case-control study, HbA1c> 6.5% was connected with a stroke rate ratio of 2.95. In the cohort study, HbA1c> 7% compared to 2.83 for strokes [19-21]. Chronic hyperglycemia, as designated by high HbA1c levels, is related with 18% upsurge in stroke risk for every 1% increase in HbA1c. Unfortunately, no such work has yet been done in Pakistan [22]. Our study is the first of its kind in Pakistan to determine the relation between ischemic stroke and high HbA1c. Our study found a positive association between high ischemic stroke and HbA1c.
5. CONCLUSION

It was concluded that glycated haemoglobin plays an important role for reducing the macro complication of Diabetes and the major macro complication observed was cerebral ischemic stroke among the people with elevated HbA1c. Mass counseling is needed in order to evaluate the complication and causes ischemic stroke among diabetic people.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES


