Original Research Article

Association between HBA1C and NIHSS score in stroke

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A B S T R A C T

Introduction: Diabetes Mellitus is a very common metabolic disorder and it is an independent risk factor for stroke and is associated with 2 to 6 fold increased risk compared with non-diabetic subjects and worsens survival of patients with acute stroke. Glucose intolerance or even fasting hyperglycemia may follow an acute vascular event, and ensuing physical inactivity and poor food intake may lead to continued glucose intolerance. Glucose intolerance in a stroke patient may or may not reflect glycemia prior to the event. Measurement of HbA1C rather than glucose as an indicator of prior glycemia offers a new perspective. Hence this study is to find out association between HbA1c levels with NIHSS score in stroke.

Objectives: To find out association between HbA1c levels with NIHSS score in stroke.

Materials and Methods: This a cross sectional descriptive study.

Results: In this study well controlled Diabetes has moderate stroke severity, fairly controlled Diabetes has moderate to severe stroke severity and poorly controlled Diabetes has severe stroke. It is observed that severity of the presenting complaints worsened from well controlled Diabetes to poorly controlled Diabetes. The NIHSS score correlates with the HbA1C, with increase in severity of the stroke from well controlled Diabetes to poorly controlled Diabetes.

Conclusion: Severity of the score increases as the infarct size increases. Poorly controlled Diabetes has more severe stroke as per NIHSS score with large sized infarcts. Stroke is a medical emergency and can cause permanent neurological damage, complications and death. National Institutes of Health Stroke Scale (NIHSS) is a well-validated, reliable scoring system for use specifically with stroke patients. The National Institutes of Health Stroke Scale (NIHSS) can be used as a standard measurement instrument by physicians to evaluate the severity of a patient and outcome.

1. Introduction

Diabetes Mellitus is a very common metabolic disorder and it is an independent risk factor for stroke and is associated with 2 to 6 fold increased risk compared with non-diabetic subjects and worsens survival of patients with acute stroke. The combination stroke and Diabetes Mellitus is associated with worse stroke related outcome, high disability and stroke recurrence. Approximately 20% of patients with Diabetes die from stroke.[1,2] The incidence of stroke increases as the age progresses and the number of stroke patients is projected to increase in elderly population. Stroke is more commonly seen in Males when compared to females.[3] The mechanism is believed to be accelerated atherosclerosis, which can affect vessels in many distributions, including small and large vessels.[4]

Glucose intolerance or even fasting hyperglycemia may follow an acute vascular event, and ensuing physical inactivity and poor food intake may lead to continued glucose intolerance. Thus, glucose intolerance in a stroke

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patient may or may not reflect glycemia prior to the event. Measurement of HbA1C rather than glucose as an indicator of prior glycemia offers a new perspective. The rate of non-enzymic glycosylation of hemoglobin is believed to depend largely or solely on plasma glucose concentration.[5] Since the erythrocyte survives about 3 months, HbA1C measurements in patients with normal erythrocyte survival reflect plasma glucose concentrations during that period.

1.1. Aims and Objectives

To find out association between HbA1c levels with NIHSS score in stroke

2. Materials and Methods

2.1. Source of data

The information for the study will be collected from Patients with Acute Ischemic Stroke admitted to BLDEU'S SHRI B. M. PATIL MEDICAL COLLEGE HOSPITAL and RESEARCH CENTRE VIJAYAPUR between December 2016 to June 2018.

2.2. Method of collection of data (including sampling procedure if any)

**Type of study - **Cross sectional study.

With the proportion of stroke 50% at 95% confidence interval & 5% precesion calculated sample size is 64.

It is known that Ischemic stroke accounts for 80%of the Stroke.(67)

n = Z^2*p *(1-p)

e^2 Z - Z value at 95% Confidence interval.

P - Proportion rate.

E - Margin of error.

Hence 64 Ischemic stroke cases will be included in the study.

2.3. Statistical analysis

Data will be analysed by

1. Mean +_SD
2. Students t test/ Mann whitney U test
3. Correlation coefficient

2.4. Inclusion criteria

1. All male and female cases of acute ischemic stroke.
2. Patients of age more than 18yrs.

2.5. Exclusion criteria

1. Patients of age less than 18yrs.
2. Hemorrhagic stroke.
3. Transient ischemic attacks.
4. Subdural/Epidural haematomas

2.6. Study design

1. Estimation of Random blood glucose and HbA1c levels were done at the time of admission.
2. Patients were scored severity based on NIH stroke scale at the time of admission
3. Hba1c levels <6% indicates well controlled,6-9% indicates fairly controlled,>9% indicates poorly controlled
4. Infarct size on CT/MRI scan brain <3cm^2 is small,3-5cm^2 is moderate and >5cm^2 is large infarct.
5. NIHSS score 0-4 indicates minor stroke, 5-15 indicates mild to moderate,16-20 indicates severe and 21-42 indicates very severe neurologic impairment.

3. Results

In this study well controlled Diabetes has moderate stroke severity, fairly controlled Diabetes has moderate to severe stroke severity and poorly controlled Diabetes has severe stroke. It is observed that severity of the presenting complaints worsened from well controlled Diabetes to poorly controlled Diabetes. The NIHSS score correlates with the HbA1C, with increase in severity of the stroke from well controlled Diabetes to poorly controlled Diabetes.

Most of the small sized infarcts occurred in the well controlled Diabetes group, medium sized infarcts in fairly controlled Diabetes and most of the larged sized infarcts in the diabetes group.

In the well controlled Diabetes group, 96% has small sized infarcts and 4% had medium sized infarcts. There were no large sized infarcts.

In the fairly controlled Diabetes group, 6.2% has small sized infarcts, 75% of patients has medium sized infarcts and 18.8% of patients has larged sized infarcts in poorly controlled Diabetes group, 100% of patients has larged sized infarcts.

In this study it is observed that, NIHSS score is lowest in the well controlled Diabetes.

4. Summary

1. In this study well controlled Diabetes has moderate stroke severity, fairly controlled Diabetes has moderate to severe stroke severity and poorly controlled Diabetes has severe stroke.
2. It is observed that severity of the presenting complaints worsened from well controlled Diabetes to poorly controlled Diabetes.
3. The NIHSS score correlates with the HbA1C, with increase in severity of the stroke from well controlled Diabetes to poorly controlled Diabetes.

Table 1: National institute of health stroke scale (NIHSS)[6]

National institute of health stroke scale Catagary		Score
1a.Levelof Consciousness (LOC):	0 = Alert; 1=Drowsy 2=Stuporous 3=Coma	
1b. LOC Questions: (Month, Age)	0=Answers both question correctly 1=Answers one correctly 2=Answers both incorrect	
1c. LOC Commands: (eyes close/open, make fist & let go)	0=Obeys both correctly 1=Obeys one correctly 2=Both incorrect	
2.Best gaze: (Eyes open- pt follows examiner's fingers or face)	0=Normal 1=Partial gaze palsy 2=Forced deviation	
3.Visual: (Introduce visual stimulus/threat to pt's visual field quadrants. Cover 1 eye and hold up fingers in all 4 quadrants.)	0=No visual loss 1=Partial hemianopsia 2=complete hemianopsia 3=Bilateral hemianopsia	
4.Facial Palsy: (Show teeth, raise eyebrows and squeeze eyes tightly shut.)	0 = Normal symmetrical movements. 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of one or both sides	
5. Motor Arm: ("Elevate extremity to 90 degrees and score drift/movement. Count to 10 out loud and use fingers for visual cue".)	0 = No drift; limb holds 90 (or 45) degrees for full 10 seconds. 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity. 4 = No movement. UN = Amputation or joint fusion, 5a. Left Arm 5b. Right Arm	
6. Motor Leg: ("Elevate extremity to 90 degrees and score drift/movement. Count to 10 out loud and use fingers for visual cue".)	0 = No drift; leg holds 30-degree position for full 5 seconds. 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement. UN = Amputation or joint fusion 6a. Left Leg 6b. Right Leg	
7. Limb Ataxia: (Finger to nose, heal down shin)	0 = Absent. 1 = Present in one limb. 2 = Present in two limbs. UN = Amputation or joint fusion	
8. Sensory: (Pin prick to face, arms, trunk, and legs- compare sharpness side to side, or no feeling at all.)	0 = Normal; no sensory loss. 1 = Mild-to-moderate sensory loss 2 = Severe to total sensory loss	
9. Best Language: ("Name items, describe picture, and read sentences. Don't forget glasses if they normally wear them".)	0 = No aphasia; normal. 1 = Mild-to-moderate aphasia 2 = Severe aphasia 3 = Mute, global aphasia; no usable speech or auditory comprehension.	
10. Dysarthria: (Evaluate speech clarity by pt reading or repeating words on list.)	0 = Normal. 1 = Mild-to-moderate dysarthria 2 = Severe dysarthria UN = Intubated or other physical barrier, explain:_____	
11. Extinction and Inattention (formerly Neglect): ("Use information form prior testing or double simultaneous stimuli testing to identify neglect face, arms, legs and visual fields".)	0 = No abnormality. 1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities. 2 = Profound hemi-inattention or extinction to more than one modality; does not recognize.	
NT= Not testable **Total score**		

Table 2: Distribution of patients according to Age (Years)

Age (Years)	No. of patients	Percentage
< 40	1	1.6
40 – 49	8	12.5
50 – 59	12	18.8
60 – 69	22	34.4
70 – 79	13	20.3
80+	8	12.5
Total	64	100.0

In this study, maximum number of patients were in the age group of 60-69 years
Next commonest age group is 70 - 79

Table 3: Distribution of patients according to Gender

Gender	No. of patients	Percentage
Male	37	57.8
Female	27	42.2
Total	64	100.0

In this study, 57.8% of the cases were male and rest 42.2 were females. There is male preponderance with male: female ratio of 1.36.

Table 4: Diabetic status in the study group n=64

HbA1C	No. of patients	Percentage
< 6.00	25	39.1
6.00 - 9.00	16	25.0
9.0+	23	35.9
Total	64	100.0

In this study 39.1% cases were well controlled, 25% were fairly controlled, 35.9% were poorly controlled.

Table 5: Infarct size in study group

Infarct class	Infarct Size	No. of patients	Percentage
A	< 3	25	39.1
B	3 -5	13	20.3
C	>5	26	40.6
	Total	64	100.0

In this study group, small sized infarcts accounted for 39.1% of cases, medium sized infarcts 20.3% and large sized infarcts accounted for 40.6%

Table 6: Risk factors in our study group

Risk Factors	No. of patients	Percentage
T2DM	13	20.3
T2DM,SM	15	23.4
T2DM,HTN,SM	3	4.7
T2DM,HTN,DYS	5	7.9
T2DM,HTN	18	28.2
T2DM,DYS	7	10.8
T2DM,RHD	2	3.1
T2DM,RVD	1	1.6
Total	64	100.0

In this study, the risk factors were Diabetes mellitus, Hypertension, smoking, Dyslipidemia, Rheumatic heart disease and Retroviral disease.

Table 7: Clinical Presentations in the study group

Motor Deficits	No. of patients	Percentage
Present	64	100
Total	64	100.0

In this study, all 64 patients has motor deficits.

Table 8:

Sensory Deficits	No. of patients	Percentage
Present	17	26.6
Absent	47	73.4
Total	64	100.0

In this study, 17 patients has sensory deficits.

Table 9:

Altered Senosorium	No. of patients	Percentage
Present	19	29.7
Absent	45	70.3
Total	64	100.0

In this study, 19 patients has altered sensorium.

Table 10:

Cranial Nerve Involvement	No. of patients	Percentage
Present	35	54.7
Absent	29	45.3
Total	64	100.0

In this study, 35 patients has cranial nerve involvement.

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Language Disturbance	No. of patients	Percentage
Present	29	45.3
Absent	35	54.7
Total	64	100.0

In this study, 29 patients has language distrubances.

Table 11: Severity of the stroke

Severity	Score	No. of patients	Percentage
Minor stroke	0-4	0	0
Moderate Stroke	5-15	24	37.5
Moderate to Severe	16-20	14	21.9
Severe Stroke	21-42	26	40.6
Total		64	100.0

In this study, moderate stroke is seen in 37.5% of patients, moderate to severe stroke in 21.9% of patients and severe stroke in 40.6% of patients

Table 12:

Descriptive Statistics				
X	Minimum	Maximum	Mean	Std. Deviation
Age	35	90	63.59	12.558
NIHSS score	8	35	19.55	7.719
Blood glucose on admission	80	420	212.23	88.907
HbA1C	4.50	12.80	7.6766	2.27594

Table 13: Association between HbA1C and NIHSS Score

HbA1C vs NIHSS score	Moderate Stroke	Moderate to Severe	Sever Stroke	Total	Chi square test
<6	24(100%)	1(7.1%)	0(0)	25(39.1%)	
6-9	0(0)	13(92.9%)	3(11.5)	16(25.0%)	P=0.0001*
9+	0(0)	0(0)	23(35.9%)	23(35.9%)	
Total	24(100%)	14(100%)	26(100%)	64(100%)	

Table 14: Association between HbA1C and Infarct size

HbA1C vs Infarct size	<3 cm ^{2}	3-5 cm ^{2}	>5 cm ^{2}	Total	Chi square test
<6	24(96%)	1(7.7%)	0(0)	25(39.1%)	
6-9	1(4)	12(92.3%)	3(11.5)	16(25.0%)	P=0.0001*
9>	0(0)	0(0)	23(88.5%)	23(35.9%)	
Total	25(100%)	13(100%)	26(100%)	64(100%)	

Table 15: Association between Infarct size and NIHS Score

Infract size vs NIHS score	Moderate Stroke	Moderate to Severe	Severe Stroke	Total	Chi square test
<3	24(100%)	1(7.1%)	0(0)	25(39.1%)	
3-5	0(0)	12(85.7%)	1(3.8)	16(25.0%)	P=0.0001*
5+	0(0)	1(7.1)	25(96.2%)	23(35.9%)	
Total	24(100%)	14(100%)	26(100%)	64(100%)	

5. Conclusion

1. Severity of the score increases as the infarct size increases.
2. Poorly controlled Diabetes has more severe stroke as per NIHSS score with large sized infarcts.
3. Stroke is a medical emergency and can cause permanent neurological damage, complications and death.
4. National Institutes of Health Stroke Scale (NIHSS) is a well-validated, reliable scoring system for use specifically with stroke patients.
5. The National Institutes of Health Stroke Scale (NIHSS) can be used as a standard measurement instrument by physicians to evaluate the severity of a patient and outcome.

6. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

7. Source of Funding

None.

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