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A Clinical Study on Glycemic Profile of Non Diabetic Individual with Acute Ischemic Stroke and Its Short Term Prognostic Significance

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Abstract

The association between the diabetes mellitus and its macrovascular complications like stroke had studied in many aspects before. In addition to being the risk factor for the cause of the stroke, it affects the prognosis of the affected individual by altering at the level of cellular and biochemical properties if the blood glucose reaches above certain target range .Non diabetics are also developing stroke due to various etiology and their prognosis mainly depends on the admission time blood glucose. Stress hyperglycemia that occurs due to the rise of counter regulatory hormones and fall of insulin contributes to hyperglycemia which turn leads to cellular edema and worsens the prognosis. In this study I am going to assess the non diabetic individual with acute ischemic stroke and their glycemic profile at the presentation and the short term outcome.

Keywords: *Diabetes mellitus, Stress hyperglycemia, Acute ischemic stroke.*

Introduction

Cerebrovascular diseases include some of the most common and devastating disorders such as ischemic stroke and hemorrhagic stroke. Stroke is the leading cause of the death worldwide causing 6.2 million death in 2011 and is double the rate of heart diseases in china. Stroke cause approximately 2,00,000 death each year in the united states. The incidence if the cerebrovascular diseases increases with the age and the number of strokes is projected to increase as the elderly population grows.[1] Stress hyperglycemia usually viewed as adequate maintenance in the cerebral blood flow at the time of stress events. Increased levels of ketones of hepatic source during longtime fasting decrease the obligatory

requirement for carbohydrate by fifty percent without affecting the neuronal function. Any further reduction of brain glucose uptake compromises of brain function and eventually results in the death[2]. According to ADA recommendations the blood glucose should be above 140 mg/dl. ADA and ACCE recommends the blood glucose level in acutely ill patient should never maintained above 180 mg/dl.

Materials and Methods
Study design
Hospital based cross sectional study
Sample size
50 non diabetic patients with acute ischemic stroke and their relationship with glycemic status
Study duration
October 2015 to September 2017
Study place
Patients from Rajah Muthiah Medical College and Hospital
Selection criteria
Inclusion criteria
All fresh cases of acute ischemic stroke admitted in Rajah Muthiah Medical College during the period of October 2015 to September 2017
Exclusion criteria
➤ Previous history of ischemic stroke
➤ Suspected or documented hemorrhagic stroke
➤ Transient ischemic attack
➤ Known case of space occupying lesion
Laboratory investigations
Hemoglobin
Total and differential count
Platelet count
Erythrocyte sedimentation rate
Random blood glucose within 24 hours of hospital admission
Fasting blood glucose
Post prandial blood glucose
Fasting lipid profile
HbA1c
ECG
CT BRAIN PLAIN

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

1a Level of conscious

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/ leg (right/left)

No drift	0
Drift	1
Some antigravity effect	2
No antigravity effect	3
No movement	4

6. Limb ataxia

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

7. Sensory

No sensory loss	0
Mild to moderate sensory loss	1
Total sensory loss	2

8. Best language

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

9. Dysarthria

Normal	0
Mild to moderate	1
Severe	2

10.Extinction/ inattention

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

The points were added, with a maximum of thirty points.

Patient were followed up for the duration of hospital stay ranges from 5 to 10 days. NIH stroke scale assessed during the time of admission and at the time of discharge from the hospital .The outcome was termed as good and poor outcome. The poor outcome was termed as the persistence of the same NIH stroke scale score or increase in the score further when compared with the admission time score .The outcome was termed as good when there is a fall in NIH stroke scale score when compared with the admission time score.

Results

Table 1: Characteristics of the study group (N=50)

	Mean	SD
Age (years)	60.92	11.90
Random blood sugar (mg/dL)	151.46	47.41
Fasting glucose (mg/dL)	93.62	15.15
Post prandial glucose (mg/dL)	142.94	23.98
HbA1c (%)	5.55	0.53
Total cholesterol (mg/dL)	153.06	40.51
Triglycerides (mg/dL)	109.58	27.87
LDL-C (mg/dL)	89.88	34.20
HDL-C (mg/dL)	46.00	6.63
NIHSS score at admission	8.40	3.39
NIHSS score at discharge	7.20	4.76
Hb (%)	12.14	1.67
Total count	5567.88	3806.89
Platelet count	2.17	0.66
Systolic blood pressure	141.80	26.70
Diastolic blood pressure	84.80	12.82

Table 2

		Frequency	Percent
Sex	Male	31	62
	Female	19	38
ECG changes	No atrial fibrillation	45	90
	Atrial fibrillation	5	10
RBS	RBS more than 180 mg/dL	14	28
	RBS less than 180 mg/dL	36	72
Outcome	Poor	18	36
	Good	32	64

Table 3: Characteristics of subjects with RBS more than 180 mg/dl

	Mean	SD
Age (years)	62.07	12.07
Random blood sugar (mg/dL)	214.57	29.45
Fasting glucose (mg/dL)	107.71	13.56
Post prandial glucose (mg/dL)	168.71	18.24
HbA1c (%)	6.00	0.30
Total cholesterol (mg/dL)	174.93	37.48
Triglycerides (mg/dL)	120.50	32.41
LDL-C (mg/dL)	104.57	33.52
HDL-C (mg/dL)	46.29	7.97
NIHSS score at admission	10.71	3.43
NIHSS score at discharge	10.21	5.10
Hb (%)	12.31	1.73
Total count	7743.43	2798.77
Platelet count	2.17	0.64
Systolic blood pressure	159.29	28.14
Diastolic blood pressure	92.14	16.72

Table 4

		Frequency	Percent
Sex	Male	10	71.4
	Female	4	28.6
ECG changes	No atrial fibrillation	11	78.6
	Atrial fibrillation	3	21.4
Outcome	Poor	9	64.3
	Good	5	35.7

Table 5: Characteristics of subjects with RBS less than 180 mg/dl

	Mean	SD
Age (years)	60.47	11.98
Random blood sugar (mg/dL)	126.92	24.74
Fasting glucose (mg/dL)	88.14	11.94
Post prandial glucose (mg/dL)	132.92	17.68
HbA1c (%)	5.38	0.50
Total cholesterol (mg/dL)	144.56	38.86
Triglycerides (mg/dL)	105.33	25.12
LDL-C (mg/dL)	84.17	33.17
HDL-C (mg/dL)	45.89	6.16
NIHSS score at admission	7.50	2.96
NIHSS score at discharge	6.03	4.12
Hb (%)	12.08	1.67
Total count	4721.83	3840.63
Platelet count	2.17	0.68
Systolic blood pressure	135.00	23.11
Diastolic blood pressure	81.94	9.80

Table 6

		Frequency	Percent
Sex	Male	21	58.3
	Female	15	41.7
ECG changes	No changes	34	94.4
	Atrial fibrillation	2	5.6
Outcome	Poor	9	25
	Good	27	75

Table 7: Age distribution

	RBS less than 180 mg/dl (N=36)		RBS more than 180 mg/dl (N=14)	
Age	Number	Percent	Number	Percent
30-40	2	5.6	1	7.1
41-50	5	13.9	2	14.3
51-60	12	33.3	3	21.4
61-70	10	27.8	7	50.0
71-80	6	16.7	0	0.0
81-90	1	2.8	1	7.1

Table 8: Clinical history

Condition	Number of patients with the condition in subjects with RBS more than 180 mg/dl	Number of patients with the condition in subjects with RBS less than 180 mg/dl
Hypertension	9	6
Hypercholesterolemia	3	2
CAD	2	1
RHD	1	1
COPD	0	1

Table 9: Pearson Chi-Square test

		Outcome		Total
		Poor	Good	
Glycemic status	RBS more than 180 mg/dL	9	5	14
	RBS less than 180 mg/dL	9	27	36
	Total	18	32	50
	Pearson Chi-Square = 6.75 P value = 0.019			

Table 10: Risk estimate

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio (RBS more than 180 mg/dL / RBS less than 180 mg/dL)	5.4	1.431	20.382
For cohort Outcome = Poor	2.571	1.293	5.114
For cohort Outcome = Good	0.476	0.23	0.986

Figure 1 depicts patient group with the admission random blood glucose less than 180 mg/dl had 75% good outcome and 25% poor outcome

Figure 2 depicts that the patient with the admission random blood glucose equals or more than 180 mg/dl had 64.29% good outcome and 35.71% poor outcome
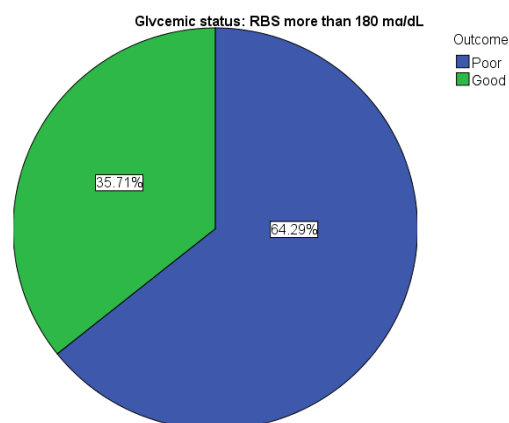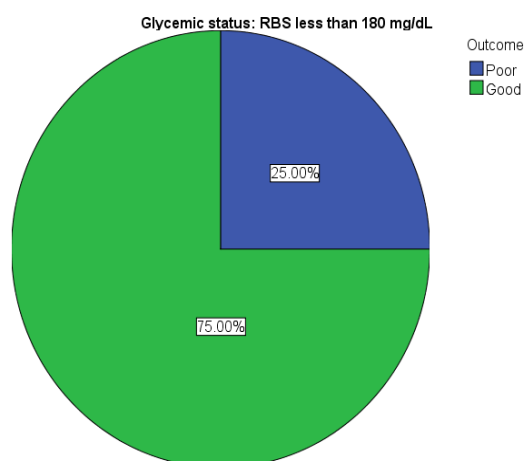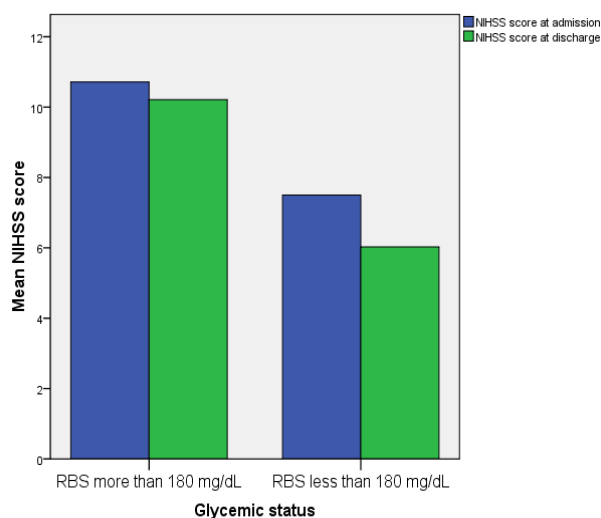
Figure 3 shows the relationship between NIHSS admission and discharge with the RBS more than 180 mg/dl and RBS less than 180 mg/dl.

Discussion

Age, Sex and Risk Factors

In the study of fifty patients majority of them belonged to male sex showing a male preponderance which is commonly seen in most studies. Male patients were 31 and female patients were 19. Male patients were 62% and females were 38%. In the group of patients with RBS more than 180 mg/dl,10 were males and 4 were females. in another group of patients with the RBS less than 180 mg/dl, males were 21 and females were 15.Both groups male preponderance were seen.

36 patients were in the group of patients with RBS less than 180mg/dl and 14 patients were in the group of patients with the RBS more than 180 mg/dl. As a whole the most of the patient age distribution belongs to 61 to 70. In RBS more than 180 mg/dl group, the predominant age distribution is 61 to70.In RBS less than 180 mg/dl group, the predominant age distribution is 51 to 60.

In this study, 15 had hypertension,5 had hypercholesterolemia, 3 had coronary artery disease, 5 had Atrial fibrillation, 2 had rheumatic heart disease and one had COPD. Hypertension, Hyperchlosterolemia, Coronary artery disease, Atrial fibrillation seen more in the patient group with the RBS more than 180 mg/dl. Each group had one Rheumatic heart disease patients and one COPD patient in group with RBS less than 180mg/dl.

Glycemic Status

In the study of fifty patients, 36 were in RBS more than 180 mg/dl group and 14 were in RBS less than 180 mg/dl. In RBS more than 180 mg/dl group, 9 showed poor outcome out of 14 patients. In RBS less than 180 mg/dl group, only 9 showed poor outcome out of 36 patients. The poor outcome demonstrated more in the RBS more than 180 mg/dl group with (p value of 0.019) which is statistically significant.

Severity of Stroke

Severity of stroke was assessed with NIH Stroke scaling system.

Admission day patients with RBS more than 180 mg/dl had a higher score when compared to patients with RBS less than 180mg/dl (10.71 vs. 7.50 respectively). Patients with the RBS more than 180 mg/dl had a higher score when compared to patients with the RBS less than 180 mg/dl (10.21 vs 6.03).Hence an elevated blood sugar at the time of stroke resulted in severe stroke

Comparison with the other studies, In Kamelabdel Aziz Mohammed study in 2013 male patients were 1% and female were 39%.in Abdu Hameed AI Kassir study in 2012 male patients were 7.% and female patients were 32.4%. In Hala EI Kawas study in 2006 male patients were 5.% and females were 43.3%.In our study male subjects were 68% and female subjects were 32%.

According to Perttu J. Lindsberg and Risto o Roine[3] hyperglycemia was noted in two third (66%) of all ischemic stroke patients. In our study hyperglycemia which have considered as random blood glucose more than 180 mg/dl was noted one fourth (28%) of all ischemic stroke patients.

A study published in European journal of Neurology, 2002[4] concluded that elevated glucose level after acute stroke is associated with higher stroke severity than those with normal level. In

our study the mean NIHSS in RBS less than 180 mg/dl group at admission and discharge was 7.50 and 6.03 whereas the mean NIHSS in the RBS more than 180 mg/dl at admission and discharge was 10.71 and 10.21 respectively.

In the journal of clinical endocrinology and metabolism, 2002[5] a study confirmed that patients with newly detected hyperglycemia had a significant higher early mortality and a lower functional outcome than patients with a history of diabetes or normoglycemia. Our study in fifty acute stroke patients had the same results in functional recovery after stroke and no association found out in mortality

Williams et al 66 0ld stress hyperglycemia was present in 40% of patients at the time of admission, hyperglycemia was an independent predictor of death at 30 days.

Hala EI Kawas study found that acute hyperglycemia predicts the increased risk of poor neurological and functional outcome. Measures to normalize blood glucose level in the setting of acute stroke could be of value in improving stroke outcome.

Sagarbasu study suggested with high blood sugar level as a marker of stroke severity

Conclusion

The study showed there is significant relationship between poor outcome in acute ischemic stroke patients who had admission day random blood glucose more than 180 mg/dl than those who had admission day random blood glucose value less than 180 mg/dl. There is a good correlation between tight admission day glucose level and the outcome in ischemic stroke. Admission day elevated glucose level was a significant predictor of poor functional outcome after acute stroke. Hence, restoration of normoglycemia as soon as possible should be encouraged though conclusive evidences are lacking. In the interim, we should fare well with adhering to good general stroke management, normalization of body temperature, fluid balance and hemodynamics or we may

otherwise risk the favorable outcome even in the patients with normoglycemia.

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