Association between severity of Stroke and HbA1C in Patients with Type 2 Diabetes

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Abstract-

Introduction- Type 2 diabetes affects more than 220 million people worldwide, has an alarming number of new cases in the Asian population and is an important risk factor for ischemic stroke. Moreover, hyperglycemia as indicated by high Glycated hemoglobin (HBA1C) is associated with poor outcome in acute ischemic stroke.

Aim- To assess the association of HbA1C level on the severity of stroke in diabetic patients.

Methodology- Hospital based cross sectional observational study conducted at Medicine OPD, medicine wards of SMS hospital, Jaipur from July 2018 to November 2019 on 40 diabetic patients of Stroke.

Results- In our study patients with HbA1C level > 10, 2 had National Institutes of Health Stroke Scale (NIHSS) score 5-15, 3 had NIHSS score 16-20 and 21 each. Patients with HbA1C level 9.1-10, 2 had NIHSS score 5-15, 1 had NIHSS score 16-20 & each. Patients with HbA1C level 8.1-9, 1 had NIHSS score 1-4 and 16-20 each, 2 had NIHSS score 5-15 and each. Patients with HbA1c level 7.18, 3 had NIHSS score 16-20 and 1 had NIHSS score . Patients with HbA1c level 6.5-7, all 3 had NIHSS score 5-15. Patients with HbA1c level < 6.5, 5 had NIHSS score 1-4, 7 had NIHSS score 5-15 and 3 had NIHSS score 16-20. Thus, most patients with a better prognosis as determined by their lower NIHSS score had a lower HbA1C level, and most with a worse prognosis as per their higher NIHSS score had a higher HbA1c level. Pearson correlation between NIHSS severity score and HbA1C found r=0.469 with p value 0.001.

Conclusion- Stroke severity is related with glycaemic control. Early diagnosis and treatment including lifestyle modification and prevention of diabetes may reduce the development of stroke and its complications because it presents a major challenge for health care professionals facing an epidemic of both diabetes and stroke.

Keywords- Type 2 diabetes, HbA1C, NIHSS.

Introduction-

Worldwide more than 200 million people are affected by Diabetes mellitus [1]. Prevalence of diabetes has nearly doubled in Asia in the past decade [2-4]. The current prevalence of diabetes in India is between 5.3–13.6% [2].

Stroke is the second most common cause of mortality and the third most common cause of disability [5]. Diabetes mellitus has been established as a risk factor for stroke and are associated with poor patient outcomes [6, 7]. The prevalence of stroke in diabetics is 1.5-3 times higher as compared to non-diabetics [8]. The pattern of stroke in diabetics is different than non-diabetics. Diabetes significantly increases risk of stroke in younger patients as well as women [9]. A study has revealed that the prevalence of diabetes was significantly higher in subjects with small vessel cerebrovascular accidents (35.5%) as compared to patients with large vessel atherosclerosis (29.0%) or cardio-embolic (28.1%) stroke, and subjects with other combined etiologies of stroke (9.4%) [10].

As the prevalence of diabetes and ischaemic stroke in Asians has increased, the importance of predictive value of glycated haemoglobin (HbA1C) has been an area of focus in recent years [11, 12].

Research conducted by European multicentre study has shown that stroke in diabetic patients was different from stroke in non-diabetics from several perspectives [13]. Though considerable work has been done on this matter internationally, there is paucity of Indian data. Therefore the present study has been planned to identify the severity of stroke in diabetics in association with HBA1C in Indian population. This will assist in designing a better strategy towards primary prevention of stroke in the diabetic population by improving glycaemic control.

Aim- To assess the association of HbA1C level on the severity of stroke in diabetic patients.

Methodology- Hospital based cross sectional observational study conducted at Medicine OPD, medicine wards of SMS hospital, Jaipur from July 2018 to November 2019 on 40 diabetic patients of Stroke.

Statistical analysis- Qualitative data is presented as percentage & proportion. Quantitative data was presented as mean & SD. Appropriate statistical test like chi square test, spearman correlation test were used to determine association.

P value less than 0.05 is taken as significant.

Inclusion Criteria

All known type 2 diabetic patients with features of new onset stroke

Exclusion Criteria

Patients with

- Old stroke

- Focal neurological deficit induced by subdural haematoma / space occupying lesion/aneurismal rupture/head injury

- Drug induced focal deficit (anticoagulants)

- Transient ischaemic attack

- Cerebral venous thrombosis

- Refusal to give consent

Methodology-All patients with features of stroke who satisfied the inclusion criteria were included in the study. Semi structural data collection proforma was used to record basic investigation reports, radiological findings. After the confirmation of stroke from radiologic investigation, HbA1C value was calculated and patients with HbA1C > 6.5 % and diabetic patients on medication even with HbA1c < 6.5% were included in study population. Presence of other risk factors as age, sex, hypertension, smoking, dyslipidemia, ischemic heart disease, old cerebrovascular accidents were noted. Severity of stroke was assessed by using National Institutes of Health Stroke Scale (NIHSS) score at the time of presentation.

Results-

Table 1: Age distribution of patients

Age	Number of patients	Percentage

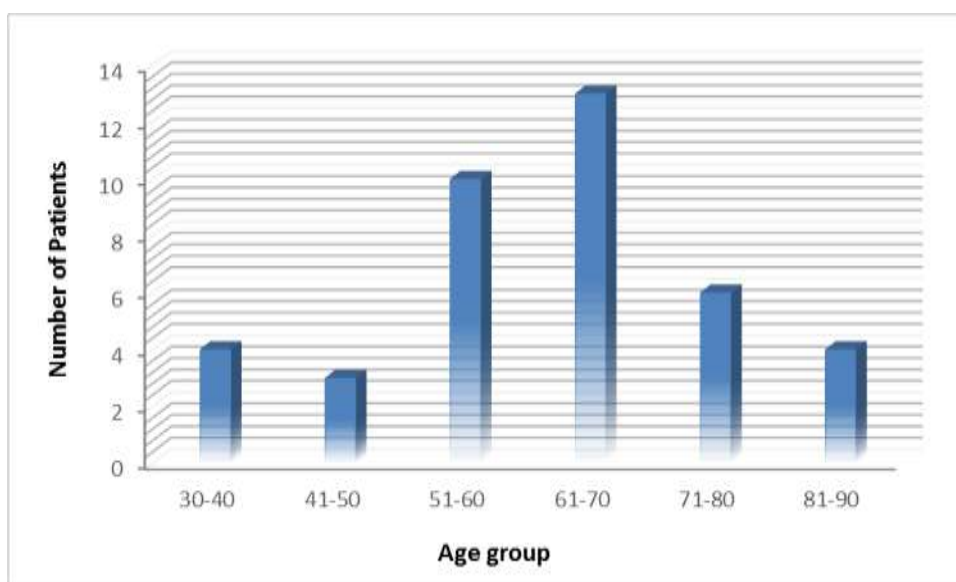|		
30-40	4	10
41-50	3	7.5
51-60	10	25
61-70	13	32.5
71-80	6	15
81-90	4	10
Total	40	100
Mean ±SD	62.42±14 .46	

Fig 1: Age distribution of patients

Table 2: Gender wise distribution of patients

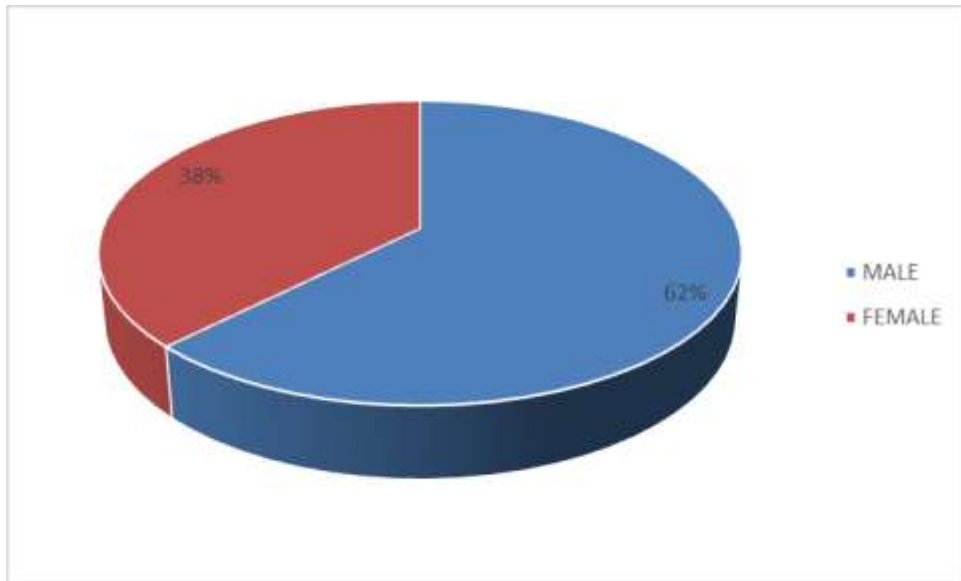| Gender	Number of patients	Percentage
Male	25	62.5
Female	15	37.5
Total	40	100

Fig 2: Gender wise distribution of patients

Table 3: Correlation of HbA1c with NIHSS score

Serum	0	1-4	5-15	16-20	>21	TOTAL

HbA1c						
>10.0	-	-	2	3	3	8
9.1--10	-	-	2	1	1	4
8.1-9	-	1	2	1	2	6
7.1-8	-	-	-	3	1	4
6.5-7	-	-	3	-	-	3
<6.5	-	5	7	3	-	15
Total	-	6	16	11	7	40
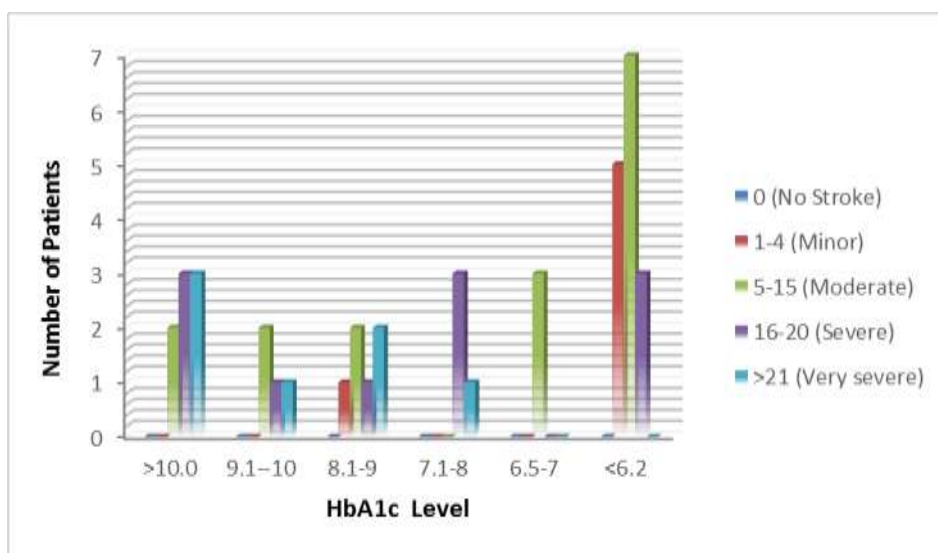
Fig 3: Correlation of HbA1c with NIHSS score Table

4: Correlation of HbA1c with NIHSS

	HbA1c	
NIHSS	r	0.469
	P-value	0.001

Here we calculated Pearson correlation between NIHSS severity score and HbA1c and found r=0.469 with p value 0.001.
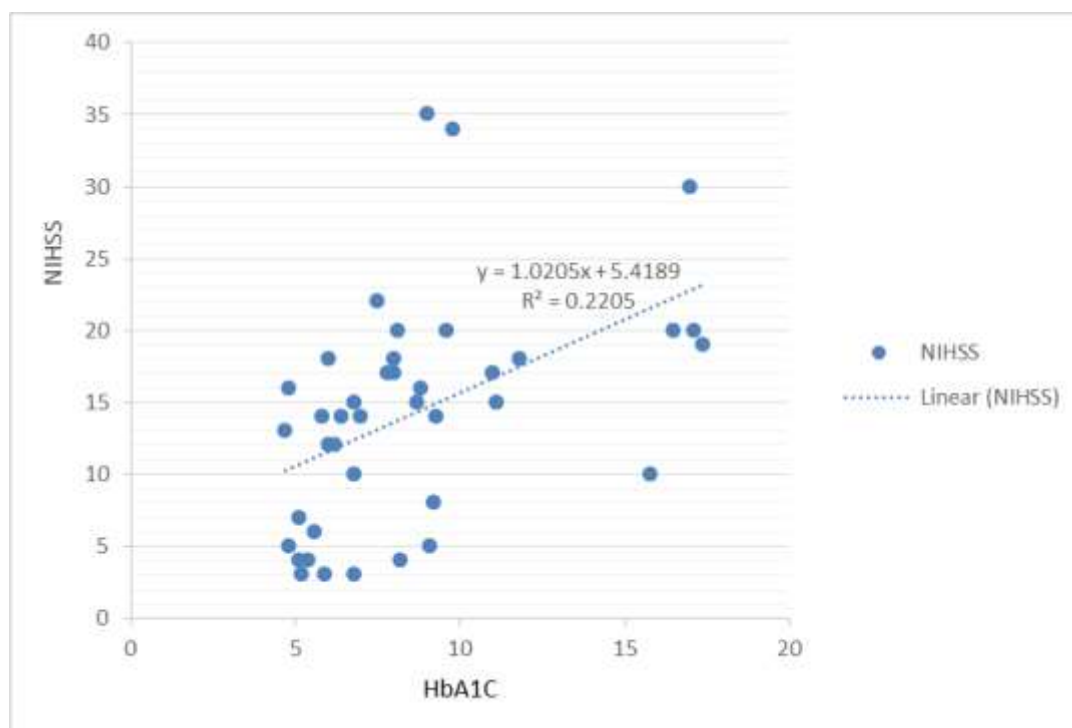

Fig 4: Correlation of HbA1c with NIHSS

Discussion-

In present study majority of patients (32.5%) were in age group 61-70 years followed by 25% patients in age group 51-60 years with mean age of patients as 62. 42±14.46 years. Similarly Patibandla et al [14] in their study found that the mean age of stroke patients was 61.68±12.97 years which is consistent with results of present study. Similarly K Ghanachandra Singh et al [15] observed that the incidence of stroke is

more common in the age group of 51-60 years. Older adults over 60 exhibited higher odds of experiencing strokes than their younger counterparts (aged under 60) [16].

In present study there were 62.5% male and 37.5% females with male to female ratio was 1.7:1. Similarly Patibandla et al [14] found that out of 60 stroke patients 41(68%) were males and 19(32%) were females and male to female was 2.1:1. Similarly Sunanda et al [17] found that out of 130 stroke patients males were predominant (94/130) comprising 72.3% of study population.

These findings corroborate previous studies by Boehme et al [18] and Kamalakannan, S et al [19] which have consistently reported a higher prevalence rate of stroke among older adults and males.

The sex-related differences in stroke could be explained on the basis of differences in the sex steroid hormones, principally estrogen hormone [20]. Estradiol in females has strong dilation effects on the vascular endothelial and promotes blood flow, whereas testosterone hormone in males leads to constriction of the endothelial and decreasing blood flow [21].

In present study there are statistically significant differences in term of severity of Ischemic stroke as reflected by NIHSS score with variation in HBA1C i.e. most patients with a better prognosis as determined by their lower NIHSS score had a lower HbA1C level, and most with a worse prognosis as per their higher NIHSS score had a higher HbA1C level.

Kizer et al [22] in their study has shown that a higher blood HbA1C levels have a more serious neurological impairment and the prognosis is worse after three months.

HbA1C levels may be is an important predictor to evaluate the neurological impairment in patients with acute ischemic stroke. Chronic elevation of blood

glucose levels leads to damage of blood vessels. The endothelial cells lining the blood vessels take in more glucose than normal, since they do not depend on insulin leading to formation of more surface glycoproteins and thickening and weakening of basement membrane culminating in microvascular complications (due to damage of small blood vessels) and macrovascular complications (due to damage of arteries). Research data show an increased risk of stroke associated with hyperglycemia [23].

According to Kamouchi et al [24] higher blood HbA1C levels have a more serious neurological impairment. Patibandla et al [14] found correlation, association between the levels of serum Hb1AC and NIHSS score and indicating a linear relationship between increase in NIHSS score with increase in HbA1C.

Garg et al [25] suggested that hyperglycemia after stroke had adverse effects on the clinical course of ischemic stroke, and was associated with the expansion of infarct volume as a result of neurotoxicity. Similar results were found in Ahmed Hussein et al [26], hyperglycemia level at the time of admission influences the severity of stroke. In their study high random blood sugar level taken at the time of admission high NIHSS stroke scale score found in diabetic stroke patients ($P < 0.02$).

According to Clara Hjalmarsson et al [27], poor glycemic control prior to ischaemic stroke is an independent risk factor for poor survival and a marker for stroke severity (high NIHSS on admission) and associated with poor outcome.

Limitations- This investigation was done on a sample of modest size in a single center; therefore, the effects of modest sample size should be considered while generalizing the results.

Conclusion- Stroke severity is related with glycaemic control. Early diagnosis and treatment including lifestyle modification and prevention of diabetes may reduce the development of stroke and its complications because it presents a major challenge for health care professionals facing an epidemic of both diabetes and stroke.

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