Original Article

Activity Functional Outcome of Poor Prestroke Glycemic Control in Diabetic Patients with Acute Ischemic Stroke

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ABSTRACT

Objective: Diabetes mellitus (DM) is an independent risk factor of cerebrovascular events including for ischemic stroke. In diabetic patients, prestroke glycemic control is known to impact the functional outcome of acute ischemic stroke. Therefore, we conduct this study to see the activity Functional outcome of poor Prestroke glycemic control in Diabetic patients with acute ischemic stroke.

Study Design: A prospective, cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Internal Medicine, Sandeman Provincial Hospital, Quetta from January till July 2014.

Materials and Methods: All patients of diabetes mellitus type II admitted in the hospital with acute ischemic stroke were included. HbA1c levels were done and correlated with functional outcome of stroke. Data was entered and analyzed using SPSS v 19.0.

Results: The study was completed by 136 patients. Their mean age was 53.2 ± 8.4 years. There were more males than females (60% vs. 40%). Hba1c was ≥10% in 82 (60.3%) patients. Poor functional outcome was reported in 94 (69.1%; p=0.000) patients. Poor functional outcome was statistically related to older age (≥40 years) (n=81; 86.2%), hypertension (n=68; 72.3%; p=0.000), smoking (n=54; 57.4%; p=0.01), and Hba1c ≥10% (n=69; 73.4%; p=0.000).

Conclusion: In diabetic patients, the predictors of poor short term functional outcome of acute ischemic stroke include age ≥40 years, hypertension, smoking, and Hba1c ≥10%.

Key Words: acute ischemic stroke, cerebrovascular events, glycemic control

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INTRODUCTION

Type 2 Diabetes mellitus (T2DM) is the commonest metabolic illness. It has been recognized as an independent risk factor of cerebrovascular events including for ischemic stroke. Patients of DM have an increased of ischemic stroke by 1.8–6 times [1]. As many as 21–44% patients of ischemic stroke patients have coexisting T2DM [2]. In almost all cases of ischemic stroke, underlying atherosclerosis is the major causative agent. Atherosclerosis results from immune mediated mechanisms as a result of modifiable metabolic risk factors such as T2DM [3].

Some researchers have reported that as compared to non-diabetic individuals, T2DM patients have an adverse outcome of stroke [1].

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However, not all studies have shown consistent results. In a study from Africa, the mortality rate in ischemic stroke was similar for both T2DM and non-diabetic individuals [4]. Glycemic control remains the major therapeutic objective for prevention of acute and chronic complications related to the disease. HbA1c has become the gold standard for monitoring long term glycemic control; lowering it by proper T2DM management reduces the risk for complications [5]. Hyperglycemia may occur in as many as 30-40% of ischemic stroke patients including those with no T2DM history [6]. The functional and neurological outcomes of stroke are dependent on demographic and clinical characteristics including glycemic status of the patient at the time of admission[7].

It has been recommended by American Diabetic Association that glycosylated hemoglobin is a reliable parameter for determination of glycemic control [8]. In a multicenter registry, Kamouchi et al. found poor functional outcomes in patients of acute ischemic stroke with poor prestroke glycemic control (PSGC) [1]. In this study poor functional outcome was noted in 65.5% patients who had poor PSGC, showing a negative association of poor functional outcome with prestroke glycemic control [1].

It has been found that patients with high level of glycosylated hemoglobin are at higher risk for neurological deterioration [9]. Patients with T2DM are at

greater risk of death or dependency and of recurrent stroke in comparison to non-diabetic patients [10]. Blood glucose level has been found inversely related with the prognosis of ischemic stroke patients [11]. This association of T2DM and poor outcome has not yet been revealed very much in our population. Therefore, results of our study helped in identification of patients who may have worst outcome so that timely preventive management actions can be taken in this group of patients.

MATERIALS AND METHODS

It was prospective, cross-sectional study conducted in the Department of Internal Medicine, Sandeman Provincial Hospital, Quetta. The study was conducted from 25th January till 25th July 2014. All patients were included after attaining informed consent. The study was approved by institutional review board.

Sample size was calculated using World Health Organization sample size calculator. With an anticipated 65.5% frequency of poor outcome [1]; confidence level of 95%; and absolute precision of 8%; the sample size calculated was 136. Non-probability consecutive sampling technique was adapted and all patients of T2DM admitted in the hospital with acute ischemic stroke were included.

Computed tomography (CT) scan of the brain was done for all patients to exclude intracranial bleed seen as hyper density on CT scan. Patients with intracranial bleed, patients who were unaware of time of onset of stroke, patients with underlying malignancy, and patients who refused for participate were excluded from the study.

A semi-structured questionnaire was constructed to record demographic, clinical, and biochemical information, and outcome of stroke. HbA1c levels were routinely done in all ischemic stroke patients, as a part of acute ischemic stroke management keeping in view the current standard guidelines. No additional investigations were performed. Departmental protocol was followed for the management of the patients.

In order to assess the functional outcome of stroke, Modified Rankin Scale (mRS) was used [12]. It is scored from 0–6. The scores are defined as follows: Score 0 – no symptoms at all. Score 1 – no significant disability despite symptom; able to carry out usual duties and activities. Score 2 – slight disability; unable to carry out all previous activities but able to look after own affairs without assistance. Score 3 – moderate disability; requiring some help but able to walk without assistance. Score 4 – moderately severe disability; unable to walk without assistance and unable to attend to own body needs without assistance. Score 5 – severe disability; bedridden, incontinent, and requiring constant nursing care. Score 6 – dead. Score 0–1 represents good outcome and score 2 or more represents poor outcome.

Data was entered and analyzed using Statistical Package for Social Sciences (SPSS v 19.0). Mean and standard deviation was calculated for continuous variables. Frequency and percentages were calculated for categorical variables. For statistical correlation, chi square test was applied. P value $\leq$0.05 was taken as significant.

RESULTS

The study was completed by 136 patients. Their mean age was 53.2 ± 8.4 years (range: 36-61 years). There were more males than females (60% vs. 40%). Their demographic and clinical characteristics are summarized in table 1.

Table No.1:

Patient characteristics	Frequency n (%)
Age in years	
Mean SD	53.2 ± 8.4
Less than 40	42 (30.9%)
40 or more	94 (69.1%)
Gender	
Male	81 (59.6%)
Female	55 (40.4%)
Risk factors	
Hypertension	81 (59.6%)
Smoking	57 (49.3%)
Obesity	54 (39.7%)
Hba1c	
Less than 10%	54 (39.7%)
10% or more	82 (60.3%)

Poor clinical outcome was reported in 94 (69.1%) patients and the remaining 42 (30.9%) patient good functional outcome. Outcome was correlated with patient factors which is summarized in table 2. Table 2 showed that poor functional outcome was statistically related to older age (≥40 years), hypertension (HTN), smoking, and Hba1c ≥10% (table 2).

Table No.2:

Patient characteristics	Functional outcome		P value
	Poor (n=94)	Good (n=42)	
Age in years			
Less than 40	14 (14.9%)	28 (66.7%)	0.000
40 or more	81 (86.2%)	13 (30.9%)	
Gender			
Male	53 (56.4%)	28 (66.7%)	0.12
Female	42 (44.7%)	13 (30.9%)	
Risk factors			
Hypertension	68 (72.3%)	13 (30.9%)	0.000
Smoking	54 (57.4%)	14 (33.3%)	0.01
Obesity	40 (42.5%)	14 (33.3%)	0.24
Hba1c			
Less than 10%	26 (27.6%)	28 (66.7%)	0.000
10% or more	69 (73.4%)	13 (30.9%)	

DISCUSSION

According to epidemiological reports, in patients with T2DM, the relative risk of stroke is 1.5-3 times higher than non-diabetic healthy individuals. If stratified for gender, the risk is 2-3 times higher for diabetic males and 3.6.5 times for diabetic females [13-17]. In another large cohort from Kingdom, diabetic patients had twice the absolute rate of stroke as compared to non-diabetics. Women had 8 times the risk as compared to 4.6 times in men [18]. In our study, female to male ratio was 1:1.4 and the incidence of stroke was higher in older diabetic participants. In our study, more stroke patients were of older age group (≥40 years); however, literature has reported that the risk of stroke in T2DM patients decreased with age [18]. Another population based report concluded that the risk of stroke is highest in diabetic patients of age <65 years [19] which is in agreement to our results as the maximum age of our sample was 62 years.

Of all the diabetic patients, 60% were hypertensive, 50% were smokers, 40% were obese, and 60% had poor glycemic control in our study. Results from a Chinese stroke registry showed that among their diabetic patients of ischemic stroke, only 7% were obese, 35% were smokers, and 77% had HTN [2]. In our study, poor clinical outcome was seen in 70% patients. In a Chinese report, 57% of diabetic patients had poor outcome of stroke at follow-up as compared to 43% with good outcome (p-0.01) [20]. Increased age, smoking, HTN, and poor glycemic control were the predictors of poor outcome in our study. A systematic review has identified older age as a prognostic factor for poor outcome in stroke [21]. HTN has been reported to be significantly associated with diabetes in ischemic stroke patients ($p \leq 0.05$) but smoking has been more commonly seen in non-diabetic Chinese individuals [2].

The most important predictor of adverse stroke outcome was poor glycemic control – 70% patients with poor PSGC had poor outcome after stroke. Poor PSGC has been associated with both acute and long term mortality in ischemic stroke. In a comparative study with diabetics and non-diabetics, higher Hba1c was associated with increased of developing ischemic stroke [22]. In an epidemiological report from Sweden, hazard ratio (HR) for acute mortality was 1.45 and 1.29 for long-term mortality in stroke patients with uncontrolled diabetes mellitus. With HbA1c>6%, the odds ratio (OR) of acute stroke severity increased to 1.29 [23]. In Tanaka et al., ischemic stroke patients were followed for 30-days. Poor outcome (mRS: 2–6) was significantly associated with the diabetes group as compared to non-diabetic and pre-diabetic groups (OR =3.6; p <0.001) [24]. As many as 47% cases of ischemic stroke with poor glycemic control had functional dependency even after three months of stroke [3]. In a local study with non-diabetics, incidence of stress induced hyperglycemia increased the relative risk of mortality in ischemic stroke patients to 2.36 (p-0.004) [25]. To the best our knowledge, no local study investigated the impact of poor PSGC on functional outcome, although the international evidence is robust[1,2].

CONCLUSION

Diabetes mellitus is a metabolic syndrome with impacts on all major systems of the body. Its cardiovascular consequences can have great morbidity and mortality. Ischemic stroke is not uncommon in T2DM patients. Patients of T2DM do not have promising outcome of ischemic stroke. Poor outcome is associated with older age, active smoking, comorbid HTN, and poor glycemic control. Such patients become high-risk groups and are vulnerable to adverse complications.

Author's Contribution:

Concept & Design of Study:	Gulandam
Drafting:	Kaleemullah Kakar, Maria Abid
Data Analysis:	Maria Abid, Mohammed Atif Gulzar
Revisiting Critically:	Gulandam, Kaleemullah Kakar
Final Approval of version:	Gulandam

Conflict of Interest: The study has no conflict of interest to declare by any author.

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