Frequency of Newly Diagnosed Diabetes Mellitus as a Comorbidity Among Acute Ischemic Stroke Patients

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ABSTRACT

Objective: The aim of the study was to determine the frequency of newly diagnosed DM and other associated risk factors in patients with AIS.

Study Design: cross sectional study

Place and Duration of Study: This study was conducted at the Department of Medicine of Ayub Teaching Hospital, Abbottabad for a period of one year from January 2018 to December 2018.

Materials and Methods: The sample comprised all AIS patients of both genders between the age group of 30 to 60 years while the patients with known diabetes were excluded. Diabetes was evaluated on the basis of fasting blood sugar (FBS), random blood sugar (RBS) and Glycated hemoglobin (HbA1c) estimates. The history regarding other risk factors was also taken i.e. patients age, weight, body mass index (BMI) and blood pressure (BP) etc. Data was analyzed using SPSS version 22. Chi-square test was applied to investigate the association between diabetic profile and associated risks. A p-value<0.05 was considered significant.

Results: A total of 136 AIS patients with a mean age of 42.58±11.10 years competed the study. Based on HbA1c and FBS levels, 28(20.6%) patients were diagnosed with DM. Moreover, obesity, hypertension and hyperlipidemia were the most frequently reported risk factors among the newly diagnosed diabetic AIS patients (p<0.05).

Conclusion: AIS patients with increased glucose concentrations remain un-diagnosed in a large number of patients. Therefore, initial diabetes screening is recommended for all acute stroke patients, in order to reduce complications and control associated morbidity and mortality.

Key Words: Acute ischemic stroke, Diabetes Mellitus, Hypertension, Obesity, Hyperlipidemia

INTRODUCTION

Stroke has become a debilitating illness worldwide resulting in increased neurological morbidity and mortality. One of the leading causes of disability and the third commonest cause of death, it reduces the overall mobility among the sufferers[1,2]. Based on the rough estimates, the incidence rate is increasing rapidly among Asian countries.

Although there are a very few local epidemiological studies specifying the stroke incidence rate, Pakistan contributes a significant proportion of this globally devastating burden due to its inadequate resources,

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financial crisis, declining community health, services and the overall compromised economy of the country[3,4]. A study provided the estimated rate of stroke incidences in Pakistan i.e. 95/100,000cases are reported per year[5,6]. Moreover, ischemic strokes contribute to 87% of all stroke cases observed globally[2].

Diabetes mellitus (DM) and hypertension, are the traditional and well-known predictors and/or risk factors of cardiovascular diseases (CVD), providing predictions for recurrent stroke as well as stroke following transient ischemic attack (TIA)[7-9].Around 90% of the stroke cases are associated with modifiable risk factors including patient's blood pressure (BP), BMI, renal functioning, glucose and lipid profile[10]. Nearly 74% cases are related to the behavioral and lifestyle risk factors like smoking, alcohol consumption, dietary pattern and physical activities etc while air pollution is responsible for the remaining 29% risk ratio[10].

The stroke and diabetes/hypertension burden shows a similar trend. It has been reported that majority of the Pakistani population is suffering from either diabetes or hypertension or both along with a third comorbid i.e. stroke[3,4]. Which unfortunately remains undiagnosed due to lack of personal healthcare, medical checkups, screening unavailability. Even though if successfully

diagnosed, lack of follow-up visits and decreased treatment compliance are among the other challenges which results in incompetent management of the disease condition[11]. Apart from the above mentioned risks factors, obesity is also among the precipitating factors for acute ischemic stroke (AIS)[11].

Hyperglycemic incidences among the patients with acute stroke either diabetic or non-diabetic contribute to increased risk and complexities as compared to the counterparts without hyperglycemic incidences, indicating glucose intolerance or diabetes among such cases. This comorbid often remains ignored as it is usually thought to be occurring secondary to the physiological stress of acute stroke[8].

Hence, the rapidly increasing ratio of diabetic patients, under-diagnosed silent diabetes cases and the association of diabetes with ischemic stroke prompts the need for diabetes screening of all the AIS patients with hyperglycemia. It is essential to diagnose diabetes among AIS patients as it modulates the overall management of the patients especially in terms of associated comorbidities other than diabetes and associated risk factors including lipids and blood pressure outcomes. Since, there is a paucity of local data regarding un-diagnosed diabetes in stroke patients and associated comorbid conditions, the current study was designed to determine the frequency and association of newly diagnosed diabetes in AIS patients.

MATERIALS AND METHODS

This cross-sectional study was conducted at Department of Medicine, Ayub Teaching Hospital Abbottabad Pakistan over a period of one year from 1st January 2018 to 31st December 2018. The sample size for the study was 140, calculated using the WHO sample size calculator[9] assuming 95% confidence level, 8% anticipated prevalence and 9% absolute precision. Of them 136 completed the study while 4 cases were dropped due to incomplete data records. All patients aged between 30 to 60 years irrespective of gender with diagnosed acute ischemic stroke (AIS) as confirmed by history of loss of function of a part of body and compatible physical and radiological findings (computed tomography scan of brain as loss of grey-white matter differentiation, hypoattenuation of deep nuclei and cortical hypodensity with associated parenchymal swelling with resultant gyral effacement) were included in the study. While patients presented with hemorrhagic stroke, known diabetics with acute ischemic stroke and patients with gestational diabetic history were all excluded.

Based on the inclusion criteria, patients were recruited from medical ward and OPD. After receiving informed consent, the patient's demographics details and clinical records were taken. Moreover, 2 ml blood sample was drawn from each patient for measurement of FBS, RBS and HbA1C levels. Type 2 diabetes was diagnosed on the basis of HbA1C levels, patients were categorized as diabetics (HbA1C>6.5) and non-diabetics (HbA1C<6.5) based on the American Diabetes Association (ADA) Criteria (2016). Height and weight of the patients were recorded to obtain body mass index (BMI). Using BMI patients were further classified as non-obese (<25), overweight (25–30) and obese (>30). Data was recorded using a predesigned structured questionnaire and analyzed using SPSS version 22. Mean and standard deviation were calculated for continuous variables while categorical variables like gender, age groups, BMI groups, diabetes status groups were presented as frequencies and percentages. Significance testing was done using chi-square test where $p<0.05$ was considered significant.

All the patients were managed according to the ethical protocols under the supervision of a consultant physician having at least five years' experience and the study was conducted in accordance to the ethical guidelines after receiving approval from the ethical review board of Ayub Teaching Hospital, Abbottabad(ERB/2019/medicine/233).

RESULTS

Out of 136 AIS patients, 77(56.6%) were males and 59(43.4%) were females with a mean age of 42.58±11. 10 years. The mean FBS (mg/dl), RBS (mg/dl) and HbA1c (%) was also assessed and recorded as 122.70±9.65, 188±7.69 and 6.53±0.47 respectively. Of the 136 AIS patients, 28(20.6%) were diagnosed with newly diagnosed diabetes mellitus (DM).

Table No.1: Baseline characteristics of study population(n=136)

Baseline Characteristics	n=136
Mean Age (years)	42.58±11.10
Weight (kg)	89±19.22
Height (m)	1.522±0.3049
BMI (kg/m^2)	27 ±5.41
FBS (mg/dl)	122.70±9.65
RBS (mg/dl)	188±7.69
HbA1c (%)	6.53±0.47
Gender	
Male	77(56.6)
Female	59(43.4)
Associated risk factors	
Diabetes Mellitus	28(20.6)
Obesity	20(14.7)
Hypertension	38(27.9)
Hyperlipidemia	20(14.7)

*Values are given as mean±SD and n(%)
*HbA1c - Glycated hemoglobin; FBS-Fasting Blood Sugar; BMI- Body Mass Index
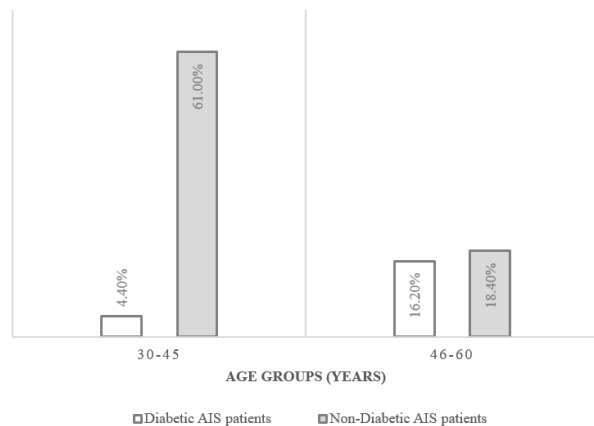
Figure No.1: Age-wise distribution of diabetic and non-diabetic AIS patients

The AIS patients were divided into two categories based on age i.e. 30-45 years and 46-60 years. 4.40% and 16.20% AIS patients between the age group of 30-45 years and 46-60 years were diabetic respectively (p<0.05).

The results showed that obesity, hypertension and hyperlipidemia were significantly associated with diabetic profile (p<0.05). Increased prevalence of the mentioned three risk factors was observed among diabetic AIS patients as compared to non-diabetic AIS patients.

Table No.2: Association of risk factors with diabetic status of the AIS patients

Risk Factors	Diabetic AIS patients	Non-Diabetic AIS patients	p-value
Obesity	13(9.6)	7(5.1)	<0.05
Hyperlipidemia	13(9.6)	7(5.1)	<0.05
Hypertension	28(20.6)	10(7.4)	<0.05

*Values are given as n(%)
*p<0.05 is considered significant
*AIS- Acute Ischemic Stroke

DISCUSSION

AIS, is a complex disease with multifactorial etiologies, indistinguishable and heterogeneous pathophysiological presentations resulting in severe disabilities and high mortality rates. Substantial contribution from other comorbidities further increase the disease complications and associated risks which in turn requires altered management and treatment according to the primary and secondary disease as well for effective control. Out of total 136 AIS patients presented to the study setting, 28(20.6%) cases were diagnosed with DM(Table 1). Consistent with our findings, a local study reported 50(20%) newly diagnosed DM-AIS cases with an average FBS level 148±10 mg/dl[13]. Furthermore, the vast data from the FIN MONICA and FIN STROKE registers also suggested that one-fourth of AIS patients are affected by diabetes i.e. 1103/4390 (25%) AIS patients were diagnosed with DM[14].

It is evident that of all the unmodifiable risk factors associated with AIS, age is the most significant constant risk in the general population[15]. In support, our results also indicated higher diabetes incidence rate among the older age group (46-60 years) (Figure 1). Besides this, common modifiable risk factors including hypertension, obesity and hyperlipidemia were significantly associated with diabetes profile and were more frequently reported comorbidities among diabetic AIS patients enrolled in the study (Table 1 & 2). In support, international data also recognized the association between stroke and this comorbid conditions [16-18]. Furthermore, a local study conducted by Zahra et al reported increased frequency of comorbidities among diabetics i.e. hypertension (71 DM cases vs 26 Non- DM cases) and hyperlipidemia (21 DM cases vs 14 Non- DM cases)[13].

Hence, the fact cannot be denied that these risk factors are interrelated and have significant effects on each other and on the diabetic profile of AIS patients as well. Obesity was more common among 46 to 60 years of AIS patients i.e. 18(13.2%) as compared to those in between 30 to 45 years of age, finding were statistically significant (p<0.05) and same was in the case of hypertension and hyperlipidemia (p<0.05).

The current study has several limitations, although the studies discussed major risk factors associated with DM among AIS patients but the common CVD associated risks and lifestyle factors were all subsided. Unlike other studies, no records of atrial fibrillation, myocardial infarction and CHD were maintained. The complications associated with each of the reported risk factors were not considered. With limited facilities and rapidly increasing disease burden, the current situation is terribly alarming indicating 1 case in every 5 AIS patient with associated diabetes profile. The condition is worsening due to the lack of knowledge and patient's un-awareness. And if not diagnosed and treated early, this morbidity and associated comorbidities will accelerate the economic burden of the country. Physicians are recommended to be will equipped with all recent knowledge and should be able to instruct the patient regarding their disease state. Follow-up visits must be considered to track the glucose levels among these patients.

CONCLUSION

Our study results were comparable to several national and international studies and hence it can be concluded from our findings that the frequency of newly diagnosed diabetes is high among patients with AIS. Patients presented with ischemic stroke must be screened for DM and other potential risk factors including obesity, hypertension, hyperlipidemia, smoking and lifestyle factors in order to avoid

complexities. Further, multicenter descriptive studies including diverse population are required for better understanding of the disease and its associated complexities.

Author's Contribution:

Concept & Design of Study:	Syed Yasir Hussian Gillani Saima Bibi
Drafting:	Saima Bibi
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