Original Article

Frequency of Stress Hyperglycemia and Incident Diabetes Mellitus in Patients Presenting with Acute Coronary Syndrome

Incident Diabetes with Acute Coronary Syndrome

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ABSTRACT

Objective: To determine the Frequency of stress hyperglycemia and Incident Diabetes Mellitus in patients presenting with Acute Coronary syndrome.

Study Design: Cross sectional study

Place and Duration of Study: This study was conducted at the Coronary Care Unit of DHQ Teaching Hospital Nowshera and Qazi Hussain Ahmad Medical Complex (QHMC) Nowshera from January 2017 to June 2018.

Materials and Methods: They were interviewed through a pre-designed research proforma after informed written consent. Random plasma glucose (RPG) and fasting plasma glucose (FPG) were performed. The diagnosis of the sub type of ACS was made using the acute changes of the ECG and Qualitative Cardiac Troponin tests.

Results: A total of 278 ACS patients were enrolled I the present study. There were more male patients (56.8%) with ACS. The frequency of Diabetes was 51.8% (n, 144) as compared to non-diabetics 48.2% (n, 134) in ACS. The Frequency of Stress hyperglycemia using RPG levels was 70.5% (n, 196). Frequency of Incident DM and Pre Diabetes was 13.2% (n, 26) and 9.0% (13), respectively using FPG levels among stress hyperglycemic patients. The Frequency of STEMI, nSTEMI and Unstable angina was 59.7% (n, 166), 19.4% (n, 54) and 21% (n, 58), respectively.

Conclusion: There is higher prevalence of stress hyperglycemia and known diabetes mellitus with small number of incident diabetes in the present study.

Key Words: Acute Coronary Syndrome, Incident Diabetes Mellitus, Stress hyperglycemia

INTRODUCTION

According to World Health Organization statistics, the prevalence of Diabetes worldwide for all age groups was 2.8% in 2000. This percentage will rise to 4.4% in 2030. From 171 million people in 2000, this disease will affect 366 million individuals in 2030.[1]

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Various risk factors play a role in the occurrence of Acute Myocardial Infarction (AMI) and Diabetes is one of them. An odds ratio of 2.37 was found in a study (the INTERHEART study) when associating diabetes as a risk factor for AMI.[2] Patients often present to the Emergency departments or the Coronary Care Units with an AMI in the presence of hyperglycemia whether it be stress hyperglycemia, an incidental finding of undiagnosed Diabetes or a previously known case of Diabetes Mellitus.[3,4] The TRIUMPH study, having a sample size of 4340 showed that 2854 patients had metabolic data available. Of these, 10.1% had underlying Diabetes which was undiagnosed. In a total of 4193 patients, 6.8% had undiagnosed underlying diabetes which had presented with an AMI.[4] A study carried out in Naples, Italy showed that 29% of their patients who presented with an AMI had no prior history of Diabetes but they presented with a plasma sugar of more than 7 mmol/L.[3] Another study indicated that the prevalence of undiagnosed hyperglycemia was 5.3% and the uncontrolled Glycosylated hemoglobin (HbA1c) lead to more cardiac complications following an MI.[5] A Canadian study showed that the odds ratio for patients without a history of diagnosed diabetes

(135 out of 1078) was 2.44.[6] Diagnosing diabetes mellitus in the presence of Myocardial Infarction can be done by evaluation of Random Blood Sugar on admission followed by Fasting Blood Sugar and the HbA1c levels. Diagnosing diabetes mellitus in the presence of Myocardial Infarction can be done by evaluation of Random Blood Sugar on admission followed by Fasting Blood Sugar and the levels of HbA1c.[7]

Clinical outcomes following an MI have also been divided into subgroups based on the value of plasma glucose on admission. Admission hyperglycemia was a predictor of poor outcome as compared to normoglycemia and hypoglycemia.[8] Another study showed that non-diabetic patients had comparable risk of death to diabetics which presented with a plasma glucose of 200 mg/dl or more. It has been documented that patients who are undiagnosed Diabetics have a much poor outcome as compared to patients with already diagnosed Diabetes once they present with an AMI.[10]

It is evident that stress hyperglycemia does occur with Acute Myocardial Infarction. However, there is no significant data from our country or our province as to how much percentage of this hyperglycemia is indeed stress hyperglycemia or whether it is because of underlying undiagnosed Diabetes Mellitus that presented with AMI. Our aim would be to evaluate the prevalence of undiagnosed diabetes that surfaced due to an AMI which could be the possible complication of DM. Another aim would be finding out the associated diagnosis along with AMI that present with hyperglycemia on admission.

MATERIALS AND METHODS

Study Design: It is a cross sectional study that was carried out from January 2017 to June 2018 at the Coronary Care Unit of DHQ Teaching Hospital Nowshera and QHMC Nowshera.

Participants

Inclusion criteria: All patients presenting to the Coronary Care Unit of DHQ Teaching Hospital and QHMC Nowshera, presenting with Acute Coronary Syndrome were enrolled in the study.

Exclusion criteria: Admissions with diagnosis other than ACS were not enrolled into the study. Subjects who were discharged on will or left against medical advice and not consenting were also excluded.

Variables: The diagnosis of the patients was noted. RPG fasting blood sugar (FBS) upon admission was performed regardless their previous status of diabetes. The different diagnosis presenting to the CCU will also show the frequency of the sub-categories of diseases in Acute Coronary Syndrome.

Data Sources/ Measurement: The study was conducted after approval from the hospital ethical and research committee. Author constructed questionnaire was used. It was supplemented by lab results for the tests of RBS, FBS and HBA1c in order to confirm the diagnosis of Diabetes Mellitus. The diagnosis of the sub type of myocardial infarction was made based on the acute changes of the ECG and qualitative troponin kit tests (of Roche Pharmaceuticals).

Sample Size: A total of 278 patients were enrolled into the study to account for an adequate sample size.

Statistical analysis: Data was entered into the latest version of SPSS and analyzed.

RESULTS

The samples taken showed a gender differentiation in which 56.8% (157) were males and 43.2% (120) patients were female. A higher percentage of male population was being affected by Acute Coronary Syndrome. The mean age of the patients was 57.9 ± 10.1 years.

Table 01shows the number of patients who came to the CCU with other known co-morbidities. Patients who were aware of their diabetic status were 144 (51.7%) patients while 134 (48.2%) were either non-diabetics or undiagnosed. On the hand, it is evident that 120 (43.1%) patients were hypertensive.

There were 33 (11.9%) smokers and 245 (88.1%) were non-smokers; while the number of patients who had pertinent family history of ACS was 25 (9%).

Table No.1: Co Morbid Risk Factors and ECG Parton

Sr. No	Co morbid Risk Factor	Yes	No
1.	HTN	120 (43.1%)	158 (56.8%)
2.	DM	144 (51.7%)	134 (48.2%)
3.	Smoker	33 (11.9%)	245 (88.1%)
4.	FH of ACS	25 (9%)	253 (91%)
5.	LBBB	9 (3.2%)	269
6.	RBBB	7 (2.5%)	271

FH=Family History, LBBB=Left bundle branch block, RBBB=Right bundle branch block

Table 02 shows frequency of stress hyperglycemia based on admission RPG that was 70.5% (196) while 82 (29.5%) patients were normoglycemic.

Patients were further sorted into categories based on their admission RPG levels values into normal, pre-diabetic and diabetics. Patients with a normal admission RPG were 82 (29.5%) while patients who had impaired glucose tolerance (IGT) were 69 (24.8%) in number. The admission RPG showed 127 (45.7%) patients having a blood glucose in the range of being a diabetic. Prediabetic Patients and diabetic patients were further subjected to a fasting plasma glucose level as well to rule out stress hyperglycemia.

Table No.2: Frequency of Diabetes, Stress Hyperglycemia & IGT in ACS

Character	Observation	Normoglycemic	Stress Hyperglycemia		Total
Known Diabetic	No	55 (41.00%)	79 (58.95%)		134 (48.2%)
	Yes	27 (18.75%)	117 (81.25%)		144 (51.8%)
	Total	82(29.5%)	196(70.5%)		278
Stress Hyperglycemia			IGT	Diabetes	
			69(24.8%)	127(45.7%)	

IGT=Impaired Hyperglycemia

Table 2 also shows that frequency of Stress Hyperglycemia among known diabetics was 81.25% (117) while among non-diabetics it was 58.95% (n, 79). Patients with an elevated RPG were then subjected to a FBS in order to confirm the diagnosis of underlying diabetes mellitus. This was done to find out the cases which had not been diagnosed and presented to us with one of the complications, i.e ACS, of Diabetes Mellitus as shown in Table 03.

Table No.3: Frequency of Diabetes Mellitus Based On Fasting Blood Sugar

	Observation	Normoglycemic	Pre diabetics	Diabetics by FBS	Missing FBS	Total
Known Diabetics	No	5(3.73%)	5 (3.73%)	26 (19.40%)	98 (73.13%)	134 (48.2%)
	Yes	3(2.08%)	13 (9.0%)	82 (56.94%)	46 (31.94%)	144 (51.8%)
	Total	8(2.87%)	18 (6.47%)	108 (38.8%)	144 (51.79%)	278

It can be seen that out of the 196 (70.5%) patients with stress hyperglycemia, frequency of Incident DM and Pre Diabetes was 13.2% (n, 26) and 9.0% (13), respectively (Table 03). These cases presented with a complication of DM as ACS. There were 56.94% (n, 82) known diabetics having FBS in diabetic range. The total prevalence of Diabetic patients that presented to the CCU with a deranged blood sugar level was 108 (38.8%). These statistics are based on in hospital blood sugar values among patients with ACS.

Figure No.1: Prevalence of Sub types of Acute Coronary Syndromes

Taking into account the previously (144) and current cases (26) of Diabetes the total comes down to 170 (61.2%) patients. A total of 144 patients were lost to follow-up and adequate blood sugar measurements which can suggest an underestimated level of undiagnosed diabetics in this study group.
Figure 01 shows the different types of ACS with their respective occurrence. Unstable angina and Inferior wall Myocardial Infarction were the most common ones. There was no significant [P=0.725] association seen between any specific type of ACS and stress hyperglycemia.

DISCUSSION

More male Patients (56.8%) were affected by ACS in this study. The Reykjavik study was entirely conducted on a male population due to the propensity of the disease to affect males more.[11] The disease affected 43.2% of females in our study, a comparatively lower population which is comparable to other studies.[12] The percentage of females being affected by Myocardial infarction is on the rise as shown by our study. The proportion of male patients was still higher as shown in a study conducted over a 25-year period showing hospitalizations due to myocardial infarction.[13]
Global estimates of undiagnosed Diabetes show that the prevalence is 45.8% which is between 24.1% to 75.1% for individual regions.[14] A 13.2% prevalence of undiagnosed diabetes was reported in our study which is underestimated due to loss of follow up of patients.
Trend in the incidence of ACS is also noted in this study which is shown by the increased cases of NSTEMI presenting to the CCU. A similar study carried out showed a rise in the incidence of NSTEMI.[15] Prevalence comparable to another study was seen which showed 61.7% patients with NSTEMI and 38.3% patients with STEMI.[16] Our study showed 59.7% patients showing ST Elevations Myocardial Infarctions.
The Frequency of stress hyperglycemia in our setup was found out to be 70.5%. This percentage is rather high considering the association of mortality with an acute hyperglycemic episode upon admission. In an
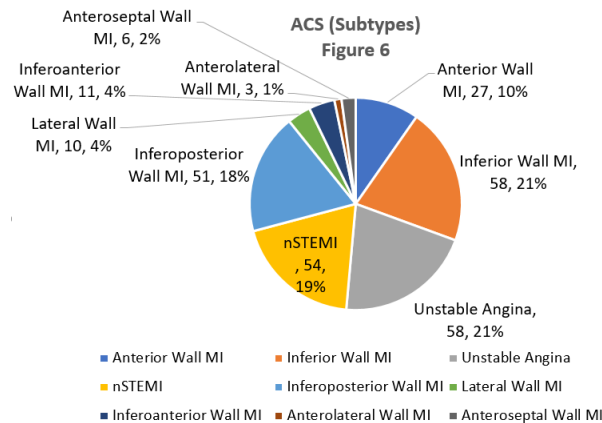
American study, the odds ratio of a high glucose level in different diabetic and non-diabetic groups was 2.44 for in-hospital mortality.[16] Similar articles showing a high mortality rate associated with stress hyperglycemia have also been documented which presented with acute myocardial infarction.[18, 19, 20].

CONCLUSION

There is higher prevalence of stress hyperglycemia and known diabetes mellitus with small number of incident diabetes in the present study.

Admission hyperglycemia can be a fatal condition in both diabetics and non-diabetic patients. A small proportion of patients are also undiagnosed diabetics with poor glucose control that present with Acute Myocardial Infarction. Admission hyperglycemia should prompt thorough investigation of underlying Diabetes to diagnose the condition early in order to start glycemic control and to reduce mortality.

Author's Contribution:

Concept & Design of Study:	Naveed Danish
Drafting:	Samiullah Khan, Muhammad Niaz Khan
Data Analysis:	Muhammad Saad Bin Nasir, Muhammad Kashif Iltaf, Hammad Shah
Revisiting Critically:	Naveed Danish, Samiullah Khan
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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