FREQUENCY OF UNIDENTIFIED DIABETES MELLITUS IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

Objective: To determine the frequency of unidentified Diabetes Mellitus in Acute Myocardial Infarction.
Study Design: Descriptive cross-sectional study.
Place and Duration of Study: Army Cardiac Centre Lahore, Lahore, from Jan 2020 to Feb 2020.
Methodology: Patients (male and females) with acute myocardial infarction both ST Elevation MI and non-ST Elevation MI presenting to cardiac centre were included through consecutive non probability sampling technique. Patients with gestation diabetes mellitus and diabetes type I were excluded. Data was collected through detailed questionnaire covering the necessary variables. Distribution of unrecognized diabetes in these patients were determined through Blood Sugar Fasting and HBA1c levels undersigned by the classified Pathologist.
Results: Over the study period, a total of 150 patients were included. 68.6% were males with 40.6% patients suffering from STEMI and 28% with NSTEMI. Among 31.2% females, 12.6% patients had STEMI and 18.6% had NSTEMI. Out of total patients, 40% were known case of diabetes, 26.6% were newly diagnosed diabetics, normoglycemic were 23.3% and impaired fasting blood glucose levels was present in 10% patients. Total 40 (26.6%) patients were those who were first diagnosed diabetes during admission for acute MI management. In unidentified diabetic group STEMI was more common than NSTEMI with male predominance.
Conclusion: There is a high frequency of unrecognized diabetes mellitus in patients with acute Myocardial infarction in our population. Therefore, in high risk patients for ischemic heart disease, screening for diabetes is routinely suggested to take timely preventive efforts and avoid complications.

Keywords: Acute myocardial infarction, Cardiovascular disease, Unidentified diabetes.

INTRODUCTION

American Heart Association considers dia-betes mellitus as one of the major risk factor for atherosclerotic CVD (ASCVD)[1]. Diabetics are more prone to develop cardiac problems and their incidence to death is two to four times grea-ter than non diabetics[2]. The Framingham Study first determined this close relationship between diabetics and cardiac diseases which further strengthened with time[3].

According to World Health Organization (WHO), diabetes is a serious chronic illness whose trend is rising substantially. Earlier, dia-betes mellitus type 2 was considered prevalent in Western world but now it is a global health problem. Recently, a report is being published in the International diabetes Federation Diabetes Atlas, which shows that the overall prevalence of diabetes in adults is 463 million or in other words 1 in every 11 adult suffers from diabetes[4]. The National Diabetes Statistics Report of United States published in 2020 showed that the preva-lence of diabetes has increased in US population. Formerly, it was approximately 13 million in 2013–2016 but according to recent literature in 2018, it is estimated to be 34.2 million people of all ages or 10.5% of the US population[5]. China being heavily populated country ranks number one in diabetes epidemic and accounts 109. Six million adults[6]. Similarly, India`s diabetic popu-lation ranges approximately 60 million in 2014 and predicted to be reach around 79.4 million in 2030[7]. Likewise, Pakistan is of no exception. In 2013, there were 5.2 million people diagnosed with diabetes and this number is estimated to reach 13.9 million in 2030[8]. In Pakistan, current prevalence of

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the diabetes is 11.77%, more com-mon in urban population (14.81%) than rural (10.34%). Among them, one in every two indi-viduals with diabetes is unidentified leading to an increased rate of death in Pakistan; approxi-mately every sixth expires due to it`s complica-tions[9].

The common complications of diabetes mellitus type 2 are cardiovascular diseases (CVD), stroke, chronic kidney diseases, premature death, blindness, amputations and depression. The most lethal complication is coronary artery disease which decreases the life expectancy by[10], years.

However, in all such statistics the unidentified diabetic population is masked. The close relationship between diabetes and coronary artery diseases highlights the importance to recognize the undiagnosed cases which is leading to be a silent killer among our population. Therefore, this study aims to figure out the unknown cases of diabetes mellitus type 2 in acute myocardial infarction patients. Previous international and national literature determines the frequency of newly recognized diabetes via Fasting blood sugar levels (BSF) or HBA1c. However, this study scrutinized the patients via risk factors, BSF and HBA1c levels which further confirms the diagnosis by ruling out stress hyperglycemia. This study accentuates the importance of screening of diabetes mellitus type 2 which is not routinely done in our set up and patients get discharged with a high risk of micro and macrovascular complications and even treatment failure like stent thrombosis in MI patients who undergo intervention in a cardiac unit. Secondly, it is beneficial to know the prevalence of diabetes in our population, so health care providers concentrate over this issue and make appropriate decisions for early diagnosis and risk stratification.

METHODOLOGY

A descriptive cross-sectional study was conducted at Army Cardiac Centre Lahore from 3rd January 2020 to 27th February, 2020 after approval of institution ethical committee. Consecutive nonprobability sampling technique was used. Sample size was calculated by WHO stat calculator with confidence interval of 90% with 10% margin of error. One hundred and fifty patients were included through purposive convenience sampling after getting informed consent. All male and female patients with acute myocardial infarction (ST elevation myocardial infarction and Non-ST elevation myocardial infarction) presented to Emergency room and Cardiac care unit were enrolled. Although, patients with diabetes type 1 and gestational diabetes were excluded. Data was calculated via structured questionnaire.

Standard definitions by AHA guidelines were used to diagnose patients with ST elevation Myocardial Infarction (STEMI) and non-ST elevation MI (NSTEMI), published in 2013 and 2014 respectively. As per guidelines, STEMI were diagnosed with ECG of new ST elevation at the J point in at least 2 contiguous leads of ≥2 mm (0.2 mV) in men or ≥1.5 mm (0.15 mV) in women in leads V2–V3 and/or of ≥1 mm (0.1 mV) in other contiguous chest leads or the limb leads[10]. Non-ST elevation patients were those who have ECG with absence of persistent ST-elevation (except in patients with true posterior myocardial infarc-tion) but clinically appropriate candidate with raised cardiac biomarkers[11]. All patients were reviewed via detailed clinical history and risk factors for diabetes type 2 like age, weight and fa-mily history. Diabetes was diagnosed according to the American Diabetes Association Standards of Medical Care 2019. Total 4 groups were for-med, known cases of diabetes mellitus type 2, pre diabetics, unidentified diabetics and patients with no diabetes. Diabetics were considered those who had Fasting Plasma Glucose (FPG)> 126mg/dl and HBA1c >6.5%. Impaired Fasting Glucose (IFG) is defined as Fasting Plasma Glucose levels between 100 and 125 mg/dL (between 5.6 and 6.9 mmol/L)[12]. Unidentified group were unaware of their glycemic control, and during admission no record available in discharge summaries or physician`snotes regarding diabetes or already use of anti diabetic medication but still have BSF >126 mg/dl and HBA1c 6.8%. Patient with no diabetes (normoglycemic) are those who had no previous history and normal BSF levels.

Fasting Blood Sugar levels were analyzed via fully automated chemistry analyzer "selectra Pro M" and Glycosylated Haemoglobin (HbA1c) levels measured through Enzymatic Calorimetric Method on "Selectra Pro M" in Army Cardiac Centre. Data was analyzed by using IBM SPSS 20. Categorical data was presented as frequency and compared with chi-square statistics or Fischer "s exact test where appropriate. Continuous data was presented as mean ± SD.

RESULTS

A total of 150 patients suffering from Acute Myocardial infarction including both ST elevation Myocardial infarction (STEMI) and Non-ST elevation Myocardial Infarction (NSTEMI) were included in the study. Among them 103 (68.6%) were males and 47 (31.2%) were females. Majority of participants, 70 (46.66%) were in the age bracket of 45-65 years with the mean age of 55.9 ± 9.3.

Table-I: Distribution of acute myocardial infarction by gender.

Acute MI	Male	Female	Total
STEMI	61 (40.6%)	19 (12.6%)	80 (53.3%)
NSTEMI	42 (28%)	28 (18.6%)	70 (46.6%)
Total	103 (68.6%)	47 (31.2%)	150 (99.6%)

Table-II: Distribution of undiagnosed diabetes by gender.

Undiagnosed Diabetes	n=40	Percentage
Male	25	62.5
Female	15	37.5

Table-III: Undiagnosed diabetes n=40.

Gender	STEMI	NSTEMI
Male	18 (45 %)	11 (27.5%)
Female	6 (15%)	5 (12.5%)

Table-IV: Risk factors (n=40).

Risks	Male	Female
Smoker	7 (17.5%)	1 (2.5%)
Hypertension	8 (20%)	6 (15%)
Hyperlipidemia	2 (5%)	4 (10%)
Smoker ± Hypertension	3 (7.5%)	-
No Risk	5 (12.5%)	4 (10%)

STEMI was diagnosed in 80 (53.3%) patients with males 61 (40.6%) and females 19 (12.6%). Seventy (46.6%) patients suffered from NSTEMI with males 42 (28%) and females 28 (18.6%) (table-I). STEMI=ST elevation Myocardial Infarc-tion. NSTEMI=Non-ST elevation Myocardial Infarction.

There were in total 60 (40%) patients who had diabetics with acute myocardial infarction, 15 (10%) with Impaired Fasting blood glucose level, 40 (26.6%) had diabetes which was earlier unidentified and 35 (23.3%) participants had normal blood glucose levels throughout the admission in hospital (figure).

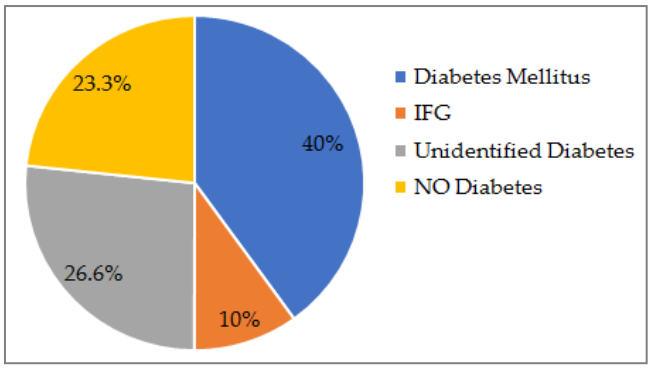

Figure: Distribution of diabetes in acute myocardial infarction patients.

In our study, males were predominant in unidentified group or newly diagnosed diabetes type 2. There were 25 (62.5%) were males and 15 (37.5%) were females (table-II). In terms of myocardial infarction, this group had STEMI (56.7%) more common than NSTEMI (43.3%) (table-III).

Additionally, in the study,risk factors were analysed in newly diagnosed diabetic patients and major ones were highlighted. The major risks noticed were smoking (20%) hypertension (35%), hyperlipidemia (15%), hypertension with smoking (7.5%)while there are 26.6% patients with no risk factors (table-IV).

DISCUSSION

Cardiovascular disease (CVD) has become the most significant cause of death around the globe. As per World Health Organization (WHO) in 2015, 17.7 million deaths occurred due to CVD and specifically 7.4 million were due to coronary artery disease. 13 Similarly, in Pakistan, the incidence of coronary artery disease and associated mortality rate has been raised to a larger extend. Chaudhry *et al*, illustrated in a local study that

30% of population of age >45 are suffering from coronary artery disease (CAD)[14]. According to the latest data published by WHO in 2017, there is an estimated 265,051/100,000 deaths by CAD which makes Pakistan rank 13th in the world with highest fatality CAD[15]. There are many modifiable and non modifiable risk factors associated with such diseases which needs to be addressed to control this increasing trend. Determination of such factors is also essential and foremost step for primary prevention of non communicable diseases like CVD[16]. A case control study was conducted, INTERHEART, in 52 countries Europe, The Middle East, Australia, Africa, Asia and South and North America and revealed that there are 9 modifiable risk factors including diabetes, hypertension smoking, central obesity, lack of exercise, psychological index, improper diet lacking fruits and vegetables, Apolipoprotein B/Apolipoprotein A1 (ApoB/ApoA1) ratio and use of Alcohol[17].

Nowadays, modifiable risk factors are the main driving force for skyrocketing cardiovascular diseasepopulation[18].

Of these contributors Diabetes Mellitus type II is an emerging health care problem and will be expected to be 7th leading case of death by 2030, as WHO anticipates[19]. In Pakistan, till 2000 the prevalence of diabetes was 12% which makes 7.8-8 million people and expected to be 14.5 million by year 2025[20].

There is a wide range of literature which depicts a strong correlation between diabetes and high risk of cardiovascular morbidity and mortality. As per global registry for acute coronary disease, there is high prevalence of diabetes mellitus in acute coronary syndrome; this fact is advoca-ted in our study where 40% of patients suffering from acute myocardial infarction were known ca-se of diabetes mellitus type-2. Such high inciden-ce was seen also in a study conducted in China where 36.8% acute MI population had diabetes[21].

Hyperglycemia in acute MI patients could be observed due to stress hyperglycemia, identified or unidentified diabetes. During early phase of myocardial infarction stress mechanism activates, involving increase of adrenaline, steroids, glucagon and free fatty acids. Glucose is always favoured source of energy for ischemic myocardium and insulin is required for utilizing it. Stress hyperglycemina is a transient phase and is therefore associated with less serious complications. A local study conducted in Mayo Hospital Lahore depicts post MI angina and heart failure is more pronounced in undiagnosed diabetic group than stress hyperglycemic patients[22]. Therefore, our study mainly objectifies the importance of undiagnosed cases of diabetes mellitus in myocardial infarctions due its high prevalence. In the present study, patient with acute Myocardial Infarction were studied for the presence of unidentified diabetes. The frequency of such newly diagnosed patients was 26 (6%). Norhamman *et al,* conducted a study and determined 25% had unidentified diabetes in such patients. Another study of Myocardial infarction by Hayat *et al* revealed 29.6% patients were already diabetics who were first time diagnosed at the time of presentation of myocardial infarction.

Among the patients of our selected group males were common than females. First time diagnosis of diabetes in patients of Myocardial Infarction was also conducted in Birmingham UK and showed similar result of male dominance in these patients[23]. STEMI patients were frequent than NSTEMI in them and this finding was consistent with Global registry of Acute coronary syndrome[24].

Our study validates the notion that the undiagnosed diabetes is common in Acute myocardial infarction patients of our population therefore screening will be beneficial for primary and secondary prevention of this disease. Moreover, screening not only help people to be protected from the complications of diabetesbut will also highlight the psycho-social needs of such patients which can be catered accordingly. Unrecognised diabetes is an additional risk in health care sys-tem as well as economic burden worldwide. Such patients get hospitalized often, stays longer in ICU therefore require more infection control measures.

In 2017, USA spend $ 31.7 billion over undiagnosed diabetic population[25].

This is a single center prospective study therefore could not represent rural area efficiently. Follow up complications and major adverse cardiovascular events (MACE) are not catered and therefore future studies could be done with these considerations.

CONCLUSION

It is concluded that there is high prevalence of diabetes mellitus type-II in patients with Acute myocardial infarction in our population. Such patients are prone to develop post Myocardial infarction complications. In "nondiabetics", patients having risk of ischemic heart diseases should be screened via routine Fasting Blood glucose levels so life threatening complications could be avoided. Unidentified diabetes mellitus is an alarming issue which can be addressed via public education regarding disease and its complications. Community based measure for screening and primary prevention should be implemented with emphasis on lifestyle modification in order to over come increasing burden of cardiovas-cular disease and financial burden on country's economy.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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